UNIVERSITY UNDERGRADUATE
RESEARCH & ARTS FORUM

UURAF

April 12, 2024

ACKNOWLEDGEMENTS

The 26th 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 12, 2024. This program book recognizes the outstanding research and creative endeavors by over 1,000 undergraduate students. These students represent 12 different colleges and were mentored by more than 600 faculty, staff, post-doctoral fellows, graduate students, and industry partners.

UURAF is sponsored by the Office for 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 undergraduate and support staff: Navanidhiy Achuthan Kumaraguru, Anapaola Almaguer-Morales, Katy Anderson, Marena Haidar, Binitha Liyana Lekamalage, Keely Thorpe, Martina Yen, and Monica Zamudio
- Casie Chunko, Administrative Assistant for Academic Initiatives
- Heather Dover, Coordinator for Undergraduate Research and lead UURAF organizer
- Mordecai Harvey, Assistant Director for Undergraduate Research
- Brian Keas, Director for Undergraduate Research
- Korine Wawrzynski, Assistant Dean, Academic Initiatives

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

The cover art was designed by Mia Tran who received a BFA in Graphic Design from the College of Arts & Letters in 2023.

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 2023-24 Undergraduate Research Ambassadors include:

Grant Bruninga	Tanvi Karkare	Hari Ramakrishnan
Faith Cherop	Olivia Leblanc	Maya Salamey
Emily England	Anne Lemek	Grace Stys
Joey Esparza	Sydney Logsdon	Hannah Vanslembrouck
Neha Gopalakrishnan	Nikita Nel	Dorothy Zhao

Undergraduate Research
MICHIGAN STATE UNIVERSITY

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Abstracts

Abstracts are organized by category. Please note that each abstract was limited to 1,500 characters; any submissions exceeding this limit were truncated.

Agriculture & Animal Science

EVALUATING SUSTAINABLE IRRIGATION TECHNIQUES FOR BLUECROP BLUEBERRIES.
Presenter(s): Bhavesh Sivashankar, Maxwell McFee, Megan Ransler
Agriculture and Animal Science
Mentor(s): Younsuk Dong (College of Agriculture & Natural Resources)

Sustainable water management is a pressing concern in the age of modern farming, where aquifers levels are falling and over pumping is a threat to farmers everywhere. The majority of blueberries are produced in southwest Michigan, and the state leads the country in blueberry production. However, groundwater is badly depleting, especially along the coast of Lake Michigan where this farming is taking place. An evaluation of the differences seen in water usage with drip irrigation between Bluecrop and Jersey blueberry plants is crucial in the determination of how to better conserve and promote sustainable water management when growing these two species. Additionally, proper irrigation documentation is needed to be developed in order to enhance the growth of these plants. This experiment aims to do exactly this. The experiment will be done with Bluecrop and Jersey blueberries, and all plants will be watered with a drip irrigation system. We will be gathering data about the weights of the plants before and after the watering each weekday, as well as collecting data to account for water lost due to evaporation. By doing this we will be able to evaluate the amount of water used by each plant everyday and then classify this data for each species, Bluecrop and Jersey. Based on literature, we expect the Jersey blueberry plants to use more water than the Bluecrop blueberry plants. This research aims to serve as a foundation to effective irrigation and water management when far

APPLICATION OF A LOW-COST THERMAL IMAGING CAMERA IN PLANT CANOPY HEAT STRESS MONITORING
Presenter(s): Guy Sloan
Agriculture and Animal Science
Mentor(s): Younsuk Dong (College of Agriculture & Natural Resources)

In the past, there has been a large focus in agricultural technology toward harvesting and planting crops and plants' health. However recently, more and more remote sensors have been used to record various data points like soil moisture, air humidity/temperature and precipitation to aid in plant monitoring. However, the costs of equipment can be a barrier to implementation, with it being the primary driving factor in using thermal imaging technology as a sensor. This study was conducted using FLIR's Lepton 3.5 thermal imaging camera and evaluated its functionality and applicability toward the monitoring of leaf and canopy temperature. The camera was operated using a Raspberry Pi 4 Model B, with various tests being done on the camera to compare it to a commercial handheld infrared thermometer. Both the camera and infrared thermometer decreased in accuracy with distance, with a 1-degree Celsius difference occurring when measuring past 1.8 meters. Variation in temperature reading was also conducted on the thermal camera. It only deviated ±0.5 C° from the center, with a max of ±1.05 C° and a min of ± 0.27 C°. Furthermore, the camera's performance was conducted on a blueberry canopy. The camera was able to differentiate between upper and lower canopy temperatures and differentiate between wet and dry leaves. The evaporative cooling of the leaf was also able to be observed. In conclusion, the Lepton FLIR 3.5 thermal imaging camera is a viable option in agricultural practices to mon

PAWSITIVE PROGRESS (PART II): REFINING AND VALIDATING A NOVEL TOOL TO ASSESS SHELTER DOG COPING BEHAVIOR
Presenter(s): Eileen Chen
Agriculture and Animal Science
Mentor(s): Jacquelyn Jacobs (College of Agriculture & Natural Resources)

Dogs in animal shelters are exposed to a variety of environmental stressors (e.g., sensory overload, and restricted space) and many struggle to adjust. As a result, clinical kennel stress may occur, either as chronic excessive arousal or severe despondency. In such cases, behavioral and pharmaceutical intervention can improve the dog's welfare, but access to such resources vary dramatically among shelters. To identify at-risk shelter dogs, a novel behavior assessment was developed to quantify coping behavior and was previously refined through a process of clinical and statistical validation. The tool results in a score ranging from -40 indicating severe anxious avoidance (AA) to +40 indicating severe excessive arousal (EA), with 0 scores indicating adaptive coping (AC). Shelter dogs (n = 39) were assessed using the refined tool from February-March 2024. Inter-rater reliability (IRR) of each human animal interaction (HAI) was calculated using quadratic weighted kappa and percent agreement. The tool was found to have moderate to perfect IRR for all 7 HAI's. A subset of 11 dogs, representing a range of scores on the refined tool, were diagnosed as EA, AA, or AC by a blinded board-certified veterinary behaviorist through video observation for validation. Validity analysis is ongoing, but significant differences in estimated marginal means between total coping scores for AC, AA, and EA dogs are expected. We anticipa

EFFECTS OF NON-NUTRITIVE SWEETENERS ON THE MORPHOLOGY OF THE SMALL INTESTINE DURING THE WEANING PERIOD IN PIGS
Presenter(s): Riley Barber
Agriculture and Animal Science
Mentor(s): Kwangwook Kim (College of Agriculture & Natural Resources)

The objective of this experiment was to investigate the effects of non-nutritive sweeteners on intestinal morphology during the post-weaning period in pigs. One hundred sixty-eight pigs (6.13 ± 0.41 kg body weight) were weaned at 21 ± 1 days and allotted to 4 dietary treatments with 6 pigs/pen. The dietary treatments were: (1) Control diet (CON); (2) CON + 150 mg/kg of sucralose (SCL); (3) CON + 30 mg/kg of neotame (NEO); and (4) CON + 50 mg/kg antibiotic Carbadox, (CBX). On day 14 and 28 post-weaning, 1 pig/pen was euthanized (7 pigs/treatment, respectively) to collect small intestinal segments (duodenum, jejunum, and ileum) and fixed in 10% formalin. Samples were then sliced, placed in cassettes with 50% ethanol, and embedded in paraffin. After sectioning, slides were stained with hematoxylin and eosin solution, scanned, and intestinal morphology (villi height, crypt depth, villi width, and villi area) was measured. NEO and CBX tended to increase ($P < 0.10$) or had greater ($P < 0.05$) villi height: crypt depth ratio in the day 14 duodenum, respectively, compared to CON. Pigs in the treatment groups showed tendencies ($P < 0.10$) or increases ($P < 0.05$) [RB1] in villi height and width in the day 14 ileum, compared to CON. These results indicate a potential beneficial effect of non-nutritive sweeteners on intestinal development in post-weaning pigs. These findings contribute valuable insights into using non-nutri

SOIL STORAGE METHOD IMPACTS ABILITY TO DETECT ALFALFA AUTOTOXICITY
Presenter(s): Kaylee Graham
Agriculture and Animal Science
Mentor(s): Paige Baisley (College of Agriculture & Natural Resources)

Alfalfa (*Medicago sativa*) is a common forage crop used for hay and silage. One challenge to alfalfa production is autotoxicity which occurs when seedling germination and growth are suppressed by compounds released by established plants of the same species. Bioassays are a tool used to measure autotoxicity in soil by measuring its effect on seedlings. Together, reduced root length and increased root diameter in seedlings suggest autotoxicity is present. The bioassay's ability to detect autotoxicity is affected by many factors including soil storage methods. We tested three soil storage methods (air-dry, frozen, and room-temperature) at four-time points (0 (fresh soil - no treatments), 1, 2, and 3 weeks of storage) to determine which storage method was most effective in preserving autotoxicity. The baseline bioassay at 0 weeks showed no differences in average root length between alfalfa field soil (autotoxic soil) and control (non-autotoxic potting soil) ($P>0.05$) suggesting a lack of autotoxicity. However, the baseline average root diameter in the field soil was 0.026-0.038mm greater than in the control ($P < 0.05$) suggesting autotoxicity was present. Baseline results contradict each other since length and diameter typically agree in autotoxicity detection implying the bioassay's sensitivity and consistency must be better understood. No differences were detected in average root length for storage methods throughout the study ($P > 0.05$).

THE IMPACT OF SLOW INTRODUCTION OF UNKNOWN OBJECTS TO SHEEP
Presenter(s): Abby Baxter
Agriculture and Animal Science
Mentor(s): Brian Nielsen (College of Agriculture & Natural Resources)

Reducing stress and improving comfort is critical to the welfare of production animals. While introducing new objects may not seem stressful to humans, it may cause unnecessary stress to an animal, particularly if not allowed to interact with the objects. This study investigated whether the repeated introduction of new objects to sheep increases their willingness to interact with those objects. The study used 28 Dorset Polypay sheep. Sheep were split evenly into two test groups, 14 sheep per group. The novel objects that were introduced to the herd included a large cardboard box, a folding chair, a green dodgeball, and an orange traffic cone. Every object was introduced to the sheep twice for 10 minutes with a two-week time period before the next data collection date for that novel object. Interactions were video-recorded and types of encounters were documented. Sheep tended to interact with the novel object more the second time, but typically interacted with the control object less than the novel objects. We concluded production animals should be allowed to interact with new objects on their own before becoming part of the production system to increase familiarity, decrease fear, and improve welfare.

IMPACT OF SYNTHETIC PHEROMONE EXPOSURE TO PUPAE OF THE ORIENTAL FRUIT MOTH ON SUBSEQUENT MATING BEHAVIOR

Presenter(s): Sophia Burke

Agriculture and Animal Science

Mentor(s): Juan Huang (College of Agriculture & Natural Resources), Julianna Wilson (College of Agriculture & Natural Resources)

Mating disruption is a sustainable pest management technique that employs synthetic sex pheromones to inhibit the ability of adult male insects to locate conspecific females, thus preventing mating, leading to no viable offspring production. This approach has been pivotal in controlling the Oriental Fruit Moth (OFM), Grapholita molesta, a significant pest in pome and stone fruit orchards. Traditionally applied during the adult phase of OFM, our study explores the application of mating disruption at the pupal stage instead of the adult stage to assess the mating behavior of emerging adults. Newly formed male and female OFM pupae were exposed either to sex pheromone or to nothing until adult emergence. Results indicate that mating disruption applied at the pupal stage successfully delayed mating in treated OFM populations. However, it did not significantly affect egg viability among those that mated. This research underscores the potential of early-stage mating disruption as a complementary strategy in OFM management, offering insights into broader applications for sustainable pest control in orchards. By extending the use of mating disruption to earlier developmental stages, we may enhance the efficacy of pest management programs and reduce reliance on chemical insecticides, thereby supporting agricultural sustainability.

SALMONELLA INACTIVATION IN BAKED BEEF PASTIES

Presenter(s): Rosie Vanluven

Agriculture and Animal Science

Mentor(s): Ian Hildebrandt (College of Agriculture & Natural Resources), Michael James (College of Agriculture & Natural Resources)

Foods with meat encased in dough, such as pasties, have been identified as a "scientific gap" in the USDA FSIS Revised Cooking Guideline Appendix A, indicating a need for additional scientific data. The objective was to quantify the inactivation of Salmonella during pilot-scale cooking of pasties. Beef cubes (raw and pre-cooked) or dough were inoculated with an 8-strain Salmonella cocktail. Pasties were made using equal portions (~60 cm3) of raw or pre-cooked beef cubes, potato cubes, and diced onions enveloped in dough. Pasties were baked in an oven at 160°C for 30 min or 50 min and quenched in 150 ml chilled peptone water. Samples were then stomached, serially diluted, plated on modified Tryptic soy agar, incubated (37°C, 48 h), and enumerated. Initial Salmonella levels in inoculated raw beef, pre-cooked beef, and dough were 9.18±0.24, 9.03±0.15, and 7.96±0.47 log CFU/g, respectively. By 30 min cook time no treatment resulted in ≥6.5 log reduction. By 50 min, Salmonella reduction in the raw beef, pre-cooked beef, and dough-inoculated pasties was 8.20±1.29, 7.93±0.6, and 7.32±0.85 log reductions, respectively, exceeding the 6.5 log reduction target for beef products ($P < 0.05$). Pasties failed to achieve 6.5 log reductions of Salmonella at the par-cooked state of 30 minutes. By 50 min, pasties resembled a fully-cooked, ready-to-eat product and reliably achieved >6.5 log reductions of Salmonella. Pre-cooked filling would reduce the overall risk of pathogens s

EXPLORING THE IMPACT OF NIGHT OR DAY HEAT STRESS IN COWPEA VARIETIES WITH DIFFERING HEAT TOLERANCES

Presenter(s): Alethia Regina Pratas da Costa Braun

Agriculture and Animal Science

Mentor(s): Peter Lundquist (College of Natural Science), Shannon Donnelly (College of Natural Science)

Plastoglobules, crucial for lipid metabolism and stress responses, are studied to understand how cowpeas' thylakoid membrane responds to high temperatures. My research proposal investigates the impact of day and night heat stress on cowpeas, focusing on plastoglobules' role in plant health under extreme temperatures. Advanced techniques like python coding, lipid extraction, and proteomics will be employed to analyze changes in protein abundance, metabolic profiles, and the crop system. Cowpeas were strategically chosen for their global importance and susceptibility to temperature fluctuations, mimicking real-world conditions. Securing funding is essential in the context of climate change. This research has the potential to unveil new strategies for crop resilience, impacting global food security. Understanding how plastoglobules influence plant health under day-night temperature variations could revolutionize crop development and stress response strategies. The research goals include examining thylakoid membrane protein abundance, cowpeas' metabolic responses, and the impact of yield to intense heat. The hypothesis predicts distinct plastoglobule behavior under nocturnal heat stress and unique alterations in the thylakoid membrane's response during daytime stress. This study not only aims to enhance cowpea resilience but also contributes to a broader understanding of plant stress responses in variable temperatures. Stakeholder support is crucial for advancing scient

IMPACT OF PARITY ON STALL UTILIZATION IN FREE ACCESS STALL SYSTEMS
Presenter(s): Simon Collier
Agriculture and Animal Science
Mentor(s): Andrea Luttman (College of Agriculture & Natural Resources), Catherine Ernst (College of Agriculture & Natural Resources)

Consumer pressure is leading producers to transition to gestational group-housing systems such as free access stalls. The objective of this study was to describe stall utilization by gestating gilts and parity 1 (P1) sows in a free access stall system. A gilt pen and a P1 pen, each with 8 stalls and 1 pig allocated per stall space (n=16 total), were used for this study. Pigs were moved into stalls at 25 days of gestation and allowed to acclimate before being moved out of stalls at noon 5 days later. Continuous overhead video recording was captured for 72h immediately following mixing (acute stage) and at 3wk post-mixing (stable stage). Videos were manually decoded for the sows' time of entry and exit from stalls. Total stall utilization between the acute and stable stages was analyzed using a paired t-test. To assess the influence of parity, stall utilization was analyzed using a Gaussian linear mixed model with fixed effects of parity, stage, interaction between parity and stage, and random effect of individual animal. We observed stall utilization for gilts significantly decreased between the stages (20.9h vs. 11.3h, $P < 0.001$) and remained unchanged for P1 sows (16.9h vs. 19.0h, $P = 0.1631$). In conclusion, gilts began utilizing the pen environment more once the group environment became stable whereas P1s remained unchanged. The observed parity differences may suggest that gilts adapt more quickly to the free access stall system com

EXERCISE APPEARS TO RELAX SHEEP. POSSIBLE IMPLICATIONS FOR HANDLING SHEEP, AS WELL AS HORSES.
Presenter(s): Kaitlin Grieser
Agriculture and Animal Science
Mentor(s): Brian Nielsen (College of Agriculture & Natural Resources), Renee Harbowy (College of Agriculture & Natural Resources)

Exercise can be a contributing factor to enhanced wellbeing. It is commonly known that human mental health can improve with exercise. Also, horses have fewer behavioral issues and are easier to train after being "turned out" for exercise. However, both humans and horses are known to exercise for fun. Does the same apply to other species such as sheep? We hypothesized that sheep will appear more relaxed after exercise. This project used 28 sheep, exercised four days per week in a circular exerciser with the study lasting for six weeks. Exercise duration was five minutes at the initiation of the study, and increased duration by five minutes each week. Observations on their behavior were taken for 3 minutes prior to exercising, while exercising, and for 10 minutes after exercising. Observations included head position, ear position, elimination, movement, sniffing, flocking, avoidance, shaking, and posture. An ANOVA test was done to determine which behaviors changed with exercise ($p \leq 0.05$). Altered behaviors included ear position, elimination, movement, sniffing, and flocking. A regression was used to determine the effect exercise had on them. After exercise, ears were more planar, elimination, sniffing, and flocking decreased, and movement slowed down. The detected changes in sheep behavior suggest the animals were more relaxed and less anxious after exercise. As such, exercising sheep or allowing "turn out" for confinement-housed sheep may permit them to be h

MOOVING FORWARD: UTILIZING ANIMAL BEHAVIOR DATA FOR EARLY BLV DETECTION
Presenter(s): Brandon McClure, Delani Stull
Agriculture and Animal Science
Mentor(s): Tasia Kendrick (College of Agriculture & Natural Resources)

Bovine leukemia virus (BLV) causes a lifelong infection that suppresses the immune system of cattle making them more susceptible to infections and decreasing their lifespan. Currently, BLV-infection status is determined by the amount of BLV provirus (PVL) detected in a biological sample. The higher the amount of BLV PVL in an animal, the more infectious the animal is to their herdmates. The industry lacks a low-cost noninvasive sampling technique to determine BLV-infection status. The current preliminary study aims to utilize behavioral data as an indicator of high BLV PVL among adult dairy cattle during the first 60 days of pregnancy. BLV-infection status was obtained from 14 adult dairy cows, 7 of which had high BLV PVL (2.356 ± 0.925) and 7 had near zero BLV PVL (0.011 ± 0.009). Behavioral data was recorded by a wireless monitoring system, CowManager ear sensor which recorded average daily rumination, activity status (high, moderate, or none), and eating time for each cow. A statistical analysis will be conducted to determine differences between BLV-infection status and the measured behavioral variables. Utilizing a behavioral monitoring system to offer insights of an animal's BLV-infection status or disease would equip producers with a cost-effective noninvasive tool to enhance management decisions on the farm and improve overall animal welfare.

UNIVERSITY STUDENTS' ATTITUDE TOWARD HORSES IMPROVED WITH PARTICIPATION IN AN EQUINE ACTIVITY.
Presenter(s): Erin Simpkins, Haley Preston
Agriculture and Animal Science
Mentor(s): Christine Skelly (College of Agriculture & Natural Resources), Karen Waite (College of Agriculture & Natural Resources)

The Michigan State University Horse Teaching and Research Center (HTRC) is open daily to the public. In 2022, 865 Michigan State University students took part in classes at the HTRC, representing only a fraction (1.74%) of the 49,696-student population. This study explored how student participation in a horse activity influenced their attitude toward horses. MSU students ($n = 115$) were recruited through posters and class announcements. Students were randomly divided into three activity groups: A guided walk on a farm lane with no opportunity to interact with horses ($n = 37$); a self-guided tour of HTRC with the opportunity to interact with horses ($n = 38$); and grooming a horse ($n = 40$). All study participants completed a pre- and post-activity survey immediately before and after their 30-minute activity. Both surveys included seven items regarding attitudes toward horses using a 5-point response scale. The scaled instrument had a Cronbach's alpha score of .761, indicating a satisfactory level of scale reliability. A repeated-measures ANOVA in SPSS showed that mean horse attitude scores improved significantly between pre- and post-test for all groups (F(1, 112) = 39.879, P < 0.005) with no differences between activity groups. The HTRC has an estimated 30,000 visitors each year, and these results support that a visit to the campus horse farm can positively influence a student's attitude toward horses.

SYSTEMIC ADIPONECTIN DOES NOT CHANGE AFTER INTRA-ARTICULAR STEROIDS IN HORSES.
Presenter(s): Maya Salamey
Agriculture and Animal Science
Mentor(s): Brooke Boger (College of Veterinary Medicine), Jane Manfredi (College of Veterinary Medicine)

In humans, insulin, glucose, and adiponectin increase post-intra-articular injection of corticosteroids (triamcinolone acetonide (TA)) for osteoarthritis (OA). Adiponectin increases more in metabolically normal versus abnormal humans, likely as a compensatory response because systemic adiponectin is insulin-sensitizing. In metabolically normal horses, insulin increases after intra-articular TA which is concerning for hyperinsulinemia-associated laminitis. Studies are mixed on how systemic adiponectin correlates to the development and severity of OA. It is unknown whether intra-articular TA causes an increase in adiponectin in horses and whether adiponectin levels differ in joints with OA. We hypothesized total adiponectin would increase more in metabolically normal horses, after intra-articular TA and positively correlate to systemic triamcinolone concentrations, and that adiponectin will be lower in OA joints. Horses (6 metabolically normal, 4 abnormal) were injected with TA (18mg) in one middle carpal joint. Systemic adiponectin was followed for 72 hours post-injection. Synovial fluid was sampled in twelve joints (4=OA, 6=normal) from thirteen horses. Total adiponectin was measured using ELISAs. Statistical analyses included mixed-effects analyses and Spearmen correlations (significant at p<0.05) The average systemic adiponectin did not change from pre (580.29±79.98 ng/ml) to post (579.92 ±3.32 ng/ml) intra-articular TA or between normal and metabolically abnormal

HEAT STRESS IMPACT ON BEHAVIORAL SIGNS AND PRODUCTION EFFICIENCY IN BEEF STEERS
Presenter(s): Michael Aron
Agriculture and Animal Science
Mentor(s): Jongkyoo Kim (College of Agriculture & Natural Resources)

Heat stress in beef cattle is defined by the instances of periods in which temperatures exceed the thresholds of the thermoneutral zone which could result in adverse or lethal production outcomes. This study aimed to elucidate the effects of prolonged heat stress on the stress response and production efficiency in finishing beef steers. Predominantly Angus finishing beef steers (n=32) with an initial average BW 354 ± 4.60 kg were subject to a 28-d heat stress period. Steers were randomly assigned to one of two treatment groups (n=16 steers/trt): 1) Control (CON), exposed to outdoor environmental temperature-humidity index (THI) of 60; 2) Heat Stress (HS), subject to THI of 70-80 for 8h, then returned to control treatment THI to simulate typical cooldown periods exhibited in instances of HS. This study was designed as a completely randomized design with the individual animal as the experimental unit. Growth performance and respiratory rates were analyzed using repeated measures ANOVA with post-hoc analysis via Tukey's test for specific comparisons. Final BW decreased in HS vs. CON steers ($P = 0.01$), with no changes in ADG, DMI, or F:G ($P > 0.05$). Elevated respiratory rates were reported for HS vs. CON steers ($P < 0.001$). From this, we found that heat stress has the potential to limit growth performance in finishing beef steers. Mitigating heat stress through appropriate management practices is necessary for maximizing steer growth and productivity.

GLUCOSAMINE FOR JOINT HEALTH: IS GLUCOSAMINE PRESENT IN OVINE BLOOD AFTER SUPPLEMENTATION WITH A GLUCOSAMINE-CONTAINING JOINT SUPPLEMENT?
Presenter(s): Julia Hogan
Agriculture and Animal Science
Mentor(s): Brian Nielsen (College of Agriculture & Natural Resources), Renee Harbowy (College of Agriculture & Natural Resources)

Glucosamine is an ingredient in many supplements commonly used to treat joint health problems. However, the efficacy of such remains to be determined. A concurrent study used sheep as a model for horses to investigate proposed benefits to joint health; the objective of this project was to determine if glucosamine concentrations were elevated in the blood plasma serum of supplemented sheep. Twenty-eight sheep were divided into two pens, each housing seven control sheep and seven supplemented sheep, totaling fourteen sheep per pen. Over a six-week period, sheep received their respective treatment of either sweet feed (control) or glucosamine supplement (experimental). Sheep were fed 4g of their respective treatment, representing 50% above the recommended dose to aid in protection against rumen degradation. They were exercised in a round pen four times per week as part of the concurrent study evaluating joint health. Blood samples were collected from each sheep at the end of weeks 2, 4, and 6 to test for the presence of glucosamine. Samples are still being analyzed to determine if glucosamine was elevated in the blood plasma of supplemented sheep. These findings will provide valuable insight into the absorption of glucosamine in ruminants and potential implications for joint health management in horses.

UNDERSTANDING NITRATE MOVEMENT IN SOIL USING ELECTRICAL CONDUCTIVITY SENSORS
Presenter(s): Mia Dagati
Agriculture and Animal Science
Mentor(s): Younsuk Dong (College of Agriculture & Natural Resources)

Recent extreme and unpredictable episodes of precipitation have left Michigan's agricultural industry in a scramble to maintain their crop yields. Improper irrigation and fertilization management that does not consider excessive rainfall can lead to elevated soil water content levels and can cause runoff valuable nutrients. When the water content of the soil reaches above the holding capacity of the soil, soluble form of nitrogen (nitrate) in the root zone dissolute into the water. This excess of water and nitrate can runoff to surface water or leach into groundwater. The USEPA has set the maximum contaminant level of nitrate to 10 mg/L-N due to the negative health and environmental impacts of increased nitrate in soil. Thus, it is important to minimize nitrate leaching and improve fertilizer management practices. There are little to no current technologies that accurately measure leaching nitrate in soil. There are even fewer if not any devices that are easily operational and available for the common farmer. Creating a user-friendly sensor monitoring system that can document nitrate in soil will be exponentially beneficial to Michigan's agriculture industry and their ability to regulate nitrate levels in water. The intent of these series of experiments is to be able to estimate nutrient availability in soil based on Electroconductivity (EC) readings. Although EC readings do not directly measure specific ions or compounds, EC has been found to correlate with soil concentrati

EFFICACIOUS OR A WASTE OF MONEY? DETERMINING IF A GLUCOSAMINE-CONTAINING JOINT SUPPLEMENT ACTUALLY BENEFITS JOINTS
Presenter(s): Julia Hogan, Kaitlin Grieser, Matthew Nikolaidis
Agriculture and Animal Science
Mentor(s): Brian Nielsen (College of Agriculture & Natural Resources), Renee Harbowy (College of Agriculture & Natural Resources)

Supplements containing glucosamine are believed to support joint health by aiding in the maintenance and repair of cartilage. Such supplements are used in the horse industry with the intent of promoting joint health and improving the welfare of horses. Cartilage is the tough, flexible tissue that cushions the joints, aids in shock absorption, and allows joints to withstand mechanical loading. Glucosamine is a key component of cartilage and joint health. Horses commonly suffer conditions related to joint degradation, making supplements containing glucosamine popular amongst owners and trainers. This study was done in order to determine whether or not these supplements are efficacious in maintaining or improving joint health. Twenty-eight sheep were randomly assigned to either the glucosamine supplement (GS) or placebo (sweet feed). GS was provided at 4 g/d for 42 d. Blood samples were collected every 2 wk for serum biomarker concentrations. After day 42, the sheep were humanely euthanized at the MSU Meat Laboratory. Synovial fluid was collected from the carpus, images of joint surfaces in the forelimb were recorded for lesion analysis, and a cartilage sample was collected from the distal surface of the carpometacarpal joint. Analysis of factors indicative of joint quality allows for the assessment of the effectiveness of joint supplements in mitigating damage. Thus, the results of this study will further our understanding regarding the role of glu

BOVINE GENE EXPRESSION
Presenter(s): Emilia Puda
Agriculture and Animal Science
Mentor(s): Cynthia Collings (College of Agriculture & Natural Resources), Zheng Zhou (College of Agriculture & Natural Resources)

Branched Chain Amino Acids (BCAA) and Branched Chain Keto Acids (BCKA) are crucial components in the nutrition and metabolism of dairy cows, impacting muscle protein synthesis and energy provision. This study aimed to investigate their influence on gene expression related to various biomarkers in transition cow muscle tissue. RNA was isolated followed by cDNA conversion. Quantitative PCR was conducted using specific primers targeting genes.

Amplification and analysis were performed and expression levels were normalized using internal control genes. Analysis of gene expression in transition dairy cow muscle tissue indicated significant changes in ACADVL, ACADL, ATGL, CPT1B, UCP3, NRF2, GSR, GPX, NFKB, and IL1B as well as tendencies in ACADVL, ACADL, NRF2, GPX, and NFKB.

USE OF MACHINE LEARNING TO IDENTIFY DRUG PACKAGING USED IN DAIRY PRODUCTION
Presenter(s): Ashley Siegmund
Agriculture and Animal Science
Mentor(s): Pamela Ruegg (College of Veterinary Medicine)

Antibiotics have continuously improved the well-being of both livestock and humans for generations. By reducing the abundance of bacterial infection and mortality amongst livestock, our society has been maintained with a healthy, safe food supply. While antibiotics have been essential to the treatment and prevention of many diseases, usage of antibiotics naturally leads to the progression of antimicrobial resistance. Ensuring only necessary usage of antibiotics in livestock, such as dairy cows, will ensure that antibiotics remain effective for treatment of both animals and their human caretakers. Ensuring responsible antibiotic usage reduces economic losses of disease and maintains effectiveness of existing treatments. Many dairy farms house thousands of cows, and while most cows are healthy, some become sick and require antibiotic treatments. Antibiotic usage occurs on most farms and while treatment records are required, proper tracking of treatments can be challenging. A machine learning model that identifies and catalogs antibiotic usage within dairy production facilities would create a passive step towards effective monitoring of antibiotic usage. As antibiotics are administered, facility staff will take photos of the medicinal packaging, and the model will detect the varying sizes and types of packaging, determining the usage of each drug. Streamlining this counting process will alert dairy production management of any high or low usage of antibiotics and co

IMPACT OF HERBICIDE, APPLICATION METHOD, AND VARIETY ON CELERY DISEASE SYMTOMS
Presenter(s): Rachel Mickey
Agriculture and Animal Science
Mentor(s): Sushila Chaudhari (College of Agriculture & Natural Resources)

Michigan celery growers began to note symptoms of crown rot, wilting, stunting, chlorosis, and plant death around 2015 and called these symptoms "meltdown". Preliminary results of celery samples collected in 2018 and 2019 indicate that the outbreak is the re-emergence of the pathogen Fusarium oxysporum f.sp. Apii (FOA). Growers raised concerns that production practices such as herbicide use, application methods, and celery cultivar section may impact the occurrence and severity of plant disease. Treatments were set up in a field with a history of celery plant "meltdown and were arranged in a two-way factorial of three levels of herbicides [S-metolachlor (SM), flumioxazin (FL), and S-metolachlor plus flumioxazin (SM+FL)] by three application methods (pre-plant incorporation, pre-plant surface applied, and post-transplant) and non-treated control. The plots were in a 7 randomized block design with three replicates. The results from the study indicate that the type of herbicides and the application methods had no impact on the development of celery meltdown. Celery variety reported some impact on the development of celery meltdown, and 'CR-1' was more susceptible than 'Stalker'.

EFFECT OF OLEATE AND PALMITATE SUPPLEMENTATION ON BOVINE ADIPOCYTES: SUBCUTANEOUS VS VISCERAL

Presenter(s): Megan Grusczynski

Agriculture and Animal Science

Mentor(s): Andres Contreras (College of Veterinary Medicine), Ursula Abou Rjeileh (College of Veterinary Medicine)

Dairy cows are susceptible to metabolic diseases during the periparturient period due to excessive negative energy balance and limited capacity of their adipocytes to buffer energy stores. Fatty acid (FA) supplementation increases diet's energy density. However, the extent to which distinct adipose tissue (AT) depots store energy in response to differences in diets is not known. Our objective was to assess lipid accumulation in subcutaneous (SC) and omental (OM) derived bovine adipocytes following FA supplementation. Pre-adipocytes were isolated from SC and OM AT (n=4, non-lactating, non-gestating Holstein dairy cows) and induced to differentiate. Mature adipocytes were cultured with standard differentiation media (CON) supplemented with a mixture of palmitic (PA) and oleic (OA) acid (60% PA - 40% OA; 60-40) at 300 µM. Palmitic and oleic acid are fatty acids that enhance metabolic function. FA were solubilized in albumin (10% BSA) to ensure physiological conditions. Adipogenesis was evaluated using a neutral lipid stain, Bodipy 493/503. Triglyceride levels were quantified using Triglyceride-Glo Assay. The statistical model included the random effect of cow and the fixed effect of treatment, AT depot, and their interaction. OM adipocytes had higher adipogenesis efficiency compared to SC adipocytes ($P<0.01$). FA supplementation did not affect adipogenesis ($P=0.10$). However, FA supplementation increased triglyceride (TAG) acc

ROLE OF MILD DEHYDRATION ON PERFORMANCE AND COMFORT WHILE RUNNING

Presenter(s): Mckenzie Melosh

Agriculture and Animal Science

Mentor(s): Brian Nielsen (College of Agriculture & Natural Resources), Cara Robison (College of Agriculture & Natural Resources), Renee Harbowy (College of Agriculture & Natural Resources)

Advancements in equine health are crucial to horse welfare. While the diuretic medication Lasix is known to aid in reducing exercise-induced pulmonary hemorrhage (EIPH), many racetracks have banned it due to the false belief it is linked to breakdowns. However, besides the decrease in EIPH, the mild dehydration it causes may also decrease exercise-induced transient abdominal pain, and thus may be beneficial to the welfare of racehorses. Using humans as our model for horses, twenty-nine participants were split into 2 balanced treatment groups who ran 2 one-mile races, two weeks apart in a cross-over design. In race 1, half of the participants ran mildly dehydrated, not drinking 4 hours prior to the start of the race. The other half of participants ran hydrated, drinking as much as they would like prior to the race, and an additional 10 ml/kg BW 30 minutes before the race. In race 2, the groups were flipped, and the same conditions were applied, respectively. Each race had 5 different start times in which treatment groups were evenly dispersed. After each race, participants completed a survey with questions regarding discomfort and exertion while running. Data were analyzed using Proc Mixed in SAS 9.4. No differences were found in performance, exertion, or pain between treatment groups. This suggests that mild dehydration does not cause any changes in running comfort or performance. These results indicate that Lasix use in racehorses is likely a safe measure in preventing EIPH.

EXPLORING HUMAN IMPACT ON LAKE ENVIRONMENTS: A MULTIVARIATE ANALYSIS
Presenter(s): Quinn Lafontaine
Agriculture and Animal Science
Mentor(s): Patrick Hanly (College of Agriculture & Natural Resources)

Lakes fulfill vital ecological roles by supporting diverse biota and serving as economic and social resources. However, various human stressors pose significant threats to these ecosystems. Despite the necessity of understanding these impacts for effective management, a knowledge gap exists, with no comprehensive index available to managers. Therefore, this study aimed to develop a multivariate index of human disturbance factors for lakes across the conterminous United States. The overarching goal was to evaluate combined human-induced stressors on lakes. In order to collect quantified variables, we used several existing databases. We processed that data with structural equation modeling (SEM) to create a complete index that provides inferences and indicators of anthropogenic stress on lakes. The final product is an SEM flow diagram representing all statistically significant connections (p-value < 0.05). Our findings emphasize how human and agricultural disturbances will continue to shape lake ecosystems. By identifying threshold values for in-lake variables and generating predictive maps, our research provides managers with valuable tools to make informed decisions when assessing lake health and implementing conservation strategies.

HOW CLIMATE CHANGE IS AFFECTING THE FLOW OF THE EUPHRATES RIVER
Presenter(s): Jacob Marsh
Agriculture and Animal Science
Mentor(s): Camelia Suleiman (College of Arts & Letters)

This presentation provides insight into the why the flow of the Euphrates River is changing so drastically, and to discuss what action is being taken, and what more needs to be done. The Euphrates River is the longest river in Western Asia and runs through Turkey, Syria and Iraq. Combined with the Tigris River, the Euphrates forms one boundary of the region known as Mesopotamia, This was the birthplace of many ancient civilizations including Babylon and the Sumerians. The river is currently being used for drinking water, agricultural irrigation, and animal husbandry. The flow of the Euphrates is being greatly impacted by the effects of global warming. Climate change causes an increased duration and intensity of drought conditions which greatly impact the water levels of streams and rivers. This reduces precipitation, river instream flows, and groundwater recharge. The dams that Turkey has built on the river has also impacted the flow. They've reduced water levels, blocked and slowed the river, altered the timing of the flows, and held back silt, debris, and nutrients. The governments of Turkey, Syria, and Iraq have done nothing about the issue, but Non-Governmental Organizations (NGOs) have taken action in their place. In this presentation I go over the finer details of what is being done, and I explain what action needs to be taken to solve this issue in the Middle East. I do this to educate listeners about the issue and spread awareness about the situation regarding the Eup

CHANGES IN THE ANTIOXIDANT PROFILE OF EGGS AND FORAGE ACROSS THE GRAZING SEASON IN A SOUTHERN OHIO-BASED PASTURE-RAISING SYSTEM FOR LAYER HENS
Presenter(s): Shreya Chavva
Agriculture and Animal Science
Mentor(s): Jenifer Fenton (College of Agriculture and Nat Resources), Rachel Vanduinen (College of Agriculture & Natural Resources)

There is a growing interest in regenerative egg farming, focusing on soil health, increased biodiversity, and symbiosis between the chickens and the environment. Pasture-raised systems provide poultry access to more phytochemically rich plants and insects, creating eggs with a more favorable antioxidant profile for human health. However, the quality and composition vary throughout the seasons, and there is limited research delving into phytochemical profile changes throughout the grazing season. Therefore, the objective of this study was to characterize monthly changes in egg characteristics, egg lipid oxidation, and antioxidant profiles of egg yolks and forage throughout the foraging season. After eggs and forage were collected, characteristics were assessed monthly from May to December ($n = 96$). Twenty-four eggs were collected each month and pooled to form $n = 12$ replicates and three forage samples were collected monthly ($n = 3$). Vitamin content was assessed by a commercial laboratory. Total carotenoid content, total phenolic content, and lipid oxidation were assessed colorimetrically. Egg characteristics significantly differed by month ($p < 0.05$). Yolk vitamin A content was higher in the late summer months ($p < 0.001$), while vitamin E content gradually increased over the season and was highest in November (p < 0.001). Yolk carotenoid content was higher in mid-summer and late fall ($p < 0.001$). This study demonstrates significant changes in the antioxidant profil

Anthropology & Archeology

REASSOCIATING COMMINGLED SKELETAL REMAINS: JE'REFTHEEL CAVE
Presenter(s): Ari Markov
Anthropology and Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

The purpose of my study was to catalog and analyze a set of human skeletal remains from the archaeological site of Je'reftheel, a Maya mortuary cave in central Belize used from approximately 550-680 AD. The remains are from nine individuals - three subadults and six adults. Longbones were carefully analyzed by comparing morphological features to re-associate by individual, and age, sex, and height estimators were also applied to characterize the burial assemblage.

PRINTED 3D MODELS FOR SKELETAL TRAUMA EDUCATION IN FORENSIC ANTHROPOLOGY
Presenter(s): Anna Stolz
Anthropology and Archeology
Mentor(s): Carolyn Isaac (College of Social Science)

This project will evaluate the use of photogrammetry to create three-dimensional models of skeletal trauma for 3D printing and assess the efficacy of those printed elements for teaching. Forensic anthropology education relies upon physical specimens to aid in student's understanding of difficult concepts, like skeletal trauma, that are challenging to glean from photographs alone. The majority of the donated individuals that comprise the donated skeletal collection in the MSU Forensic Anthropology Laboratory do not contain skeletal trauma, and, unfortunately, many of those that do have skeletal trauma also have fragile remains that could be easily damaged in a classroom context. Forensic casework is another potential source of skeletal trauma, but it is not appropriate to utilize remains that originated from this context for teaching. Thus, it is necessary to explore alternative approaches to providing hands-on skeletal trauma instruction without the risk of damage to specimens or the unethical use of forensic material.

THE RELATIONSHIP BETWEEN MATERNAL STRESS AND THE IMMUNE SPECIFICITY OF MILK
Presenter(s): Aditi Sharma
Anthropology and Archeology
Mentor(s): Masako Fujita (College of Social Science)

The benefits of breastfeeding in developing an infant's immune system are widely accepted. While various immunological molecules in mothers' milk and their variation with maternal stress has been researched, little is known about how stress affects the immune system of milk, particularly its activity. The coordinated immune response in whole milk has just recently become an area of research with a new in-vitro stimulation technique, consisting of stimulating milk with bacteria and monitoring the change in immunological molecules, like a pro-inflammatory cytokine interleukin-6 (IL-6). In our research, we investigate whether a relationship exists between mother's stress levels and milk immune specificity, defined as the ability to attack and distinguish pathogenic bacteria from benign bacteria. We predict that as stress levels increase, the immune specificity will decrease, meaning the milk either underreacts to pathogenic bacteria, overreacts to benign bacteria or negative controls, or both. This ongoing project collects nutritional, environmental, and psychosocial stress data from breastfeeding mothers in Michigan via anthropometry, finger-stick blood, and questionnaire. In-vitro stimulation of milk samples with each bacteria strain is used to characterize the immune response as the ratio post-: pre-stimulation IL-6 concentration quantified through ELISA and specificity as the immune response to pathogenic bacteria (*Salmonella enterica*) but not to the negative contro

BIOARCHAEOLOGICAL DATA CATALOGING: CREATING AND CONTEXTUALIZING A DIGITAL DATA REPOSITORY
Presenter(s): Allison Thomson
Anthropology and Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

The Michigan State Bioarchaeology Laboratory has multiple collections attributed to different archaeological sites from the Maya region and the Middle East. Burial forms from the original excavations contain information about body positioning, preservation, associated artifacts (such as ceramics), burial location, etc. Following excavation, lab analyses provided a range of further information about the individuals (genetics, diet, disease, etc.). These datasets are the basis for all comparative analyses. This paper describes a preliminary cataloging system, via Microsoft Access, that will allow researchers to search and sort data, and identify patterns within the existing data sets to suit individual project needs.

VALIDATION OF THREE-DIMENSIONAL PHOTOGRAMMETRY MODELS TO DOCUMENT CRANIAL TRAUMA
Presenter(s): Sam Lavake
Anthropology and Archeology
Mentor(s): Carolyn Isaac (College of Social Science)

Three-dimensional imaging is an ideal way to document skeletal trauma for independent evaluation by other forensic practitioners, which allows the physical remains to be released to the decedent's loved ones in a timely manner. Photogrammetry is a three-dimensional documentation method that uses multiple photos of skeletal remains from different angles to create a three-dimensional model. This approach is both cost effective and convenient for ease of access and portability as it only requires a high-resolution camera. This makes it preferable to other three-dimensional imaging technologies of computed tomography (CT) scans and 3D laser scanning which require specialized and expensive equipment. While some studies have tested the use of photogrammetry reconstructions on cranial measurements, none have explored its utility in skeletal trauma analyses. The purpose of this study is to determine the accuracy of photogrammetry by testing the approach on fractured crania. Ten crania with blunt force fractures were photographed to create three-dimensional models through photogrammetry. Fractures measurements taken from the photogrammetry models were compared to those taken on the physical specimens to determine the accuracy of the models.

STUDENT EXCAVATIONS AT MARCO GONZALEZ
Presenter(s): Ryn Van Winkle
Anthropology and Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

This presentation follows the findings of MSU field school students working at the Maya archaeological site of Marco Gonzalez, located on Ambergris Caye, Belize. Excavations of public and residential architecture of this coastal community, we investigated their lives through the things they left behind. Looking at burials, pottery, and the buildings platforms on which they lived, we learned about the life experiences of Marco Gonzalez's residents.

SPORTSWASHING'S ROLE IN HUMAN RIGHTS VIOLATIONS
Presenter(s): Hank Leversedge
Anthropology and Archeology
Mentor(s): Eric Montgomery (College of Social Science)

Sportswashing is the process of using sporting events to improve an individual's, organization's, or state's reputation. Within the context of human rights, sportswashing is used to distract from, minimise, and normalise human rights violations. This research utilizes case examples like the 1936 Summer Olympics in Berlin, the combination of the 2014 FIFA World Cup in Brazil and the 2016 Summer Olympics in Rio de Janeiro, and the 2022 FIFA World Cup in Qatar. The study of these cases reveals how sportswashing works, how effective it can be, and what new forms of sportswashing are emerging.

OSTEOBIOGRAPHY OF MARCO GONZALEZ BURIAL 14/32
Presenter(s): Melissa Teja
Anthropology and Archeology
Mentor(s): Gabriel Wrobel (College of Social Science), Kevin Cabrera (College of Social Science)

This poster explores the biological profile of burial 14/32 excavated in 2010 at the Maya site of Marco Gonzalez in San Pedro, Belize. The biological profile data reveals estimates of sex, age, and stature but also provides an osteobiographical narrative, offering a glimpse into the possible life of this individual.

POSTPARTUM DEPRESSION AND MILK IMMUNITY
Presenter(s): Alli Harkenrider
Anthropology and Archeology
Mentor(s): Masako Fujita (College of Social Science)

Postpartum depression (PPD), a psychological health issue, impacts 10-20% of mothers in America. Maternal depression can change the content of mother's milk, influencing milk immunity. Previous research has found that milk cortisol and immunoglobin levels are increased in mothers when stressed. We hypothesize that postpartum depression would decrease milk immune specificity, which is its ability to differentially respond to varying bacteria. This study investigates the relationship between PPD and milk immune specificity. Mid-Michigan mothers were interviewed to complete the Edinburgh Postnatal Depression Scale, which was used to find mothers with PPD. Participants also donated a milk sample, which were incubated overnight in differing conditions - containing salmonella, bifidobacterium, or no bacteria. Interlukin-6 (IL-6) response (the ratio of IL-6 concentration after incubation to before incubation) was compared between these conditions. We found that mothers with PPD had a positive IL-6 response to incubation without bacteria than with either bacterium. Mothers without PPD had little response to no bacteria, and positive response to bacteria. We find that the data produced aligns with our hypothesis that PPD negatively impacts milk immune response, however more research is needed to verify these findings. Infant immune development depends on the quality of milk they receive; therefore, it is essential to understand the relationship between PPD and milk immune sp

HOW LIVING IN A REDLINED AREA INFLUENCE THE NURTURE SIDE OF SCHIZOPHRENIA
Presenter(s): Laila Komis
Anthropology and Archeology
Mentor(s): Eric Montgomery (College of Social Science)

In my research project I will be looking at four main focal points: cognitive side, nurture factors, Schizophrenia, and redlined cities. Cognitive science provides a comprehensive framework for understanding the interplay between the mind and brain. Cognitive science will also give insight into how the brain and mind process nurture factors that induce Schizophrenia. The nurture factors that will be observed in this research are lead poisoning, childhood trauma, immigration, and healthcare access. Those factors individually and collectively have contributed to your individual self which is a core concept for Schizophrenia. Schizophrenia is a neurological brain disorder. There is not much information on the definite causes of Schizophrenia or the cure for it. This research project will provide a different perspective on Schizophrenia that will be beneficial for future research and for general understanding. Schizophrenia is not area specific, so I want to extend this project by looking at redlined cities. These cities will contribute to a holistic perspective. My goal is to show how this different perspective will be beneficial by showing different causes of Schizophrenia and how they arise in certain cities.

GHOSTS OF MSU: CATALOGING DEFUNCT BUILDINGS ON MSU'S CAMPUS
Presenter(s): Elizabeth Longcore, Maxine Levanduski
Anthropology and Archeology
Mentor(s): Gillian MacDonald (College of Social Science)

Our research ultimately aims to compile information about the numerous no longer existing buildings on MSU's historic campus, the "ghost buildings". The records and information for these buildings are scattered across plaques and signs, miscellaneous archived photos, old maps, and various books of MSU history. No one source has a comprehensive list of every building that has existed on campus, something we found shocking for a university with a history as long as MSU. For the purposes of this presentation we focused on the West Circle area of campus, as it is the oldest and has the highest number of defunct buildings. We utilized university archives, books, and signs around campus to research what buildings existed, along with when and where they were. With this information we used ArcGIS story maps to map the sites of former buildings in West Circle and plan to eventually expand this to the rest of campus.

MSU FIRST OBSERVATORY
Presenter(s): Hannah Magnus
Anthropology and Archeology
Mentor(s): Stacey Camp (College of Social Science)

In the spring of 2023, archaeologists began excavating the foundations of Michigan State University's first observatory. The process began when the Campus Archaeology team was called in to investigate after construction workers struck a part of the observatory's concrete base, resulting in widespread media coverage. Despite the increased public attention, little was known about the damaged edifice. The purpose of this research was to obtain as much information about the observatory as possible, with a focus on identifying the people in an 1888 photo of the structure.

EXPLORING ASSOCIATIONS BETWEEN PERCEIVED STRESS, SLEEP, AND HUMAN MILK IMMUNE SYSTEM ACTIVITY
Presenter(s): Ananyaa Asthana
Anthropology and Archeology
Mentor(s): Masako Fujita (College of Social Science)

Breastfeeding has many well-known benefits for an infant's development. The fat and protein content in human milk has been extensively studied, as well as the immune content of milk, which are the immunological factors in human milk. Human milk content can fluctuate and have varied amounts of different immune factors, including cytokines. One notable inflammatory cytokine is interleukin-6 (IL-6). Milk immune content plays a vital role in cultivating an infant's immune system. Past research has examined the influence of maternal nutrition and other factors on the immune content. However, little is known about the effects of biobehavioral factors, such as sleep quantity and quality, and milk immune content. Even less is known about the interactions of psychological state, such as high levels of perceived stress, and sleep in influencing milk immune content. The effects of poor sleep and perceived stress may exacerbate one another. Our study aims to evaluate the associations of maternal sleep (quantity and quality) and milk IL-6 concentrations. Furthermore, we will also investigate the effects of perceived stress and parity (number of births given) on this association. We used data on sleep quality/quantity scores (via questionnaire), perceived stress scores (via questionnaire), and milk interleukin-6 (IL-6) concentration from 14 Michigan mothers. We used ELISA immunoassay to quantify IL-6 concentrations and correlation tests with IL-6 levels as the outcome for statistical

EXPLORING THE RELATIONSHIP BETWEEN SOCIAL SUPPORT SYSTEMS AND POSTPARTUM MATERNAL NUTRITION

Presenter(s): Natalie Mourou

Anthropology and Archeology

Mentor(s): Masako Fujita (College of Social Science)

Social support is an important factor for physical and mental health of postpartum mothers. Previous research among pregnant and postpartum mothers found that psychological stress has a relationship with dietary quality and quantity. This research explored how social support may be associated with dietary characteristics and health of postpartum mothers. We analyzed data from 17 Michigan mothers, the initial participants in our on-going project on stress and lactation. We focused on a subset of data including questionnaires about social support systems, 24-hour dietary recalls, anthropometric measurements, and hemoglobin levels. Correlation tests and t-tests were performed to examine the relationship between social support and maternal health variables. We found that triceps skinfold thickness was positively correlated with the number of childcare helpers' mothers could rely on. We also found that mothers not having a social support system tended to have lower hemoglobin levels than those with a social support system. This raises many questions for future research about the impact of social support systems for lactating mothers and their infants' nutrition and health. The findings from this project must be verified with a larger sample size and rule out the effects of confounding variables. Additionally, we plan to analyze dietary recall data to further explore possible pathways linking social support to maternal nutrition and health.

META-ETHNOGRAPHY OF PREVENTIONS FOR OBSTETRIC AND GYNECOLOGICAL VIOLENCE AGAINST INDIGENOUS PEOPLES OF THE AMERICAS

Presenter(s): Ceco Maples

Anthropology and Archeology

Mentor(s): Heather Howard (College of Social Science)

This meta-ethnography assesses the effectiveness and decoloniality of preventions and interventions-proposed and applied-aimed at addressing obstetric and gynecological violence (OGV) experienced by the Indigenous Peoples of the Americas. Drs. Noblit and Hare's meta-ethnography approach (1988), the Preferred Reporting for Systematic reviews and Meta Analysis (PRISMA) statement (Page et al., 2021), Meta-ethnography Reporting Guidance (eMERGe) by Dr. France and colleagues (2019), Decolonized Methodologies: Research and Indigenous Peoples by Dr. Linda Tuhiwai Smith (2012), and the Consolidated critertia for strengthening the reporting of health research involving Indigenous Peoples (CONSIDER) statement (Huria et al., 2019) was used to identify, appraise, relate, 'translate', and synthesize 32 studies. 332 studies were identified from five databases: Ultimately, 32 studies totaling to at least 1362 participants were included after duplicate removal and three rounds of screening (i.e., title, abstract, full text).

RECONSTRUCTION OF THE LIFE AND DEATH OF MARCO GONZALEZ MAYAN BURIAL 14/42
Presenter(s): Lexi Edwards
Anthropology and Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

Marco Gonzalez, located on Ambergris Caye, Belize, was a small Maya coastal settlement that focused on coastal trade and salt production. The site is scattered with remnants of a once-bustling community, including pot sherds, walls, faunal remains, and human burials. MG 14/42 is a burial from the Late Classic to Early Postclassic period (600 AD-1200 AD). Data presented from the excavations coupled with subsequent lab analysis allows us to get a better understanding of who this person was and insights into their life experience. Skeletal analysis focused on estimating sex and age, and identifying evidence of activity patterns, health, and diet. We can then use the information that we gather from this person and connect back to known information about ancient Maya culture and explore the past through the lens of this person's experiences.

USING A BONE PROFILE TO BRING TO LIGHT THE LIVES OF PAST HUMANS
Presenter(s): Johnny Myall
Anthropology and Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

Bones contain a wealth of information about a person's lived experience. Focusing on a single individual from the ancient Maya site of Caye Coco, located in the Progesso Lagoon of northern Belize, I utilized a variety of methods to reconstruct aspects of social identity, including age, sex, and health status. Such analyses, considered within the social and environmental context in which people lived, provide a window into the experiences of past peoples.

INTERPRETING PROVIDER-PATIENT RELATIONSHIPS WITHIN THE POTS COMMUNITY
Presenter(s): Brooke Lattner
Anthropology and Archeology
Mentor(s): Emma Zblewski (College of Social Science)

Postural Orthostatic Tachycardia Syndrome (POTS) is a medical condition that has flooded social media forums in recent years. Characterized by chronic symptoms and tachycardia with standing, many affected individuals find it difficult to function in everyday contexts. Given the debilitating reality that some face living with a POTS diagnosis, researchers on this inquiry sought to uncover the repercussions of social media consult for potential POTS patients. Seeking for medical diagnoses through biosocial communities can be detrimental to one's health, as corroborators on these platforms often lack medical licensure. To explore underlying discrepancies with the health care industry that motivate individuals to seek social media consult, qualitative and quantitative analysis of Reddit posts was performed. By assessing keywords associated with disgruntlement, problematic aspects of provider-patient relationships were uncovered. Through awareness to these trends, the hope is to educate providers on where the medical system may be failing to provide support to struggling patients, in addition to further informing patients on the rationale behind controversial medical decisions.

LEBANESE WOMAN'S PERSPECTIVE
Presenter(s): Laila Komis
Anthropology and Archeology
Mentor(s): Eric Montgomery (College of Social Science)

My research question is how do identities and perspectives of Lebanese women impact and influence their life choices? I chose Lebanese women because I identify as one and would like to know if my experiences come from an individual perspective or a collective perspective, I am coining a term I created: symmra'atiyya. This means the perspective of Lebanese women. Symm means together and holistic view. Mra'atiyya comes from the word imra'ati lubananiyya which means Lebanese woman in Arabic. Iyya is a suffix that indicates Lebanese nationality in Arabic as well. Lebanese people have struggled with various aspects in America. For instance, their safety has been a long-lasting problem. I want to do participant observation at the Lebanese Student Association (LSA) at MSU to better grasp why this occurs. I chose LSA because they have the most Lebanese students and have already established friendships there. I will interview Lebanese women to understand their perspective and how that has influenced their life choices like goals, major, values, social life, career, and other factors. I will also interview Lebanese men to know their take on Lebanese women's struggles and how they may or may not play a role in it.

AN OSTEOBIOGRAPHY FROM KAAX TSAABIL, BELIZE
Presenter(s): Chloe Krupp
Anthropology and Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

This research delves into the analysis of human remains excavated from the Maya site of Kaax Tsaabil in central Belize. By utilizing established techniques, my research aims to discern crucial information about the individual's sex, age, health and diet. Through comprehensive examination, I seek to unveil insights into the life and death of the individual, shedding light on their historical context and contributing to a deeper understanding of the archaeological landscape.

Biochemistry & Molecular Biology

POLYMERIZATION OF PROINS WITHIN BETA CELLS DURING HIGH CONCENTRATIONS OF EXTRACELLULAR GLUCOSE
Presenter(s): Eric Puttaiah
Biochemistry and Molecular Biology
Mentor(s): Anoop Arunagiri (University of Michigan)

Pancreatic beta cells were cultured and then incubated overnight in differing concentrations of glucose. All extracellular glucose concentration tested were above the human basal blood glucose level of 10mM. Polyermerzation was observed in all concentrations steadily observing more misfolding in the last and highest concentration test.

GENOTYPIC IDENTIFICATION OF G542X-CFTR ALLELE IN PURIFIED HUMAN DNA BY AS-PCR USING THE YAKU METHOD
Presenter(s): Alexa Baker, Eva Conley, Joseph Romanelli, Pritika Manna
Biochemistry and Molecular Biology
Mentor(s): Douglas Luckie (Lyman Briggs College)

The G542X mutation of the cystic fibrosis transmembrane conductance regulator (CFTR) gene is the second most common allele found in cystic fibrosis (CF) patients in the United States, accounting for 4.6% of all CF cases. This nonsense mutation consists of a single nucleotide change from G to T, altering glycine (GGA) into a premature stop codon (TGA) at the 542nd amino acid on exon 11 of the CFTR gene. The purpose of this study is to create a more robust allele specific polymerase chain reaction (PCR) assay to diagnose the G542X mutation. We hypothesized that, through the Yaku method, the incorporation of additional intentional nucleotide mismatches at the 3' end of primers would reduce false positives in PCR due to increased primer discrimination. Positive controls were regularly run to establish reliable PCR protocols and template integrity. Amplification of Lambda virus Rz gene using Rz1F and Rz1R primers was utilized as a 'PCR control' that produced a 395 bp product when reagents were optimal and PCR of purified template with published primers versus CFTR was conducted as a CFTR 'template control' which produced a product size of 256 bp. In developing our novel AS-PCR assay we designed PCR primers using the Yaku group's intentional mismatch strategy. These 'Yaku primers' were designed to amplify an 855-nucleotide region to diagnose the presence of either mutant G542X-CFTR or wild-type CFTR in samples. Amplification of mutant and wild-type CFTR DNA samples was performed pr

INVESTIGATION ON THE CONCENTRATION OF SALMONELLA USING GLYCAN-COATED MAGNETIC NANOPARTICLES

Presenter(s): Leah Wilson

Biochemistry and Molecular Biology

Mentor(s): Anthony James Franco (College of Agriculture & Natural Resources), Evangelyn Alocilja (College of Agriculture & Natural Resources)

Annually, the United States witnesses 1.35 million cases of Salmonella infections, triggering 26,500 hospitalizations, and 420 deaths [1]. Largely associated with contaminated food, 23% of these cases are traced to poultry, underlining its contribution to the overall presence of Salmonella [2]. Current detection methods involving an overnight culture and pre-enrichment are inefficient, augmenting operational costs and posing challenges for poultry storage. Recently, magnetic nanoparticles (MNPs) have been used in simplifying sample preparation for detecting foodborne pathogens. This research explores the interaction of glycan-coated MNP's and Salmonella in the context of concentrating bacterial cells from solution. In this study, Salmonella was concentrated using glycan-coated MNP's synthesized by batch in 2017, 2021, and 2023. For each batch of magnetic nanoparticles, the capture efficiency and concentration factors of pure cultures of Salmonella and Salmonella-inoculated water and poultry rinsate samples were calculated. Similar capture efficiencies of pure Salmonella culture were calculated between MNPs. The zeta potential and hydrodynamic size of the magnetic nanoparticles revealed that newer MNP's had smaller particle sizes and greater zeta potential. Given the consistent capture efficiency seen across MNP's of different years, the data suggests that other predominant factors may influence the interaction between the MNPs and the bacteria. Literature suggests that t

ARABIDOPSIS THALIANA FLOE2 REGULATES SEED GERMINATION DURING WATER STRESS

Presenter(s): Alisha Kapoor

Biochemistry and Molecular Biology

Mentor(s): Seung Rhee (Research and Innovation), Sterling Field (College of Natural Science)

An essential adaptation in most seed-plants is the ability to survive desiccation and rehydration, as seeds undergo programmed desiccation during their development. Most seeds withstand desiccation, allowing them to germinate and continue developing when water becomes available in the environment, resulting in reactivation of cellular physiology. One known protein involved in sensing environmental water and regulating seed germination is FLOE1, an intrinsically disordered protein expressed in the developing seed and critical for regulating germination in water-limiting conditions. FLOE1 is found in all seed-producing plants. Our lab's previous study of FLOE1 provoked study of a homolog, FLOE2, which precedes FLOE1 and is found in all plants and some algae. To characterize the function of FLOE2 in regulating germination, we generated *Arabidopsis* knock-out lines of FLOE2, and crossed them with the *floe1-1* mutant. We then assayed germination of Col-0 (wild type), *floe1-1*, *floe2-1*, *floe2-2*, and double mutant *floe1-1*, *flow1-1* in response to low water stress. *Floe2-1* and *floe2-2* had reduced germination compared to Col-0, while *floe1-1* germinated slightly more readily than Col-0. Interestingly, *floe1-1*;floe2-1 germinated even more readily than *floe1-1*. The reduced germination of single floe2 mutants suggest FLOE2 is involved in regulating germination in low water stress. Further, the increase

UTILIZING MALDI-TOF MASS SPECTROMETRY TO INVESTIGATE THE SPATIAL METABOLOMICS OF THE EPITHELIUM-LUMEN INTERFACE

Presenter(s): Gillian Robbins
Biochemistry and Molecular Biology
Mentor(s): Jacob Haffner (College of Natural Science), Tian (Autumn) Qiu (College of Natural Science)

The gut microbiome is a diverse environment that hosts a variety of bacteria and other microorganisms. These microbiota allow for the absorption of many essential molecules into the larger body. An essential part of this carefully balanced environment is the placement of microorganisms throughout the gut; however, little is currently known concerning these placements. This project develops methods for investigating the spatial distribution of bacteria in mouse gut microbiomes through the use of high-resolution mass spectrometry imaging (MSI), specifically surrounding the intersection of the gut wall and the luminal material. To accomplish this, we collected colon samples from euthanized mice, embedded them in the M-1 embedding medium, and cryo-sectioned them at a width of 16 μm. The samples were then treated with either a 2-5-dihydroxybenzoic acid (DHB) or a 1-5-diaminonaphthalene (DAN) matrix and analyzed using high-resolution MALDI-MSI on a Bruker timsTOF fleX ESI/MALDI-TIMS-Q-TOF mass spectrometer. Using these instruments, we detected several signals that were localized to either the gut tissue, lumen, or the epithelium-lumen interface. Our experiment showed tissue-specific peaks (m/z 180.0656) while also attributing peaks to luminal samples (m/z 210.9914). We also identified some peaks (m/z 136.0619) that were potentially specific to the epithelium-lumen intersection. These data demonstrate the use of MSI for inv

VISUALIZING ACETYLATION-INDUCED CHANGES IN PLANT SECONDARY CELL WALL STRUCTURE AND DYNAMICS THROUGH MOLECULAR SIMULATION

Presenter(s): Murtaza Barkarar
Biochemistry and Molecular Biology
Mentor(s): Josh Vermaas (College of Natural Science)

The thickened secondary cell wall is essential to the mechanical properties of plants and particularly woody tissues. The cell wall is composed of hemi-cellulose and cellulose polysaccharides, as well as heteroaromatic lignin polymers, which represent a significant renewable resource for multiple applications, including construction materials. While wood has been used for millennia, modifying the structure of the underlying biopolymers for enhanced mechanical strength is far newer. By acetylating cell wall components, it has been previously demonstrated that the wood degrades more slowly, but also resists further treatment. In this work, we examine the structure and dynamics at the nanoscale caused by acetylation through the lens of molecular dynamics simulation. We observe that the diffusion coefficients decrease by 2-3x for hemi-cellulose, lignin, ions and water as the degree of acetylation increases. The reduced diffusion is driven by interactions water molecules make at the nanoscale, particularly with carbonyl oxygen on the acetyl acting as a hydrogen acceptor. The partial negative charge interacts strongly with cations and forms many hydrogen bonds with surrounding water molecules. As a consequence, water pockets within the cell wall structure are smaller than in the unacetylated control. These observations provide greater understanding on the mechanistic changes at the molecular level that enable acetylation to protect secondary cell wall structure and understand its e

ANALYZING THE ANATOMICAL STRUCTURE OF VARIOUS INSECTS FOUND WITHIN FISH AND REPTILE FOOD TO DETERMINE NUTRITIONAL VALUE

Presenter(s): Breanna Vermeulen
Biochemistry and Molecular Biology
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

In this research investigation, the anatomical structure and chemical composition of various insects found in reptile and fish food will be analyzed using an Scanning Electron Microscope (SEM) in order to determine if the specific brand of pet food provides significant nutritional value. For this project, the SEM at Michigan State University's STEM Teaching and Learning Facility will be used. Backscatter electrons will be used to help distinguish the density of the material and the proportion of elements found within each insect based on specific x-ray emissions that the SEM detects using these primary electrons. Secondary electrons will be essential in the analysis of the structure of each type of insect as they are important for studying the sample's topography.

CHARACTERIZING PROMOTERS FOR TERPENE PRODUCTION IN SORGHUM

Presenter(s): Arkesh Das
Biochemistry and Molecular Biology
Mentor(s): Angel McKay Whiteman (Research and Innovation), Bjoern Hamberger (College of Natural Science)

Terpenes are a class of organic molecules that plants naturally produce as a means of defense, attracting pollinators, and even communication. Certain terpenes have applications in a variety of industries, from cosmetics to medicine. Therefore, there is a large demand for these compounds. Chemical synthesis of terpenes is often arduous, expensive and sometimes even impossible. An alternative to chemical synthesis is production in plants, such as sorghum. The thick cuticle of sorghum is an ideal candidate for terpene production since its hydrophobic nature makes terpene extraction relatively easy; however, regulatory elements such as promoters that can target production to the cuticle of sorghum are unknown and must be characterized. Using traditional stable transformation to narrow down these elements is both expensive and can take many months; however, using transient expression directly allows for gene expression in juvenile plants via agrobacterium infiltration, so terpene production can be more readily assessed. The current goal of this project is to optimize the process of transient expression in sorghum and to characterize the promoters that allow genes to be expressed in the epidermis. Once the promoters have been characterized, they will be used to target terpene biosynthesis via transient expression, and ultimately create stable transformation lines that produce specific high-value terpenes that are not found in sorghum.

STUDYING THE EFFECTS OF CONCENTRATIONS OF A RHODAMINE DERIVATIVE TO DETERMINE ABSOLUTE QUANTIFICATION OF ISOLATED CARDIAC MITOCHONDRIAL MEMBRANE POTENTIAL
Presenter(s): Chloe Roth, Lawand Barwary
Biochemistry and Molecular Biology
Mentor(s): Alyssa Vadovsky (College of Natural Science), Jason Bazil (College of Osteopathic Medicine)

Mitochondria are cellular organelles that allow the primary energy source of our body, ATP, to be formed through oxidative phosphorylation. The inner mitochondrial membrane maintains an electrical potential via proton pumping that allows ATP to be produced. Therefore, accurate quantification of this membrane potential is needed to understand the bioenergetics of metabolism. Current techniques implement standardized concentrations of Tetramethylrhodamine methyl ester (TMRM), a fluorescent rhodamine derivative, to establish binding coefficients that can be used to estimate the potential of the inner mitochondrial membrane. However, our studies revealed that utilizing TMRM at the recommended concentration of 1 μM can inhibit oxidative phosphorylation and possibly the maintenance of the electrochemical gradient needed to maintain membrane potential, resulting in inaccurate quantitative models. Isolated cardiac mitochondria from male and female Sprague Dawley (SD) rats were tested for respiratory capacity at concentrations of 0, 0.1, 0.25, 0.5, 0.75, and 1 μM TMRM using Oroboros O2k systems to determine inhibition of oxygen consumption during phosphorylation of ADP. Fluorescent signals of TMRM at each concentration were monitored using the O2k-Fluo-LED2-Module attachments to determine adequate signal strengths, while spectrofluorimetric assays allowed for the quantification of TMRM binding to mitochondrial membranes. No sex differences were observed in binding kinetics or respirat

PCS-THERMOLUC CLONING PROJECT
Presenter(s): Paige Goderis
Biochemistry and Molecular Biology
Mentor(s): Masako Harada (College of Engineering)

Extracellular vesicles (EVs) are membranous structures that serve as carriers for intercellular communication and cargo delivery throughout the body. These vesicles can be engineered to transport specific cargo, such as DNA/RNA and target distinct cells or tissues. To investigate the biodistribution of EVs, surface proteins such as fluorescent or bioluminescent labels are utilized. ThermoLuc, an enzyme derived from Photinus pyralis (fireflies), is one such label that emits light upon catalyzing the oxidation of luciferin. This emitted light enables the visualization and quantification of EVs via luminometry. Current research employs labels like ThermoLuc on EV surfaces to monitor their biodistribution. This project aims to encapsulate the molecule (luciferase) within EVs to track cargo delivery. A template plasmid, pcS-ThermoLuc-hC1C2, containing essential regions for surface expression of the protein, specifically the signal peptide

(SP) and C1C2 regions, was used to amplify the ThermoLuc gene sequences. These two regions, in combination, allow proteins to be transported out of the cell membrane and expressed on the surface. Through polymerase chain reaction (PCR), these regions were excised to retain the ThermoLuc gene inside the EVs. Subsequent molecular cloning steps, including gel electrophoresis, seamless ligation cloning extract (SLiCE), and transformation, were employed to engineer and verify the presence of the plasmid. SLiCE mediates homologous recom

CRACKING ANNONA SQUAMOSA ROOT DITERPENOID PATHWAYS
Presenter(s): James Suggitt
Biochemistry and Molecular Biology
Mentor(s): Bjoern Hamberger (College of Natural Science), Trine Andersen (Research and Innovation)

Terpenoids are the largest and most valuable class of plant specialized metabolites, represented in many markets ranging from pharmaceuticals to fragrances. Thus, understanding the underlying biosynthetic pathways are an important part of creating greener industries, and developing novel human health solutions. In the roots of the sugar apple, Annona Squamosa, previous work in our group has demonstrated high concentrations of ent-kaurene derived diterpenoids. This type of diterpenoids have various pharmaceutical activities, including anti-tumor and anti-inflammatory. Utilizing *A. Squamosa* transcriptomic data, and an annotated genome of the closely related species *Annonae cherimola*, we sought to "crack" the biosynthetic pathway generating diterpenoids in *A. squamosa*. An ent-copalyl synthase was identified, through a transient expression system, as the first dedicated step in the pathway. The terpene synthase responsible for finalizing the hydrocarbon backbone is currently being tested. Enzymes from the cytochrome P450 subfamily CYP701 are known to decorate the ent-kaurene backbone in the gibberellin pathway. Thus, they are likely candidates to participate in the next steps of the biosynthesis of other ent-kaurene derived diterpenoids. Three multiproduct CYP701's were identified, which all produced ent-kaurenoic acid and an ent-kaurene aldehyde. Together with a minor side product of the ent-kaurene alcohol this comprise

FMRFAMIDE LOCALIZATION IN THE EUPRYMNA SCOLOPES' LIGHT ORGAN AND HEMOCYTES
Presenter(s): Leah Colombo
Biochemistry and Molecular Biology
Mentor(s): Elizabeth Heath-Heckman (College of Natural Science)

Little is known about how the nervous and immune systems interact with each other on a molecular scale. The symbiotic relationship between the Hawaiian Bobtail squid, Euprymna scolopes, and its bioluminescent symbiont Vibrio fischeri provides a model in which the neuro-immune interface can be better visualized. This relationship is critical for the Hawaiian Bobtail squid as bacterial bioluminescence allows the animal to exhibit a camouflage method known as counterillumination and evade predation during the night. Upon hatching, V. fischeri is guided into the squid's light organ with assistance from the beating of cilia on epithelial appendages on the outside of the light organ. After colonization, bacterial cell wall and membrane products signal the appendages to undergo apoptosis and regress, however, the signaling pathways that enable this are largely unknown. Through immunocytochemistry, the Heath-Heckman lab has discovered that within colonized squid there is an upregulation in the neuropeptide FMRFamide shortly before apoptosis occurs. Hybridization chain reaction revealed that cells within the appendage blood sinus, likely hemocytes, were transcribing the FMRFamide message. To determine whether E. scolopes hemocytes produce FMRFamide, we are in the process of isolating these cells ex vivo and staining them for FMRFamide production. After disrupting juvenile E. scolopes tissue, we allow the liberated hemocytes to adhere to a coverslip and wi

CHARACTERIZATION OF MALIC ENZYME B WILD TYPE AND ALE- INSPIRED VARIANTS
Presenter(s): Elizabeth Courtright
Biochemistry and Molecular Biology
Mentor(s): Karen Draths (College of Natural Science)

The identification of carbon sources for bioproduction of chemicals is limited by the capability of enzymes or microbes to utilize various substrates. Adaptive lab evolution (ALE) is an approach that is used to improve growth on unnatural carbon sources.These experiments usually result in the identification of mutations in various enzymes. Recently, ALE was performed to improve growth of E.coli on acetylene dicarboxylate (ADCA) in order to exploit ADCA as an alternate feedstock. We identified variants in malic enzyme B (maeB) (A338V, Y145E, N155D, K149A, R515I) during the ALE experiment. Malic enzymes catalyze three types of reactions; the reduction of oxaloacetate (OAA) to malate, the oxidative decarboxylation of malate to pyruvate, and the decarboxylation of OAA to pyruvate. The proposed ADCA metabolic pathway involves the activity of fumarase A (fumA) enzyme for conversion of ADCA into OAA. We hypothesize that the maeB enzyme variants could possess a higher catalytic efficiency for the conversion of OAA to pyruvate. This would enable assimilation of OAA into various metabolic pathways.

HETEROLOGOUS PRODUCTION OF PROTEINS INVOLVED IN THYLAKOID MEMBRANE LIPID BIOSYNTHESIS FOR DETERMINATION OF PHOSPHATIDIC ACID PHOSPHATASE ACTIVITY
Presenter(s): Ilayda Korkmaz
Biochemistry and Molecular Biology
Mentor(s): Christoph Benning (College of Natural Science), Ron Cook (College of Natural Science)

In plants, the light dependent reactions of photosynthesis take place in the thylakoid membranes within chloroplasts. Around 80% of the lipids in those membranes are galactolipids: more specifically monogalactosyldiacylglycerol or digalactosyldiacylglycerol. These galactolipids are produced through the galactosylation of diacylglycerol which is in turn produced through the dephosphorylation of phosphatidic acid (PA). 16:3 plants have two pathways through which galactolipids are produced: the endoplasmic reticulum and the plastid pathways. The enzyme responsible for the dephosphorylation of PA in the plastid is yet unknown. Five candidate proteins are being heterologously produced in S. cerevisiae and assayed for phosphatidic acid phosphatase (PAP) activity to determine which ones are capable of functioning as the elusive plastid PAP. The candidate proteins for the PAP are three lipid phosphate phosphatases (LPPγ, LPPε1, LPPε2), a known acyltransferase (ATS1), and a predicted rhomboid-like protease (RBL10).

SUBSTRATE ENGAGEMENT BY THE INTRAMEMBRANE METALLOPROTEASE SPOIVFB
Presenter(s): Hunter Pouillon
Biochemistry and Molecular Biology
Mentor(s): Benjamin Orlando (College of Natural Science), Melanie Orlando (College of Natural Science)

Intramembrane proteolysis is a fundamental biochemical process that operates in all three domains of life. This specific proteolysis falls under a category that is mediated by a zinc metalloprotease exemplified by site-2 protease (S2P). Enzymes like these play important roles in biological processes from sporulation in bacteria to the progression of Alzheimer's disease in humans. *Bacillus subtilis* is the model organism that has served in research of S2P intramembrane proteolysis. A system of checkpoints occur through *B. subtilis* sporulation, which are all highly regulated. Specifically, in late endospore formation in *B. subtilis*, the proteolytic cleavage of the membrane-localized protein Pro-σ^K into the mature transcription factor σ^K.This cleavage is mediated by the zinc-metalloprotease activity of SpoIVFB. The σ^K gets diffused into the mother cell cytoplasm, binding to RNA polymerase and initiate transcription of genes involved in spore formation.

BMP10 ACTIVATION OF SMAD 1/5/8 SIGNALING BOTH INDUCES AND INHIBITS PULMONARY ARTERIAL ENDOTHELIAL CELL PROLIFERATION
Presenter(s): Nina Aitas
Biochemistry and Molecular Biology
Mentor(s): Erik Martinez Hackert (College of Osteopathic Medicine)

Pulmonary arterial hypertension (PAH) is a terminal disease in which chronic high blood pressure in the arteries of the lungs leads to right-sided heart failure. Induction of pulmonary arterial endothelial cell (PAEC) proliferation has been hypothesized by some to cause vascular remodeling to give rise to the disease's characteristic hypertension. The TGF-β ligand BMP10 is thought to induce cellular proliferation via activation of the transcription factor SMAD 1/5/8. The aim of this study is to determine if BMP10 activates SMAD 1/5/8 to induce proliferation in PAECs, as well as how BMP10 concentration affects signaling and proliferation. Varying concentrations of BMP10 were administered to PAECs grown in culture. Western blotting was then performed to determine if SMAD 1/5/8 was activated by BMP10, and BrdU assays were used to quantify the resulting proliferation. The results demonstrate that BMP10 does activate SMAD 1/5/8 and influence proliferation in PAECs. Increasing BMP10 concentration generally increases SMAD 1/5/8 activation and signaling. A trend was also observed in which BMP10 induces PAEC proliferation at low concentrations, and reduces proliferation at high concentrations. These outcomes highlight the promise of future studies investigating induction of proliferation in PAECs by BMP10 in the context of PAH.

LIPID DROPLET ASSOCIATED PROTEINS INTERACTIONS WITH PLANT MEMBRANES AND WAX ESTERS INVESTIGATED WITH MOLECULAR SIMULATIONS

Presenter(s): Rohith Nadella
Biochemistry and Molecular Biology
Mentor(s): Josh Vermaas (College of Natural Science), Saad Raza (College of Natural Science)

Lipid droplets are storage organelles often found in plants that are used for storage and cellular metabolism. Jojoba, a plant found in the southwestern United States, features lipid droplets that package wax esters. With substantial interest in using these esters for industrial purposes, a long-term goal is to engineer this packaging mechanism into other plants. LDAPs (Lipid-droplet associated proteins) have been identified as being essential to wax ester packaging, and the Jojoba isoforms were uniquely able to bind to membranes containing wax esters. To interrogate this at the molecular level, we studied the binding of LDAP from both Jojoba and Arabidopsis with model membranes representing lipid droplet compositions found in tobacco and jojoba. The protein models were generated in AlphaFold, and subsequently simulated in NAMD 6 times per condition. VMD was used as a visualization and analysis tool for our simulation systems. To quantify binding activity, we analyzed membrane thickness, protein stability, and protein-membrane contacts. We find that Jojoba LDAP has two specific binding patches, one that associates to typical plant membranes, and another hydrophobic patch that binds more favorably to wax esters. This suggests a mechanism by which LDAP proteins facilitate the interaction between lipid droplets and other plant membranes.

DIVERSITY OF ANTHOCYANIN BIOSYNTHESIS PATHWAY OF BRASSICACEAE FAMILY

Presenter(s): Luke Benedict
Biochemistry and Molecular Biology
Mentor(s): Erich Grotewold (College of Natural Science), Yun Sun Lee (College of Natural Science)

In this study, we investigated the diversity of regulation of anthocyanin biosynthesis in the genera Arabidopsis, Camelina, and Capsella. We focused on the MYB75 (PAP1) and MYB90 (PAP2) transcription factors, key components of the MBW complex, which play a critical role in regulating anthocyanin production in Arabidopsis. We used high-performance liquid chromatography and RT-qPCR to measure anthocyanin levels and the expression of these transcription factors. When exposed to anthocyanin-inducing conditions such as 5% sucrose, Arabidopsis showed anthocyanin accumulation in the cotyledons, whereas Camelina and Capsella showed it in the hypocotyls. In parallel, Arabidopsis showed a higher expression of PAP1 compared to PAP2, in contrast to the pattern observed in Camelina and Capsella, where PAP2 was highly expressed compared to PAP1. These results suggest a distinct pattern of anthocyanin distribution among these plant genera, possibly caused by the differential expression of the PAP1 and PAP2 transcription factors.

EXPLORING THE INTERACTIONS OF STARCH SYNTHASE 4 AND FIBRILLIN PROTEINS UNDER HEAT STRESS
Presenter(s): Natali Gonzalez
Biochemistry and Molecular Biology
Mentor(s): Peter Lundquist (College of Natural Science), Shannon Donnelly (College of Natural Science)

Starch is an essential component of plants that accumulates during the day and is broken down into sugars at night to fuel metabolic pathways. Plastoglobules (PGs), which are lipid droplets that are omnipresent in the chloroplast like starch and appear to be an essential source of the photosynthetic functions of the plant. Previously, in my research, I found PGs physically bound to starch in heat-stressed maize. The most abundant proteins found in PGs, the fibrillins (FBN), were found to be interacting with a particular isoform of starch (SS4) via proteomics. In this research, I seek to understand the molecular interaction of starch synthase 4 and the plastoglobules under stressed conditions since it has been unclear because we haven't yet isolated the PGs to identify their interaction and localization. The collection of plastoglobules will be done at various periods since starch is a source and sink depending on the circadian clock, so a time course will be used to collect from dawn to night. Due to the close integration of the chloroplast into the metabolism and signaling networks of plants, it is the primary insight into abiotic stress, making it essential to the stress tolerance and adaptation of plants. The project seeks to uncover the molecular interaction to clarify the significance of the interaction between FBNs, SS4, and PGs, as they are vital in plant metabolism.

INHIBITORY PROTEINS PUSH MEMBRANE REENTRANT LOOP OF INTRAMEMBRANE PROTEASE OUTSIDE THE MEMBRANE
Presenter(s): Caroline Erpelding
Biochemistry and Molecular Biology
Mentor(s): Lee Kroos (College of Natural Science)

Intramembrane metalloproteases (IMPs) regulate many processes in bacteria. The IMP SpoIVFB is part of a protein complex that regulates endospore formation of Bacillus subtilis, a harmless bacterium. Many pathogenic bacteria that form endospores have homologs of SpoIVFB and other proteins in the regulatory complex. The structure of the SpoIVFB-containing complex is unknown, as well as its regulation. Based on a model of the complex, we suspect that SpoIVFB inhibition requires the BofA protein, but the locations of the two proteins in the complex are not fully understood. We used disulfide cross-linking to determine the proximity of residues F66C in SpoIVFB and K28C in BofA. A strong cross-link was present, meaning that F66C must be a short distance away from K28C, which is outside the membrane. This surprising result suggests that F66C, predicted to be in the membrane, is outside the membrane. This experiment was followed with N-ethylmaleimide (NEM) treatment to test water accessibility of F66C, which showed that F66C is accessible to NEM and is therefore either exposed to solution outside the membrane or is accessible via a channel. To determine if F66C is truly outside the membrane, treatment of membrane vesicles with methoxypolyethylene glycol maleimide (malPEG) is being used in ongoing experiments. This is one step toward elucidating the natural inhibition of an IMP that regulates spore formation, that can then be used to inspire therapeutic inhibitors to target IMPs

IMPROVING TRANSFORMATION EFFICIENCY IN THE MODEL CYANOBACTERIUM SYNECHOCOCCUS ELONGATUS PCC 7942
Presenter(s): Amie Donner
Biochemistry and Molecular Biology
Mentor(s): Daniel Ducat (College of Natural Science)

Cyanobacteria are very important to the ecosystem, as they are one of the few organisms that can convert nitrogen into a form usable for plants. However, despite all the fantastic promise, cyanobacteria research has some bottlenecks. Transformation is a common technique used by molecular biologists to genetically alter organisms in research. Transformation with other model organisms, such as E. coli, takes so little time that it's hardly even considered. However, this process can take up to a week in cyanobacteria. My project aims to improve the efficiency of this process in S. elongatus. S. elongatus is one of the model organisms used for cyanobacteria research and is the strain most commonly used in our lab. This would speed up experiments in the lab and bring down costs not only for my lab at Michigan State but also for any lab working with S. elongatus. To do this, I focused on the argonaute protein. Argonaute is an endonuclease that protects cyanobacteria from foreign DNA. We hypothesized that this protein, in an attempt to protect the cell, would cut up the plasmid that cyanobacteria researchers are trying to introduce. Currently, I am doing knockout experiments to assess the function of the argonaute protein by comparing the transformation efficiency of the wild type strain to the mutants with the gene for argonaute deleted. These results will be used in my lab and others currently working with S. elongatus to improve transform

ENGINEERING OF CERIUM OXIDE NANOPARTICLES AS IMMUNOMODULATORY NANODRUGS
Presenter(s): Kieran Doran
Biochemistry and Molecular Biology
Mentor(s): Kay Hadrick (College of Engineering), Taeho Kim (College of Engineering)

Macrophages can be influenced by the molecular environment and become pro-inflammatory or anti-inflammatory. Cerium oxide nanoparticles (<5 nm) are redox-active agents which exhibit enzymatic behavior similar to superoxide dismutase (SOD), peroxidase, and catalase, by removing reactive oxygen species (ROS) implicated in inflammation and cancer (Hirst et al. Small 2009, 5, 2848). Albumin-nanoceria, ceria nanoparticles on an albumin substrate, have been shown to display strong anti-inflammatory properties and convert pro-inflammatory macrophages to an anti-inflammatory phenotype (Kalashnikova et al. Theranostics 2020, 10, 11863). However, albumin is not readily uptaken by macrophages, reducing the effectiveness of the albumin-nanoceria for immune-modulation. Alternatively, single-wall carbon nanotubes (SWCNT) are known to be immune cell targeting (Smith et al. Nat Nanotechnol. 2014, 9, 481). We aim to observe the preferential uptake and retention of PEGylated SWCNT-nanoceria compared to albumin-nanoceria by macrophages. By reacting and sonicating polyethylene glycol (PEG) with SWCNTs, the PEGylated SWCNTs become water-soluble. Albumin-nanoceria were synthesized via in situ biomineralization with hydrogen peroxide. Transmission electron microscopy (TEM) confirmed the characteristic morphology of the PEGylated SWCNT, while high-resolution TEM confirmed the presence of highly crystalline cerium oxide nanoclusters in the albumin-nanoceria and

UNVEILING THE ASPERGILLUS CELL WALL POLYSACCHARIDES THROUGH SOLID-STATE NMR SPECTROSCOPY
Presenter(s): Aswath Karai
Biochemistry and Molecular Biology
Mentor(s): Tuo Wang (College of Natural Science)

With the rise in the prevalence of antibiotic-resistant fungal infections, there is an imperative need for research on pathogenic fungi to improve treatment options. Aspergillosis, a particularly lethal fungal infection with a mortality ranging from 30-95% and estimates of 600,000 people dying each year, is caused by fungi in the *Aspergillus genus*. However, over 80% of aspergillosis cases are *Aspergillus Fumigatus* infections. The average person breathes in thousands of spores daily. For healthy people, the spores show no adverse effects. However, immunocompromised people, like those with AIDS, Leukemia, or even COVID-19, or those taking immunosuppressants, can develop aspergillosis. Current antifungal treatments for aspergillosis generally target the polysaccharidic components of the fungal cell wall, which are unique to fungi and not found in humans, providing a layer of protection for the fungi. Our research uses high-resolution solid-state nuclear magnetic resonance (ssNMR) to determine the polysaccharides that make up the cell wall of *Aspergillus Fumigatus* and related non-pathogenic *Aspergillus Nidulans*. Studying both fungi allows us to see how the cell wall structures help influence pathogenicity. Using ssNMR allows us to view intact cells in their natural environment without the need for chemical modifications. Our findings shed light onto the structural components of the complex *Aspergillus* cell wall, informing the design of

DEVELOPING PH SENSORS FOR BIOCHEMICAL APPLICATIONS
Presenter(s): Joseph Kesto
Biochemistry and Molecular Biology
Mentor(s): Alyssa Vadovsky (College of Natural Science), Jason Bazil (College of Osteopathic Medicine)

This study introduces the development of pH sensors for biochemical applications, utilizing fluorescein's pH-sensitive fluorescence in a range of buffer solutions. Fluorescein, a fluorescent dye, changes its fluorescence intensity with pH variations, offering a promising approach for accurate pH measurement. We investigated this phenomenon by preparing fluorescein solutions in buffers at pH levels 5 through 9, and analyzing the fluorescence response. The sensors were evaluated for sensitivity, accuracy, and stability, demonstrating a strong correlation between fluorescence intensity and pH, thereby enabling precise pH determination. Significantly, the fluorescein-based pH sensors showed excellent reproducibility and minimal interference from biochemical reagents, making them applicable in complex biological environments. This research highlights the potential of these sensors in real-time monitoring of biochemical processes, enzyme activity assays, and studying pH dynamics in biological systems. By leveraging the biocompatible nature of fluorescein, these sensors are also suitable for live-cell imaging applications, offering a versatile tool for biochemistry, cellular biology, and diagnostics.

THE PRO-TUMORIGENIC EFFECTS OF LPS-ACTIVATED MACROPHAGE EV'S ON COLONIC EPITHELIUM

Presenter(s): Emily Neeb
Biochemistry and Molecular Biology
Mentor(s): Christopher Contag (College of Engineering), Evran Ural (College of Engineering)

Inflammatory bowel disease (IBD) patients have a 3-5-fold increased risk of developing colorectal cancer (CRC), and immune cell secreted extracellular vesicles (EV's) are shown to contribute to IBD pathogenesis. EV's are structures released by cells into their surroundings that carry proteins, genetic material, and other molecules. They play important roles in cell communication and influence immune response, tissue repair, and disease progression. This project focuses on the pro-tumorigenic effects of LPS-activated macrophage-derived EV's on colonic epithelium. Preliminary proteomic findings indicate a significant upregulation of key proteins of the pro-inflammatory IL-17 pathway, including COX2, Cebpb, and FosL-1 in tumor cells treated with LPS-activated EV's compared to unstimulated EV's. This suggests LPS-activated EV's potential role in promoting cancer hallmarks such as inflammation and proliferation. We have also shown that EV's effect anchorage independent growth of MC38 cells (mouse colon cancer cells). By unraveling the molecular mechanisms involved in EV-mediated effects on CRC progression, this study aims to contribute to the development of novel therapeutic strategies for CRC and shed light on the relationship between inflammation, immune cell-derived EV's, and CRC pathogenesis.

DESIGNING AND IMPLEMENTING BIOLUMINESCENT CONSTRUCT FOR IN VIVO BIOMEDICAL IMAGING

Presenter(s): Quynh Tong
Biochemistry and Molecular Biology
Mentor(s): Masako Harada (College of Engineering)

Designing and Implementing Bioluminescent Construct for Biomedical Imaging Nanoluciferase (NanoLuc) is a small bioluminescent enzyme with great intensity and a low background. It is an excellent tool for current biomedical imaging as the bioluminescent signal can provide quantitative data. This project aims to create a plasmid construct containing the NanoLuc enzyme-encoding gene using molecular cloning techniques and to verify the expression for further experiments. Specifically, a part of the backbone plasmid and NanoLuc insert were amplified through PCR and homologously recombined using the Seamless Ligation Cloning Extract (SLiCE) cloning method. Techniques such as gel electrophoresis, bacterial transformation, and colony PCR were used to ensure the successful cloning of the desired construct. The construct was further transfected into HEK293T cells and evaluated for its bioluminescence properties through a bioluminescent imaging (BLI) an MCherry construct was used as a transfection control. This construct would be further used for the quantification and tracking of potential therapeutics in cells.

THE ROLE OF FERREDOXINS IN NITRITE ASSIMILATION
Presenter(s): David Villegas
Biochemistry and Molecular Biology
Mentor(s): Daniela Strenkert (College of Natural Science), Stefan Schmollinger (College of Natural Science)

In phototrophic eukaryotes, Ferredoxins deliver electrons mainly to Fd-NADP+ oxidoreductase (FNR), which converts NADP+ to NADPH mainly for the absorption of CO2. However, many other chloroplast processes, including nitrite and sulfur assimilation, chlorophyll and fatty acid biosynthesis, redox control, and H2 production also require electrons from photosynthesis. For this, chloroplasts utilize a small family of Ferredoxin proteins that manage electron distribution among the targets. The unicellular green alga Chlamydomonas reinhardtii is a eukaryotic, photosynthetic reference system that contains nine plant-type, chloroplast-targeted Ferredoxins (FDX1-FDX9). The proteins exhibit striking structural differences and are each expressed uniquely in response to dietary and environmental perturbations. These variations imply that various Ferredoxins have unique interaction partners, cellular locations, binding affinities, and redox qualities that allow them to tailor plastid energy metabolism for its biochemical demands. We studied the function of one of these Ferredoxins, FDX2, in detail.

PATHWAY DISCOVERY - A DEEP DIVE INTO THE S. PENNELLII ROOT ACYLSUGAR BIOSYNTHESIS PATHWAY
Presenter(s): Caleb York
Biochemistry and Molecular Biology
Mentor(s): Jaynee Hart (College of Natural Science), Robert Last (College of Natural Science)

Acylsugars are specialized metabolites used for protection within the trichomes of certain nightshade family (Solanaceae) species. Synthesized by ASAT (Acyl Sugar AcylTransferase) enzymes in the BAHD-family, ASATs create acylsugar products by adding acyl chains from an acyl-Coenzyme A (acyl-coA) onto sugar cores. Recent research revealed that these acylsugar products are found both within the trichomes and roots of cultivated and wild tomato (Solanum lycopersicum and S. pennellii, respectively). Three enzymes of the cultivated root acylsugar pathway, ASAT1-L, 07g043710 and 07g043700 were found to successively acylate myo-inositol to create tri-acylsugar intermediates. Because orthologs of these cultivated root pathway enzymes are expressed in S. pennellii roots, we hypothesize that the wild root acylsugar pathway begins in the same manner as cultivated tomato. We performed in vitro enzyme assays using the sugar core myo-inositol, different length acyl-coAs, and the corresponding root pathway enzymes to first determine their activity. We determined the order of the enzymes for the beginning of the wild root pathway is SpASAT1L, Sp07g023290 and Sp07g023280, matching the activity of their cultivated tomato orthologs. Indistinguishable tri-acylinositols are produced by both sets of enzymes when given the same substrates. Currently, more in-depth work on the pennellii root pathway is being done, specifically looking into acyl-coA preference and exploring h

CYP109B1: A BIOCATALYST FOR OXIDATION
Presenter(s): Malhar Amin
Biochemistry and Molecular Biology
Mentor(s): Marco Girhand (Heinrich Heine University Düsseldorf)

CYP109B1, a member of the Cytochrome P450 enzyme family, exhibits notable regiospecificity and stereospecificity, making it a promising candidate for applications in synthetic biology. Traditional chemical synthesis of various compounds can be costly, time-consuming, and environmentally hazardous. Utilizing specific enzymes offers a safer and more cost-effective approach for chemical production. This study investigates several variants of CYP109B1, known for their oxidation capabilities from the omega-1 to omega-6 positions. Lauric acid and myristic acid served as substrates, yielding multiple products whose conversion rates and distribution were examined. Cloning of the variants involved utilizing two E. coli cell lines, followed by verification procedures to confirm successful cloning. Gas chromatography spectroscopy facilitated the analysis of substrate-to-product conversion. Results revealed varying conversion rates among the CYP109B1 variants, suggesting their potential as biocatalysts for chemical synthesis. Further research involving additional substrates and variant exploration could expand upon these findings.

THE ROLE OF SPOIVFB IN REGULATION OF INTRAMEMBRANE PROTEASES IN B.SUBTILIS
Presenter(s): Achala Bannur
Biochemistry and Molecular Biology
Mentor(s): Lee Kroos (College of Natural Science)

Intramembrane proteases (IPs) are proteins that are found within cell membranes and can cut other proteins located in the same membrane or near its surface. IPs play critical roles in various signalling pathways and protein degradation processes in different organisms. Each family has specific functions and targets in the cell. Metallo IPs, like SpoIVFB, activate transcription factors in all three domains of life (bacteria, archaea, and eukaryotes). They are involved in processes such as cholesterol homeostasis, stress responses, viral infection in mammals, chloroplast development in plants, and fungal virulence. For example, SpoIVFB is crucial for the formation of endospores in bacteria like Bacillus subtilis. The inhibition mechanism of SpoIVFB by BofA and SpoIVFA is different from the regulation of other IPs. In this case, the second transmembrane segment of BofA occupies the active site of SpoIVFB, blocking access to its substrate, Pro-σ^K. This unique inhibition mechanism provides valuable insights for potential strategies to design therapeutic IP inhibitors that could have broad applications in various organisms. We made changes in SpoIVFA (F132C) and SpoIVFB (F66C) to test if we could see any disulfide cross-linking between them. However, we did not find evidence to support this hypothesis. Now, we are working toward testing the model-based hypothesis that SpoIVFA P129 and/or L130 are near SpoIVFB L23, T27, and/or H29, using a disulfide cros

CONSTRUCTION OF AN AMPLIFIED TRANSPOSON SYSTEM FOR HIGH LEVEL STABLE PROTEIN EXPRESSION
Presenter(s): Mitra Bijoy
Biochemistry and Molecular Biology
Mentor(s): Michael Bachmann (College of Human Medicine)

Stable gene expression systems that employ engineered lentiviral vectors or transposons for gene transfer are limited by the number of gene copies per cell, and hence the amount of recombinant protein produced per cell. In this project, we will engineer transposon vectors to contain the viral origin of replication of SV40 in the plasmid backbone. When the resulting plasmids are transfected into HEK293T cells that contain the SV40 large T antigen, they will be amplified approximately thousand-fold. As a result, many more transposons can be inserted into the recipient cell's genome that without plasmid amplification. This amplification step should greatly increase the copy number per cell, and hence boost the amount of protein produced.

UNCOVERING SYSTEMATIC CIRCULATION OF MICROBIALLY CONJUGATED BILE ACIDS IN A MOUSE MODEL
Presenter(s): Chris Bridges
Biochemistry and Molecular Biology
Mentor(s): Douglas Guzior (College of Natural Science), Robert Quinn (College of Natural Science)

Bile acids (BAs) are steroid detergents that contribute to fat absorption, gut homeostasis, and gut microbiome community structure due to their inherent antimicrobial and signaling properties. The human gut microbiome includes species capable of amino acid conjugation at the acyl site of BAs, producing diverse microbially conjugated bile acids (MCBAs). BAs are reabsorbed at the terminal ileum, circulating to the liver via the hepatic portal vein in a process called enterohepatic circulation (EHC). To investigate whether MCBAs are capable of entering EHC, mice were fed peanut butter pellets containing a mixture of 8 MCBAs (10 mg kg-1 individual MCBA) for 5 days followed by tissue collection for mass spectrometry-based analysis. This mixture included alanine, aspartate, glutamate, leucine, phenylalanine, serine, threonine, and tyrosine conjugates. MCBAs were detected throughout the gastrointestinal tract, gallbladder, kidney, and liver. Phenylalanocholic acid (PheCA) and serocholic acid (SerCA) reached the highest concentration among MCBAs provided and were found in more tissues. PheCA was less abundant in the liver, prompting investigation of limited enterohepatic circulation. Pancreatic carboxypeptidases have been shown to hydrolyze other conjugated BAs, but incubation of either carboxypeptidase A or B with PheCA or SerCA did not result in amino acid hydrolysis. Furthermore, AlaCA, AspCA, GluCA, LeuCA, ThrCA, and TyrCA deconjugation by carboxypeptidase B was not observe

STRUCTURAL CHARACTERIZATION OF 4-HYDROXY-TETRAHYDRODIPICOLINATE REDUCTASE AS A NOVEL DRUG TARGET FOR NEISSERIA GONORRHEA

Presenter(s): Vishvendra Chouhan
Biochemistry and Molecular Biology
Mentor(s): Brendan Abiskaroon (College of Natural Science), Maksymilian Chruszcz (College of Osteopathic Medicine)

Lysine is a key amino acid that is necessary for the synthesis of many critical proteins, especially in the formation of structural proteins of connective tissue such as collagen and peptidoglycan, where it is involved in crosslinking which improves strength and stability. In humans and other mammalian lifeforms lysine cannot be biosynthesized, as a result, it must be obtained from other sources and incorporated within diet. However, this is not the case for bacteria, fungi, plants, and some protists which have the ability to synthesize L-lysine and acquire it from their environment. In these organisms, L-lysine is synthesized as a product of either the diaminopimelate (DAP) pathway or the α-aminoadipate (AAA) pathway. It is important to note that specifically, meso-diaminopimelate (mDap), an intermediate in the DAP pathway to L-lysine, is critical for Gram-negative bacteria, as this compound forms peptide linkages that stabilize the bacterial cell wall. The DAP pathway for lysine biosynthesis is the method of production utilized by most prokaryotes, including Neisseria gonorrhea, which is considered an urgent threat with regards to its potential for antibiotic resistance. The protein of interest in the DAP pathway is 4-hydroxy-tetrahydrodipicolinate reductase (DapB), which catalyzes the reduction of (2S,4S)- 4-hydroxy-2,3,4,5- tetrahydrodipicolinate (HTPA) to 2,3,4,5-tetrahydrodipicolinate, in a NA

NOVEL METABOLOMICS DATA PROCESSING WORKFLOW FOR IDENTIFICATION OF VERY LONG CHAIN POLYUNSATURATED FATTY ACIDS AND THEIR PUTATIVE METABOLITES

Presenter(s): Ayush Ippalapelli
Biochemistry and Molecular Biology
Mentor(s): Todd Lydic (College of Natural Science)

Very Long Chain Polyunsaturated Fatty Acids (VLCPUFAs) are 26 to 38 carbon fatty acids whose biological functions are largely unknown. A major factor impeding research on VLCPUFAs is their limited commercial availability. Our collaborators at the Lipoprotein Metabolism Laboratory at the National Institutes of Health obtained a dietary supplement enriched in C24, C26, and C28 omega-3 fatty acids derived from fish oil, where they are normally present in trace amounts. Male and female C57bl/6J mice on control (no VLCPUFA), 1% VLCPUFA-enriched, or 5% VLCPUFA-enriched diet (N=4 per sex per group), were subject to a 2 month free feeding study. Various mouse tissues were collected. Untargeted metabolomic analysis using high resolution/accurate mass LC-MS/MS was performed from total metabolite extracts of each tissue type. The LC-MS/MS data was input into software called MZmine for data processing in conjunction with the online database GNPS and our in-house database of hypothetical VLCPUFA metabolites to perform feature based molecular networking. This was done to identify target VLCPUFAs and putative novel VLCPUFA metabolites. The data was exported into software called Cytoscape to visualize metabolic networks impacted by VLCPUFA feeding. Data derived from this workflow demonstrate for the first time that dietary omega-3 VLCPUFA are bioavailable and accumulate in mouse tissue, and may be further metabolized to oxygenated metabolites similar to well known fatty acid-derived signalin

RSAD2 MAY BE A THERAPEUTIC TARGET IN PVT1 EXON 9 OVEREXPRESSED NEUROENDOCRINE PROSTATE CANCER

Presenter(s): Colin Finnegan, Meghan McGill, Nu Thuy Anh Le
Biochemistry and Molecular Biology
Mentor(s): Chinedum Udekwu (College of Natural Science), Olorunseun Ogunwobi (College of Natural Science), Rachel Bonacci (College of Natural Science)

Plasmacytoma variant translocation 1 (PVT1) is an oncogene which is associated with the development of malignant tumors in prostate cancer (PCa). Previously in our lab, it was discovered that overexpression of PVT1 exon 9 in PCa samples from men of African Ancestry could explain why this demographic experiences more aggressive PCa. Our lab overexpressed PVT1 exon 9 in RWPE1 prostate epithelial cells (RWPE1_ex9) and found that PVT1 overexpression induces malignant transformation of prostate epithelial cells, tumor growth in vivo, development of neuroendocrine prostate cancer phenotype both in vivo and in vitro, and resistance to treatment with abiraterone acetate. The goal of the current project is to understand the downstream molecular mechanisms of action of PVT1 exon 9 overexpression in neuroendocrine prostate cancer cells. We used molecular biology techniques to explore the research objectives. RNA sequencing of RWPE1_ex9 yielded significant upregulation of 141 genes, including type I interferon signaling genes RSAD2 and CMPK2 compared to RWPE1_EV. In another prostate cancer model derived from the 22RV1 castrate-resistant prostate cancer (CRPC) parental cells, it was found that overexpression of PVT1 exon 9, RSAD2, and CMPK2 within isolated circulating tumor cells (C22OH) compared to primary tumor cells (T22OH) and the parental 22RV1 cells. Compared to T22OH, C22OH expressed neuroendocrine marker chromogranin A and lost androgen receptor (AR) signaling, indi

SCHWANN CELL DYNAMICS: NANOPARTICLE INTERACTION OVER TIME

Presenter(s): Aditya Midathala
Biochemistry and Molecular Biology
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

This research project explores the structural characteristics of macrophages and the spreading behavior of glial cells over a biofilm. The study involves a detailed analysis of macrophage composition and behavior and the dynamics of glial cell spread within a biofilm environment. This investigation aims to uncover the intricate features of macrophages and elucidate the mechanisms governing glial cell spreading using imaging techniques such as scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS), and backscatter imaging. By shedding light on these cellular processes, this research advances our understanding of macrophage behavior and glial cell dynamics within biofilm environments. The findings from this study have implications for various fields, including biomedical research, biomaterials science, and tissue engineering. Keywords: macrophages, glial cells, biofilm, structural characteristics, cellular behavior.

UNRAVELING ALZHEIMER'S DISEASE MECHANISMS: PLASMID-BASED HYPERPHOSPHORYLATION OF DROSOPHILA TAU
Presenter(s): Kanishk Pal
Biochemistry and Molecular Biology
Mentor(s): Min Kuo (College of Osteopathic Medicine)

During Spring 2024, I will be participating in research under Dr. Min-Hao Kuo's lab. The project aims to discover if Drosophila tau, henceforth dtau, is an Alzheimer's Disease (AD) relevant ortholog of human tau as Drosophila has been proven to be an efficient model system for human neurodegenerative diseases. Tau, a microtubule-associated protein, is implicated as a key player in Alzheimer's disease and around 20 other tauopathies. In the past, the lab has created an in-cibo AD model by feeding hyperphosphorylated tau (p-tau), synthesized in the lab using the PIMAX system, to female, virgin Drosophila flies and observing their cognitive decline through climbing assays over a period of time. The p-tau synthesized in the lab has been shown to fibrilize and aggregate human tau and through this experiment we aim to find if something similar happens with Drosophila tau. I will be assisting Mr. John Henige in developing a plasmid model using PIMAX containing a kinase, GSK3ß, and the Drosophila tau gene, which will then be transformed into Escherichia coli (E. coli) to induce the expression of the kinase and dtau protein to develop Drosophila p-tau. After expression, this would be purified and run on SDS-PAGE gel electrophoresis to validate the experiment, and later on it'll be fed to Drosophila flies to observe any changes in AD-relevant phenotypes, like brain functio

DECIPHERING THE METABOLIC PATHWAYS DURING SPERM CAPACITATION
Presenter(s): Kaushik Paladugu, Lana Kouatli, Nick Asmus
Biochemistry and Molecular Biology
Mentor(s): Melanie Balbach (College of Natural Science)

Male fertility is a complex and highly regulated process. In the U.S. around 1 in 20 males are infertile, often for unknown reasons, with minimal options for treatment. 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 sperm glycolytic flux and oxidative phosphorylation. Capacitation is regulated by changes in intracellular calcium (Ca^{2+}), sAC-mediated cAMP increase, and protein phosphorylation via PKA. The interplay between these signaling pathways regulating sperm capacitation and sperm metabolism remains mostly unexplored. We utilize sperm motility assays, Western Blot, flow cytometry, and enzymatic and metabolite assay kits to identify changes in cAMP, ATP, lactate, and PKA activity in non-capacitated and capacitated mouse sperm incubated in Ca^{2+} free media, CatSper inhibitor, PKA inhibitor, or media with different energy substrates. We find that eliminating extracellular Ca^{2+} increases the activity of PKA and prevents the capacitation-induced increase in cAMP. We also observe that exogenous energy sources affect PKA activity and intracellular Ca2+ levels. Removing extracellular Ca2+ a

ELUCIDATING THE STRUCTURAL DYNAMICS OF AN INTRAMEMBRANE METALLOPROTEASE BY PHOTOCROSSLINKING
Presenter(s): Jackson Ruffner
Biochemistry and Molecular Biology
Mentor(s): Lee Kroos (College of Natural Science)

The intramembrane metalloprotease, SpoIVFB, is part of a primary regulatory complex for sporulation in Bacillus subtilis bacteria. However, the structure and function of this complex is not fully understood. Structural models have been proposed for SpoIVFB in complex with its inhibitory proteins SpoIVFA and BofA, and its substrate Pro-σK. Photocrosslinking is an approach to test for proximity between one amino acid residue of BofA and unidentified locations in other proteins of the complex, by incorporating a single photoactive unnatural amino acid in BofA and using ultraviolet light to form crosslinks. We used site-directed mutagenesis to change codons of the BofA gene, creating four plasmids for incorporation of a photoactive amino acid at four different positions in BofA. These plasmids also express SpoIVFB, SpoIVFA, and Pro-σK. Each plasmid was co-transformed into Escherichia coli with a second plasmid that allows incorporation of added photoactive amino acid into BofA. The cells were induced to produce the four proteins, then exposed to ultraviolet light. We observed the expected photocrosslinked product for a positive control and a potential photocrosslinked product for one of the four test positions in BofA. The results suggest that photocrosslinking can reveal proximity between BofA residues and residues of SpoIVFB in the complex. The next step is to reproduce the photocrosslinking results and identify the crosslinked part of SpoIV

APPLICATION OF NANOPARTICLES IN CANCER DETECTION BY SERS NANOPARTICLES.
Presenter(s): Tahia Binta Binta Salim
Biochemistry and Molecular Biology
Mentor(s): A K M Atique Ullah (College of Natural Science)

In this study, we explore the development of novel methodologies for the synthesis of gold nanoparticles with the explicit aim of detecting and distinguishing between various forms of cancer. We began by synthesizing gold nanoparticle seeds, achieving sizes of 17 nm and 50 nm. Characterization was performed using UV-Visible spectrophotometry, where the optimal absorption peaks were identified at 517 nm for the 17 nm seeds and 527 nm for the 50 nm seeds, consistent with theoretical expectations. Further characterization involved Dynamic Light Scattering (DLS) and Zeta potential measurements to confirm the seeds' dimensions, charge, and dispersion quality. A critical aspect of our methodology was the incorporation of a minimal quantity (10 µL) of Raman Dye during the seed synthesis process, aimed at enhancing the signal for subsequent analysis. Our current research efforts are now focused on the interpretation of signals emitted by these gold nanoparticles through surface-enhanced Raman scattering (SERS), with the ultimate goal of establishing a reliable, nanoparticle-based platform for cancer detection and differentiation. This paper details the successful synthesis and characterization phases of the nanoparticles, highlighting the precision and care taken to achieve the desired outcomes, and setting the stage for the next phase of signal analysis and application development in cancer diagnostics.

Business & Entrepreneurship

GLOBAL SUSTAINABLE STOCK PORTFOLIOS FROM AN INVESTOR'S PERSPECTIVE
Presenter(s): Delani Stull, Jogi Katende
Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business)

Sustainability is an increasingly important aspect of our world. Yet many stock investors are unfamiliar with sustainable investments and, therefore, do not consider them a relevant alternative to traditional investments. Our goal is to compare sustainable investments to traditional investments and propose sustainable investment strategies. We used B-Lab certification as a sustainability benchmark. B-Lab certification is obtained by companies that work rigorously to maintain high scores on the globally used environmental, social, and governance scale (ESG). B-lab certification is challenging to attain and maintain, so it has become a critical standard to identify sustainable investments. To show investors how sustainable stock investments compare to traditional alternatives, we plan to compare stock portfolios of publicly traded B-Lab certified companies to the S&P 500. Our team also plans to conduct event analyses to measure the effects of particular global events on the performance of sustainable portfolios. We will consider events such as statements made by Elon Musk on social media regarding sustainability. Lastly, we are interested in analyzing sustainable investments according to traditional portfolio management strategies such as small companies vs large companies, domestic vs international, and per-industry performance. We hope to share valuable knowledge about sustainable investment alternatives and propose potential investment strategies. We are convinced our fi

INVESTING SUSTAINABLY: PRIORITIZING SDGS IN STOCK INVESTMENT
Presenter(s): Abdullah AlOyouni, Connor Alderman
Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

As global financial institutions move away from profit-centric methods and approach a wider range of aligned environmental and social goals, sustainable stock investment emerges as an innovative approach in response to environmental concerns. There is a lack of research in sustainable stock investment. Our research offers insights on this field by in-depth investigation and analyzing stock data, and companies' mission statements towards sustainability. Our study focuses on the implementation of the ESGs (Environmental, Social, and Governance) in the companies that might impact the delivery of two of the 17 SDGs (Sustainability Development Goals): No. 7 affordability and clean energy, and No.15 life on land. We examined global companies, with the help of our colleagues from Japan and Norway. We reviewed the company's commitment and reported progress towards sustainability, and conducted a risk/return stock analysis. The second stage of the research was to simulate a trading experiment based on the selected SDGs goals , using Stock-Trak- A stock trading simulator. Finally, we evaluated the performance of these investments for five months. Our primary aim was to gather evidence that companies committed to sustainability can thrive in the stock market while also advancing their sustainability goals. Additionally, we seeked to provide insights to investors on responsible investment practices, highlighting the potential for financial returns while contributing to e

THE IMPACT OF K-CULTURE ON WILLINGNESS TO VISIT KOREA
Presenter(s): Olivia Brenner, Yongwoo Nam
Business and Entrepreneurship
Mentor(s): Mi Ran Kim (Eli Broad College of Business)

K-culture is a term used to describe the Korean cultural influence wave comprising traditional and modernized Korean-originated movies, music, beauty, drama, art, cuisine, virtual games, literature, and so on. The goal of this study is to better understand the current trends of K-culture popularity in the U.S.A. and explore the impacts of K-culture on the willingness to travel to Korea. The online survey was conducted using a Qualtrics panel. For data analysis, 3,218 survey responses were used. The findings of this study can provide insights into and implications for a diverse group of stakeholders and the hospitality and tourism industry.

DO CORPORATE SUSTAINABILITY POLICIES MATTER TO INVESTORS?
Presenter(s): Benjamin Gnatek, Pranesh Vats
Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

Sustainable stock investment aims to invest in companies that prioritize policies and initiatives that benefit society and the environment. Companies with sustainability policies prioritize minimizing their environmental impact, promoting social responsibility, and maintaining transparency in the company's business practices. There is a research gap on the benefits of investing in sustainable companies. This research aims to evaluate the performance of companies with accessible sustainability policies on their website. We invest in a global portfolio comprising certified B corporations and companies with easily accessible sustainability policies. The stock market simulation platform, StockTrak is used to invest in eight companies spanning North America, Europe, and Asia. We selected companies from around the world, with input from colleagues from Europe and Japan, to create greater diversity in our portfolio. Average daily returns, reward-to-risk ratios, and beta risks will be used to determine the relative performance of the portfolio. A comparison to identical S&P500 metrics will determine whether sustainable stock investment offers competitive risk and returns compared to the S&P 500. This analysis will determine whether the presence of accessible sustainability policies is beneficial for investors.

INVESTING IN THE FUTURE: A GLOBAL EXPLORATION OF SUSTAINABLE STOCK MARKET INVESTMENTS

Presenter(s): Aadhaya Makkar, Riley Yearwood, Sara Kosloski

Business and Entrepreneurship

Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

With an increased focus on sustainability across numerous industries, companies are taking initiatives to become more environmentally friendly. Further, an increasing number of investors are employing SRI (socially responsible investing) and ESG (environmental, social, governance) based investing techniques to diversify their portfolios to ensure the inclusion of more sustainable companies. However, given the emerging nature of the field, sustainable stock investment requires additional research. Furthermore, such research conducted at a global level is few and far between given its complexity and lack of standardized metrics for evaluating sustainability levels. This project explores how a sustainable international stock portfolio compares to more traditional portfolios, i.e., domestic and/or non-sustainable. Through an eight-week interaction with university students in Norway and Japan, we explored non-American sustainable companies, which served as the inspiration for creating an international portfolio. Thus, our portfolio analyzes 15 global companies that represent all continents apart from Antarctica. Using Excel and a simulated stock portfolio management platform (StockTrak), average daily return, return/risk ratio, and risk percentages are calculated over five months. As a comparison, we use a set of US and international stock market indices to determine how sustainable and non-sustainable portfolios fare against one another. Focusing not only on sustainabili

SUSTAINABLE STOCK INVESTING IN THE CIRCULAR ECONOMY: IS IT WORTH IT?

Presenter(s): Evan Lockridge, Jason Sax

Business and Entrepreneurship

Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

There is a growing need for sustainability in the financial world. Unfortunately, too many companies prioritize profits over the planet's wellbeing. We are concerned about the lack of research on circular economy, which might achieve both company profit and environmental protection through reusing and refurbishing products. This research delves into the circular economy aspect of stock investment. The website Stocktrak allows us to invest in ten companies practicing circular economy and compare them to the S&P 500. Additionaly, through a COIL collaboration with Norwegian and Japanese students, we researched circular economy focused global companies to diversify our portfolio. By comparing these companies to the S&P 500, we can track if following circular economy guidelines generate attractive stock investement results for investors. We assess average return, beta risk, and return-to-risk ratio. Our research findings highlight the impact of embracing a circular economy, showcasing its broader contribution to sustainability and responsible resource management.

TOWARDS A GREENER FUTURE: EXPLORING NET ZERO SUSTAINABLE INVESTMENTS
Presenter(s): Andrew Wahls, Aryan Agarwal, Peyton Shaffer
Business and Entrepreneurship
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

An increased focus on protecting the environment has led to a shift in the way that many view certain business models. It is increasingly important that prospective investors have a proper awareness of sustainable finance, especially because technology has made global information readily accessible to individuals. Business sustainability is measured by a company's environmental impact, its influence on the social level, and its system of corporate governance. Net zero, a key aspect of business sustainability, refers to business initiatives toward negation of carbon emissions through methods that involve absorbing CO2 from the atmosphere. Our research focused on the analysis of sustainable stock investments, and their performance over time. We used the StockTrak online application to keep track of our portfolio values and compare risk and return measures to the S&P 500. Collaborating with students from Japan and Norway, we selected ten companies based on their commitments to reaching Net Zero status within a decade and evaluated their risk and return over a five-month period. We anticipated that if a company is deemed sustainable by investors, it will receive more positive attention and will be a more attractive investment than a company receiving negative attention for its harmful impact on the world. We believe that prioritizing the sustainability of a company allows investors to favor long-term profitable stock investments. The relative performance of our por

CREATING INTERDISCIPLINARY CONNECTIONS BETWEEN DIGITAL HUMANITIES AND MARKETING: AN ANALYSIS OF HUMANITIES COMMONS' SOCIAL MEDIA CAMPAIGN
Presenter(s): Emilia Breuning
Business and Entrepreneurship
Mentor(s): Larissa Babak (College of Arts & Letters)

The field of digital humanities incorporates the use of digital tools and technologies with traditional humanities disciplines, and centers interdisciplinary work with a potentially global impact, which highlights the need for a form of effective communication between scholars. A resource to support this is Humanities Commons, an open-source and open-access network for those working and learning in the humanities, which aims to create a space for scholars to share their work, create project websites, and establish connections with scholars globally. Currently, Humanities Commons' community team strives to celebrate core values through digital events such as Open Access Week. To further develop Humanities Commons' user insights, this research project executed a week-long "Spring Cleaning"-themed campaign encouraging users to update their Humanities Commons profiles through social media. Data was collected from February 19 to March 22, 2024, through the Humanities Commons website, LinkedIn, X (Formerly Twitter), Mastodon, and MailChimp. This analysis examines user profile edits, engagements, and impressions, and how to summarize user behavior and guide future campaigns to effectively communicate Humanities Commons through social media to the scholarly community to support interdisciplinary work.

Cell Biology, Genetics & Genomics

BERRY EXCITING BIOSYNTHETIC GENE CLUSTERS: A STORY OF STRAWBERRY EVOLUTION
Presenter(s): Ella Morrow
Cell Biology Genetics and Genomics
Mentor(s): Mackenzie Jacobs (College of Natural Science), Patrick Edger (College of Agriculture & Natural Resources)

Plants are amazing chemists. Within their DNA, they have the blueprints needed for growth, reproduction, and ecological adaptation. Through the synthesis of diverse organic molecules, plants fulfill these vital functions. These molecules, termed metabolites, play essential roles in plant development and reproduction. However, metabolites employed for purposes beyond these functions, such as toxin production or aroma generation, are classified as specialized metabolites. Notably, strawberry (Fragaria. sp.) varieties, are highly prized for their diversity of taste and fragrance and are considered an agricultural gemstone due to their high yield and ease of cultivation. Recent studies have shown that genes encoding biosynthetic enzymes for specialized metabolites can be co-regulated and may be physically co-localized in the genome. These groups are often referred to as biosynthetic gene clusters (BGCs). The products of these BGCs can contribute to important agricultural attributes in plants, from herbivore resistance to immune system response. In this project, we investigated the variation among biosynthetic gene clusters across several wild Fragaria species. By understanding the genetic basis of specialized metabolites in strawberry species, we can shed light on the evolution of BGCs across plants. This research not only contributes to our knowledge of the mechanisms underlying the diversity of strawberry attributes but also grants us ecological insights into wild strawberry

T-RFLP ANALYSIS OF IRON SEEDED WINOGRADSKY COLUMNS
Presenter(s): Samantha Kalchik
Cell Biology Genetics and Genomics
Mentor(s): Jennifer Kirk (College of Natural Science)

Closed communities are the best and most efficient way to see the impact a change in environmental conditions has on the community fingerprint. Our closed community of choice consisted of two Winogradsky columns both made with the same soil, but one column was mixed with iron. This allowed the baseline communities to be comparable, and to make the changes that iron caused prominent. We employed a fluorescently tagged primer set to our extracted DNA to allow T-RFLP analysis to be used, which will then result in a chromatograph with peaks corresponding to a genetic variant. During the experimental period, the Iron-seeded Winogradsky column modified from a green tint to a neutral brown color which signifies an alter in the microbial communities residing in the column. Similarly, the samples gathered from the Iron Winogradsky column on Day 19 showed a significant peak between the base pairs 494-497 in the T-RFLP analysis. Based on a fragment database, the most significant portion of organisms associated with this range were Shewanella which are associated with metal and iron reduction.

EVALUATING THE POTENTIAL OF PRUNE DIET TO REDUCE CHEMOTHERAPY INDUCED BONE LOSS

Presenter(s): Jacqueline Li

Cell Biology Genetics and Genomics

Mentor(s): Kathleen Gallo (College of Human Medicine), Kavisha Patel (College of Human Medicine), Laura McCabe (Research and Innovation), Nick Chargo (College of Osteopathic Medicine), Sandra O'Reilly (Research and Innovation)

Three major classes of chemotherapy are anthracyclines, alkylating agents, and taxanes. Chemotherapy can be lifesaving for breast cancer patients, but causes adverse effects including osteoporosis and increased risk of fractures. Dietary prune, rich in prebiotic fiber, vitamin K, and anti-inflammatory flavonoids, has been shown in both human and rodent models to increase bone density. The purpose of this study is to determine the effects of dietary prune on chemotherapy-induced bone loss in a female mouse model. Groups of adult female mice were fed either a control diet or a prune-rich diet and given 6 weekly doses of chemotherapy (doxorubicin, carboplatin, or paclitaxel). At the end of the study, the mice were harvested and femurs were collected. Computed tomography (CT) scans were used to analyze the trabeculae and cortical bones. Prism, a statistical analysis software, was used to analyze CT scans. Major measurements were trabecular bone volume to total volume fraction and trabecular bone volume to total volume fraction to body weight. These data will reveal possible benefits of dietary prune in mitigating adverse effects of chemotherapy.

THE CELL WALL STRESS STIMULON ENHANCES β-LACTAM RESISTANCE IN FERMENTING STAPHYLOCOCCUS AUREUS.

Presenter(s): Jessica Bailey

Cell Biology Genetics and Genomics

Mentor(s): Neal Hammer (College of Natural Science)

Staphylococcus aureus is a formidable bacterium that can gain resistance to some antibiotics by entering a fermentative state known as the small colony variant (SCV) which can cause prolonged infections that are difficult to treat. In 2017, the CDC reported at least 20,000 people died from a *S. aureus* infection. That same year it was estimated that healthcare costs associated with *S. aureus* infections totaled 4.6 billion dollars in the United States. Therefore, it is necessary to find what factors contribute to the increased antibiotic resistance of SCVs. MecA expression is controlled in part by the VraRS two component system, which also responds to antibiotic-induced cell envelope stress and induces other β-lactam and glycopeptide antibiotic resistance genes. To determine whether VraRS control of MecA is responsible for enhanced β-lactam resistance exhibited by SCVs we used a mutant strain inactivated for vraR and tested antibiotic sensitivity in respiration and respiration-arresting conditions. Additionally, a fluorescent reporter was used to quantify induction of VraRS response upon exposure to cell wall targeting antibiotics in fermenting SCV and respiring WT *S. aureus* strains. Together, these assays provide evidence for vraR involvement in resisting Ceftaroline, Ceftriaxone, Ampicillin, and Bacitracin.

COULD A FRUIT FLY RUN A 5K?
Presenter(s): Sophia Bonnema
Cell Biology Genetics and Genomics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Drosophila melanogaster, commonly known as the fruit fly, is often used to study genetics in humans and other mammals because of the similarities between them. To expand upon the developmental and structural similarities between Drosophila and humans, this project aimed to provide an in-depth comparison of one of the world's greatest endurance athletes- the fruit fly- to long-distance runners. The fruit fly body was surveyed using a scanning electron microscope (SEM), and further investigations were conducted on joint, muscle, and eye structure and function, as well as energy expenditure. Findings were corroborated with fellow long-distance runners to confirm that although flying may be the fruit fly's forte, they may have a future in running.

TOTAL LARYNGECTOMY FOR RESPIRATORY COMPLICATIONS FROM ADVANCED DUCHENNE MUSCULAR DYSTROPHY
Presenter(s): Jared Lin
Cell Biology Genetics and Genomics
Mentor(s): Ho-Sheng Lin (Wayne State University)

Duchenne Muscular Dystrophy (DMD) is a progressive muscle degenerative genetic disease arising from changes in a dystrophin protein that keeps muscle cells together. One of the most devastating complications in patients with advanced DMD is the progressive weakening of respiratory muscles leading to respiratory failure. Almost all of these patients eventually progress to ventilator dependence. Oropharyngeal weakness eventually jeopardizes safe and adequate food intake leading to the use of a percutaneous endoscopic gastrostomy (PEG) tube to optimize nutritional status and limit the risk of aspiration. Even with the use of PEG tubes for nutrition, these patients continue to be at high risk for aspiration pneumonia due to aspiration of oral secretions and inability to generate good cough reflexes. Here we present a case report using total laryngectomy as a treatment modality for a 34-year-old man with advanced DMD who suffered from recurrent aspiration pneumonia requiring multiple hospital admissions.

GENERATING AN INDUCED PLURIPOTENT STEM CELL LINE TO FOLLOW HEART CHAMBER-SPECIFIC CARDIOMYOCYTE DIFFERENTIATION IN HUMAN HEART ORGANOID MODEL
Presenter(s): Veona Cutinho
Cell Biology Genetics and Genomics
Mentor(s): Aitor Aguirre (College of Engineering)

Congenital heart disease (CHD) is a leading cause of morbidity and mortality in developed countries. Hypoplastic Left Heart Syndrome (HLHS) is a life-threatening condition, and yet its etiology and possible risk factors remain elusive. Ondansetron is an FDA-approved drug commonly prescribed to pregnant women to treat symptoms of vomiting and nausea during the first trimester of gestation. Epidemiological studies suggest a possible risk of CHD in embryos from mothers who have been prescribed ondansetron. This study aims to create a system for studying the effect of ondansetron on early cardiac development, particularly on the fate of First Heart Field (FHF)-derivatives mainly contributing to left ventricle structures. A pluripotent stem cell line containing the sequence encoding the reporter fluorescence protein surrounded by loxP sites and expressing Cre recombinase under the promotor of the HAND1 gene - the primary marker of FHF - will be created. This genetically engineered cell line will be used to differentiate heart organoids that recapitulate the main aspects of early cardiogenesis. Life imaging techniques will be used to track FHF-derived cardiomyocytes under exposure of ondansetron. In addition, a stem cell line with the expression of a reporter gene under the control of a proliferative marker will be developed to examine the expansion of embryonic cardiac ventricles in the presence of ondansetron. We will perform lentiviral transduction, clonal selection, and expansi

INTRADUCTAL ABLATION OF MAMMARY EPITHELIUM BY 70% ETHANOL PREVENTS TUMOR FORMATION IN RAT MNU-MODEL OF BREAST CANCER.

Presenter(s): Chaitra Kommaraju, Elizabeth Phelps
Cell Biology Genetics and Genomics
Mentor(s): Erin Zaluzec (College of Human Medicine), Lorenzo Sempere (College of Human Medicine)

Breast cancer (BC) is the leading cancer diagnosis and the second leading cause of cancer mortality in women in the United States annually. Approved prevention methods including prophylactic mastectomy and systemic hormonal therapy are effective in reducing the risk of BC but can result in intolerable side effects. Intraductal (ID) injection is a minimally invasive technique that avoids systemic toxicity by inserting a needle into the ductal tree opening to administer a solution to the targeted epithelial cells from which 80% of breast cancers arise. We study BC prevention using 70% ethanol (EtOH) as a cell-killing solution for ID injections and have shown its effectiveness in an aggressive genetically engineered mouse model of BC. To improve scalability and study the impact of partial ductal tree filling, we utilized a chemically induced rat model of BC. To induce carcinogenesis, rats received intraperitoneal injections of methyl-N-nitrosourea. Two weeks later, rats received full or half-volume ID injections of 70% EtOH and Tantalum Oxide (TaOx) - a nanoparticle contrast agent for visualization of ductal tree filling. Rats were monitored for tumor formation until reaching euthanasia criteria. Fully injected glands decreased tumor formation compared to non-injected controls. This was based on two endpoints: delayed time to tumor formation and overall number of tumors that developed in each experimental group. This preclinical study shows that ID injection of a refined solutio

LEVERAGING MACHINE LEARNING TO PREDICT ANTIMICROBIAL RESISTANCE IN ESKAPE PATHOGENS
Presenter(s): Ethan Wolfe
Cell Biology Genetics and Genomics
Mentor(s): Janani Ravi (University of Colorado)

Since the clinical introduction of antibiotics in the 1940s, antimicrobial resistance (AMR) has become an increasingly dire threat to global public health. Pathogens acquire AMR much faster than we discover new drugs, warranting new methods to better understand the molecular underpinnings of AMR. Traditional approaches for detecting AMR in novel bacterial strains require time-consuming, labor-intensive assays. Here, we introduce a machine learning approach to identify AMR-associated features. We focus on six highly drug-resistant bacterial pathogens responsible for most nosocomial infections: the "ESKAPE" pathogens. We use all NCBI-PGAP-annotated ESKAPE genomes with known AMR phenotype data from the Bacterial and Viral Bioinformatics Resource Center (BV-BRC). Then, for all complete and WGS genomes from each ESKAPE member, we cluster similar genes and construct pangenomes with Panaroo. We use accessory rather than core genes (present in >95% of genomes) because these are more likely to be involved in acquired resistance. To uncover the molecular mechanisms behind drug-/drug family-specific resistance and cross-resistance, we train logistic regression and random forest models on our pangenomes, which include antibiotic resistance/susceptibility labels per genome. The models are tested rigorously to yield ranked lists of AMR-associated genes. In addition to known AMR genes, our models have identified novel candidates that await experimental validation. Our holistic approach p

CREATION OF PCS-MIP-IGF1
Presenter(s): Kayla Bello
Cell Biology Genetics and Genomics
Mentor(s): Masako Harada (College of Engineering), Yuki Harada (College of Engineering)

Extracellular vesicles (EVs) are particles secreted by cells that naturally carry nucleic acids, lipids and proteins. Due to their ability to carry genetic information throughout the body, EVs have the potential to serve as therapeutic carriers for certain diseases, such as type I diabetes. Mouse insulin promoter (MIP) is a promoter specific for the expression of proteins found only within the pancreatic β cells of mice. Nanoluc is a type of luciferase that, when expressed, emits bioluminescence. When coupled with MIP, Nanoluc can provide visual proof of the expression of certain genes controlled by the promoter. This project aims to create a plasmid containing MIP and Nanoluc that can be used in EVs to aid in the visualization of proteins expressed by the promoter. The MIP- coding plasmid will be used as a backbone template, while a nanoLuc-coding plasmid will serve as the insert template to create the final construct. PCR amplification of MIP and Nanoluc will be confirmed by gel electrophoresis to ensure proper amplification of desired fragments. Gel purification followed by homologous recombination performed via Seamless Ligation Cloning Extract (SLiCE) will then be used to combine the sequences together. Bacterial transformation and colony PCR will be utilized to further verify the creation of the final construct. The final plasmid will be used in EVs in the future to visualize and verify the delivery of therapeutics to pancreatic β cells in hopes of

INVESTIGATING THE ROLE OF HISTONE TRI-METHYLATION MARKERS IN THE EFFICIENCY OF CLONING THROUGH H3K9ME3 CHARACTERIZATION OF BOVINE AND ZEBRAFISH SOMATIC FIBROBLASTS.
Presenter(s): Veona Cutinho
Cell Biology Genetics and Genomics
Mentor(s): import-no first name Cibelli (College of Agriculture & Natural Resources)

Somatic Cell Nuclear Transfer (SCNT), also commonly known as cloning, is a technique that allows the transformation of a differentiated somatic cell into an undifferentiated zygote. Theoretically, the manipulated zygote has the potential to develop into a fully functioning, normal organism (clone) within the conducive environment of an enucleated oocyte. However, a somatic cell acquires epigenetic modifications as it progresses in differentiation which results in variation in its gene expression compared to a naturally fertilized zygote. These differences can impediment the development of a clone, decreasing the efficiency of successful nuclear transfer. Previous studies have shown that persistent H3K9me3 in the nucleus of the somatic cells prevents zygotic genome activation during SCNT, thus being an epigenetic barrier to cloning. We hypothesise that the transfer of genetic material from somatic cells with lower H3K9me3 expression will yield better embryonic progression of the reprogrammed clone. In this study, H3K9me3 expression will be characterised in bovine somatic cells and 24 hours post fertilization zebrafish embryos. Cells with low expression of H3K9me3 will be further phenotyped using whole embryo immune cytochemistry. Understanding the abundance and localisation of cells bearing the lowest levels of H3K9me3 will facilitate their live isolation using flow cytometry. Finally, these isolated cells will be tested for their efficiency as donors for SCNT.

IDENTIFICATION AND CHARACTERIZATION OF SUPPRESSOR MUTANT IN A JASMONIC ACID ACCUMULATING ARABIDOPSIS LINE
Presenter(s): Sam Hu
Cell Biology Genetics and Genomics
Mentor(s): Jinjie Liu (College of Natural Science)

Jasmonic Acid (JA) and its derivatives are important plant hormones involved in plant growth and stress responses. Plastid Lipase 3 (PLIP3) cleaves 18:3 (number of carbons : number of double bonds) acyl groups from chloroplast membrane lipids which are then metabolized to oxylipins including JA. The PLIP3 overexpression line (PLIP3-OX) showed increased levels of JA and its derivatives, altered leaf morphology, and stunted plant growth. We are interested in discovering novel components of JA synthesis and signaling processes. Toward this goal, we conducted a suppressor mutant screen in the PLIP3-OX line. One candidate, suppressor mutant 97, carries a recessive mutation leading in the homozygous state to partial reversal of the PLIP3-OX phenotype in addition to yellow leaves and a lipid phenotype similar to PLIP3-OX, but with a reduced level of 18:3 acyl groups. Through next-generation DNA sequencing of bulk DNA from an F2 mapping population consisting of 93 homozygous suppressor mutant individuals, a set of mutated candidate genes likely including the one casually responsible for the observed phenotypes was identified. To ultimately determine the causal mutation, we are currently crossing independent T-DNA mutants disrupted in the candidate genes with PLIP3-OX and suppressor line 97.

MSU SCIREVIEW
Presenter(s): Leah Meppelink, Vincetti Carandino
Cell Biology Genetics and Genomics
Mentor(s): Geraldine Zeldes (College of Communication Arts Sciences)

Scientific literacy rates are low in the general population. This is due to a variety of factors, one being that many scietists fail to convey their findings in a way that is understandable to others outside of thier field (including the general public). This creates barriers that contribute to a lack of access to scientific knowledge. We know that discoveries found through research are valuable, but when they are not presented in a manor that is digestable to the public it makes it difficult for people to be excited or interested in those findings. MSU SciReview was created to help scienfic literacy rates grow across MSU's campus by providing a free online scientific jounal that anyone can access. Students involved with SciReview are encouraged to write a research literature review article for the journal, and members are taught scientific reading, writing, and analytical skills. MSU SciReview is committed to making scientific information accessible and digestible to members of all communities in hopes of increasing scientific literacy and involvement on the MSU campus

FLUORESCENT MICROSCOPIC ANALYSIS OF SINGLE EXTRACELLULAR VESICLE SUBTYPES
Presenter(s): Matthew Gagea, Xheneta Vitija
Cell Biology Genetics and Genomics
Mentor(s): Masamitsu Kanada (College of Human Medicine), Najla Adel Saleh (College of Human Medicine)

Increasingly, extracellular vesicles (EVs) are being researched for a variety of biomedical applications. EVs are a heterogeneous group of lipid-enclosed biomolecules and are classified into micro-vesicles and exosomes. They play key roles in the delivery and uptake of biomolecules within tissues and intercellular communication. As such, they can potentially be used as disease biomarkers and engineered to be vectors of delivery for gene therapeutics, improving biomedicine. Interleukin 10 (IL-10) is a protein that promotes an anti-inflammatory immune response. Single EV analysis (sEVA) is becoming more prevalent as there is a greater need for understanding specific EVs. Considering this, we aim to use fluorescent microscopy paired with image-processing tools for sEVA. Moreover, we aim to address the broader goal of utilizing exosome-based IL-10 delivery as a novel approach to enhance the anti-inflammatory effects of IL-10. Small EVs (sEVs) isolated from HEK293FT cells expressing IL-10-RFP and tetra-spanning exosome markers-CD-9-GFP, CD-63-GFP, or CD-81-GFP-were characterized. Fluorescent microscopy was performed on samples plated on poly-N,N-dimethylacrylamide hydrophobic slides to effectively immobilize EVs. Images were then processed using ImageJ/Fiji and the EVAnalyzer application. Preliminary findings suggest that fluorescent microscopy can quantify single-EV colocalization across a heterogeneous population. Furthermore, there is no significant di

RETRIEVAL OF OLFACTORY MUCOSAL STEM CELLS THROUGH MINIMALLY-INVASIVE COVID MICRO-BRUSH
Presenter(s): Medha Guduguntla
Cell Biology Genetics and Genomics
Mentor(s): Jean Nelson-Peduzzi (Wayne State University)

Spinal cord injury (SCI) causes devastating lifestyle and financial consequences for the patient. Treatment strategies emphasize neuroprotection, but not regeneration. In this regard, stem cells are an innovative field of study that has the potential to regenerate neural tissue, thereby increasing a person's ability to regain function. The purpose of this project is two-fold: to attain olfactory stem cells located in the nasal canal in a minimally-invasive way and to gather neural cells from the epithelium and mesenchymal cells in the lamina propria. Cells were gathered with sterile nasal micro-brushes, stored, and grown in flasks. After cells reached confluency, they underwent immunofluorescence using antibodies specific for location and characteristics. Additionally, samples were sorted magnetically to confirm epithelial and mesenchymal cells. A cell count was taken before and after sorting. Immunofluorescence showed the presence of cells that expressed cell markers tested. There was consistent overlap between cell markers and antibodies. Cell count for magnetic sorting yielded total count of 2.45x10^6 cells with viability of 93.9%. Magnetic sorting yielded percentage of cells expressing CD90 of 57.1% and cells expressing CD54 of 24.5%. This experiment shows the presence of both epithelial and mesenchymal stem cells gathered via sterile micro-brush nasal swabbing. This represents a minimally-invasive way to gather neural and mesenchymal stem cells. We show that expa

SURVIVAL MOTOR NEURON 1 IMPACT ON BLOOD GENE EXPRESSION
Presenter(s): Mithil Penta
Cell Biology Genetics and Genomics
Mentor(s): Daniel Campbell (College of Human Medicine)

Spinal muscular atrophy (SMA) is a severe neuromuscular disorder caused by homozygous mutations of the SMN1 (survival motor neuron 1) gene, which produces the protein SMN. The paralogous gene SMN2 encodes a truncated, unstable isoform of SMN that lacks exon 7 and can only partially balance functional loss of SMN1. The severity and age of onset of SMA varies dramatically, from a severe life-threatening form in which children do not achieve the ability to sit without support and require respiratory support to live beyond 2 years of age (Type I) to a form that goes undetected until well into adulthood, usually after the age of 35 years (Type IV). Recent breakthroughs have provided remarkable treatments for SMA. The breakthrough treatments directly target either the SMN1 gene to correct the mutation or the SMN2 gene to increase its activity. However, responsiveness to these treatments are variable among patients. To develop a more comprehensive understanding of SMA patients and normal individuals we aim to find differentially expressed genes and biomarkers to highlight pathways that are differentially affected in both groups low SMN1 and high SMN1 patients. After cross-analyzing common differential expressed genes across projects from SRA Geo Accession we found 13 genes. The main pathways that these genes are involved in are Nitric oxide transport, O2 transport, cellular oxidation detoxification, heme catabolic waste, cell signaling, and overall mRNA process

GENETIC VARIATION AMONG PARASITES AND HOW THE DIFFERENT INFECTION RATES OF VARIANCES DETERMINE A HOST'S REPRODUCTIVE FITNESS.
Presenter(s): Eva Woods
Cell Biology Genetics and Genomics
Mentor(s): Lindsey Thompson (College of Natural Science), Nina Wale (College of Natural Science)

Infectious diseases come in many variations, but what causes the differences in an infection's ability to make you sick? In this study, we leverage Daphnia, the common water flea, as a model organism to investigate the differential virulence in bacterial strains - how their genetic variations cause varying degrees of damage to host Daphnia. Daphnia has a translucent body that allows us to visually observe the infection by Pasteuria ramosa in real time within the body. P. ramosa is an endospore-forming bacterium that castrates its Daphnia host and has many different strains, each containing different genetic makeup. A previous experiment noticed that in a virulent strain there was a vegetative form that presented in cauliflower shapes, however the cauliflower was less apparent in the non virulent strain. Our hypothesis is that these cauliflower increase P. ramosa's fitness, while also resulting in greater castration of its host, so the more there are, the more virulent the infection is. In this experiment three strains were studied: one highly virulent strain that stops its host from reproducing, a moderately virulent strain that sometimes stops reproduction, and a minimally virulent strain that has been shown to allow its host to continue to reproduce. Using an attune flow cytometer, we can capture images of the spores within each infected individual to identify if cauliflowers are present. If we can identify what increases the pathogens' fitness while harming the host,

A STEM CELL-DERIVED HUMAN HEART ORGANOID TO STUDY HUMAN HEART INFLAMMATION
Presenter(s): Hussain Basrai
Cell Biology Genetics and Genomics
Mentor(s): Aitor Aguirre (College of Engineering), Colin Ohern (College of Osteopathic Medicine)

Cardiovascular diseases (CVDs) represent the leading cause of death in the developed world. Cardiac arrhythmias make up a large proportion of CVDs and are often fatal if left untreated. In the last decade, a research group demonstrated that macrophages (MPs), a type of white blood cell part of the innate immune system, contribute to the conduction system of the heart, which is critical for coordinated heart contraction, and that recruited proinflammatory MP populations in the cardiac conduction system elicits atrial fibrillation. To further investigate the impact of MPs and pro-inflammatory factors on human heart tissue function, we utilized a stem cell-derived human heart organoid (hHO) platform that provides an accessible way of studying human heart biology. These hHOs have measurable electrophysiology, physical contraction, and relevant cardiac cell types. It has been well established that subjecting MPs to lipopolysaccharide (LPS) and interferon-gamma (IFN) induces a proinflammatory state in MPs. Thus, we hypothesized that subjecting hHOs to additions of monocytes supplemented with IFN and LPS will induce changes in the structure and function of hHOs. Our preliminary immunofluorescence and brightfield microscopy imaging data indicate that hHOs exposed to LPS and IFN have a larger MP population and altered hHO contractility versus the control. We believe this hHO inflammation model and future work will provide answers as to how MPs contribute to the human cardiac conductan

CONSERVED SOMATIC MUTATION IN CKIT ONCOGENE IN MOUSE MODEL OF BREAST CANCER ASSOCIATED WITH LOSS OF EXPRESSION
Presenter(s): Caroline Downes
Cell Biology Genetics and Genomics
Mentor(s): Eran Andrechek (College of Human Medicine)

Human breast cancer is one of the leading causes of cancer-related mortality. Robust interactions and pathways are required for the development of human cancer resulting in complexities while studying the mechanisms behind tumor progression. The mouse model overexpressing Myc [Mouse Mammary Tumor Virus Promoter (MMTV)-Myc] is a simplified model that uses the oncogene myc under the control of the hormonally inducible MMTV promoter to cause tumor development. Preliminary sequencing of MMTV-Myc tumors revealed the oncogene cKit contains a conserved, somatic mutation. Kit is a Receptor Tyrosine Kinase that is activated when bound by stem cell factor (SCF), allowing for cell survival, proliferation, and apoptosis. The identified prevalent mutation was predicted to significantly impact the transmembrane domain of cKit, leading me to hypothesize this mutation would prevent insertion into the membrane, resulting in a loss of expression. Western blot analysis has revealed a subset of cKit mutant tumors with a total lack of expression, while other tumors have expression. Immunohistology has revealed wildtype staining in the membrane while lower expression reveals small, patchy regions of the membrane. Higher expression of cKit stains oppositely from PCNA suggesting regions where cKit is expressed is not/minimally undergoing proliferation. Western blot and IHC results suggest heterogeneity, we will proceed with qrt-PCR wildtype and mutant copy analysis. Kaplan-Meier plottin

IMPACTS OF CELL CULTURING METHODS ON INTRACELLULAR METAL ION FLUCTUATIONS
Presenter(s): Sam Durrant
Cell Biology Genetics and Genomics
Mentor(s): BongJin Hong (College of Human Medicine)

Maintaining intracellular metal ion homeostasis plays a pivotal role in function and signal transduction, regulating the stability of a cell. In cell culturing conditions, there are various factors that play a role in maintaining the stability, overall contributing to the metal ion homeostasis within the cell. Fluctuations in such conditions can be highlighted through a number of factors directly related to the technique of cell culturing, stemming from media composition, varying cell densities, chemical makeup of such washing stages, and perturbations in the cellular membrane via cell scraping can all be quantified using ICP-QQQ-MS, a type of mass spectrometry used to measure and quantify intracellular elemental composition. Elucidating the roles played between intracellular metal ion homeostasis and cell culturing methods is an essential quality for performing further cell-based research, paired with an understanding of the roles such metal ions play within the cell. Placing an emphasis on the cell culturing conditions in an effort to replicate intracellular conditions can facilitate the learning of the true homeostatic mechanisms, and give rise to the elements present within such processes. This study outlines the impact of cell culturing conditions and how they translate to intracellular metal ion homeostasis, leading to an understanding of how perturbations to the cell through culturing conditions can be applied to future experimental projects, investigating intracellula

CLONING GAUSSIA LUCIFERASE REPORTER GENE FOR EXTRACELLULAR VESICLE IMAGING
Presenter(s): Shubh Gorantla
Cell Biology Genetics and Genomics
Mentor(s): Masako Harada (College of Engineering)

Extracellular vesicles (EV) are membrane-bound structures that can carry molecules like DNA, RNA, proteins, lipids, and other biomolecules. They are secreted by cells for cell-to-cell communication by delivering cargo from one location to another. Recently, they have been investigated for their potential to be engineered and used to treat diseases. In order to monitor their distribution through the body, fluorescent or luminescent proteins are used. Gaussia Luciferase (gLuc) is a reporter protein that comes from the marine copepod Gaussia princeps. The goal of this project is to generate a plasmid that contains the genes encoding for gLuc so that it can be used for imaging EV distribution in the future. The plasmid was generated by first amplifying the necessary fragment of DNA from a larger plasmid, pcDNA-gLuc, using PCR and the size of the resulting construct was verified using gel electrophoresis. Subsequent steps involve transformation using Seamless Ligation Cloning Extract (SLiCE) which uses RecA-independent homologous recombination. The plasmid also contains an ampicillin resistance gene, which will be used to confirm transformation of bacteria by growing the bacteria in ampicillin and seeing whether they survive. In the future, the plasmid will be transfected into mammalian cells and used for imaging EVs produced by them.

STUDY OF PTPN11 DRIVER MUTATIONS IN HEMOPHAGOCYTIC HISTIOCYTIC SARCOMA IN BERNESE MOUNTAIN DOGS AND OTHER BREEDS OF DOG.
Presenter(s): Ishana Kapoor
Cell Biology Genetics and Genomics
Mentor(s): Alexander Engleberg (College of Veterinary Medicine), Tuddow Thaiwong-Nebelung (College of Veterinary Medicine), Vilma Yuzbasiyan-Gurkan (College of Veterinary Medicine), Ya-Ting Yang (College of Veterinary Medicine)

Histiocytic sarcoma (HS) is an aggressive cancer of cells of macrophage and dendritic cell lineage. While HS is a rare cancer in both humans and dogs, certain breeds such as the Bernese mountain dog (BMD) have a high prevalence rate, about 25%, which gives us an opportunity to study to understand this rare disease. Previous studies from our lab have identified the presence of driver mutations in PTPN11 (v=43%) and KRAS (v=3%), oncogenes in a major cell proliferation pathway, MAPK. Hemophagocytic histiocytic sarcoma (HHS) is a subtype of HS which is characterized by engulfment and destruction of erythrocytes by the proliferating cancer cells. The aim of this study was to find the frequency of driver mutations in the PTPN11 gene for HHS. We extracted and analyzed the DNA from tumor tissue from confirmed HHS cases, of 14 BMD, and 12 from other breeds. Our results reveal that 12 of 26 cases (46%), carry a driver mutation in PTPN11, resulting specifically in E76K or the G503V amino acid substitutions, residues that are major hotspots for mutations identified in our previous studies. One KRAS mutation was identified (4%). We conclude that HHS has a similar prevalence of mutations in the PTPN11 and KRAS genes as HS. Most importantly, the findings point to the activation of the same pathway in both HS and HHS. Specific inhibitors of this pathway are available and can be utilized for HHS cases. Further studies investigating other mutations in HHS are ongoing and can identify additiona

VERIFICATION OF A SUPER ENHANCER AND ITS EFFECT ON A PROXIMAL CHITINASE GENE CLUSTER IN ARABIDOPSIS THALIANA.
Presenter(s): Megan Meyer
Cell Biology Genetics and Genomics
Mentor(s): Jiming Jiang (College of Natural Science)

Plant chitinases, a broad class of defense-related proteins, play critical roles in defense against various abiotic and biotic stresses, most notably plant fungal infection. Within plant species, chitinase genes may be found clustered together, such as the CHI9 cluster on chromosome 4, in the model plant species Arabidopsis thaliana. This cluster is composed of nine homologous genes that encode for class V chitinases. Moreover, the transcriptional regulation of CHI9 merits further exploration as it has been demonstrated that cis-regulatory elements (CREs), also known as enhancers, can significantly alter the transcription of several genes. Here, we describe a 10kb proximal super enhancer (SE), dubbed AS4, which putatively acts as a transcriptional regulator of the CHI9 cluster. Furthermore, DNase-seq and MH-seq chromatin sensitivity datasets, as well as expression data, informed various ~1000bp deletions of the AS4 SE using CRSIPR/Cas9. Subsequently, we will stimulate plant defense response pathways by inducing transgenic plants with phytohormones ABA and JA. These plants will be assayed for differential responses via RNA-seq and qPCR expression analysis. We aim to characterize a powerful regulatory element associated with CHI9, and the mechanics of chitinase expression. Ultimately, evaluating enhancer driven gene expression could establish a basis for controlling the upregulation of chitinases, which are crucial for plant defense against environmental stresses that threaten

MESENCHYMAL STEM CELL DERIVED EVS USE FOR SKIN INJURY AND WOUND HEALING
Presenter(s): Hady Omar
Cell Biology Genetics and Genomics
Mentor(s): Burra Madhukar (College of Human Medicine)

Diabetes is one of the most prevalent chronic diseases in America. Diabetes can cause uncontrollable blood circulation leading to less blood flow in wounds, which causes less nutrients to wounds. People with diabetes, when injured, are more susceptible to a delayed period of healing compared to those without diabetes. Extracellular or EVs have been shown to promote skin health improvements. The usage of Mesenchymal stem cells and EVs for wound healing is a new method of skin health support. Our study aims to look at how effective stem cell placental-derived EVs can be in improving the healing process for diabetic keratinocytes.

USING TRANSPOSON MUTAGENESIS TO IDENTIFY BIOSYNTHESIS GENES OF A POTENT NEUROTOXIN
Presenter(s): Julia Walton
Cell Biology Genetics and Genomics
Mentor(s): Heather Eisthen (College of Natural Science), Samantha Westcott (College of Natural Science)

Tetrodotoxin (TTX) is a potent neurotoxin that blocks voltage-gated sodium channels, preventing action potentials and resulting in paralysis and death. TTX was isolated in 1963 from a pufferfish, and in 1986, bacteria associated with pufferfish were found to be the source of their TTX. Although more animals have been found to have a symbiotic relationship with TTX-producing bacteria, the genetic basis for TTX synthesis remains unknown. We are working to locate the genes responsible for TTX production by mutagenizing TTX-producing bacteria and sequencing the genomes of non-TTX-producing mutants. The Eisthen Lab has a robust collection of TTX-producing bacteria that we isolated from rough-skinned newts (Taricha granulosa). From our collection, we selected a TTX-producing bacterium - an Aeromonas sp. with a genome that we fully sequenced - to create a transposon library. We used E. coli donor strain APA752 to transfer barcoded transposons to the TTX-producing Aeromonas. We expect that clones with transposon insertions in genes related to TTX production will not produce TTX. We expect to find several unique clones with a non-TTX-producing phenotype by screening 1% of our 100,000 mutants. We will compare the genomes of these mutants to that of the original Aeromonas to locate genes related to TTX synthesis. Our results will allow us to experiment with identified TTX-production genes and understand the biosynthesis of TTX, opening the door to rapid genetic s

IMPACT OF FGF4 ON MURINE ECTOPLACENTAL CONE OUTGROWTH
Presenter(s): Laura Stephan
Cell Biology Genetics and Genomics
Mentor(s): Margaret Petroff (College of Veterinary Medicine)

In the early mouse embryo, the ectoplacental cone (EPC) gives rise to the cells of the mature placenta. The EPC, and then the placenta, attaches the embryo to the uterine wall and establishes maternal blood supply to the placenta. Thus, the EPC plays a vital role in the processes of embryo implantation and placentation. For this project, we aimed to develop culture conditions for optimal EPC growth. Mice were sacrificed at gestation day 6.5 or 7.5, and the ectoplacental cone was dissected and cultured under varying media conditions. Ectoplacental cone outgrowth was quantified over six days using NIH ImageJ software analysis of microscope images. Our results show that EPC outgrowth and trophoblast proliferation occur better in the presence of Matrigel® and FGF4 (Fibroblast Growth Factor 4) as compared with standard medium culture conditions. Matrigel matrix has been shown to improve the attachment and differentiation of certain cell types in culture and FGF4 has been shown to promote trophoblast stem cell proliferation. Thus, these findings illustrate the significance of growth factors in driving trophoblast cell outgrowth and their facilitation of placentation in our experimental model. In future experiments, we will introduce hypoxic conditions that model the physiological state of the uterus during early placental growth. Our findings can be used to understand the molecular mechanisms of embryo implantation, placentation, and positive pregnancy outcomes.

Communication Arts & Sciences

HOW DOES MUSIC-BASED INTERVENTION BY SPEECH-LANGUAGE PATHOLOGISTS IMPROVE COMMUNICATION IN ADULTS WITH APHASIA?
Presenter(s): Brooke Emerick
Communication Arts and Sciences
Mentor(s): Jeffrey Searl (College of Communication Arts Sciences)

Aim: Investigate the current state of the literature regarding the use of music-based interventions by speech-language pathologists to improve communication in adults with aphasia. Methods: An integrative literature review was completed with relevant search terms using digital databases PubMed and CINAHL Search parameters included: (1) published in English, (2) publication containing a title and an abstract, and (3) Must be a peer-reviewed publication. Abstract/title and full manuscript reviews were completed in Covidence. Exclusion criteria were (1) only child participants, (2) not available in English, (3) non- music-based interventions, (4) not aphasia-focused, (5) non-communication focused outcomes (6) non-experimental study Results: A total of 338 articles were identified across both databases. After the identification and removal of 62 duplicates, a total of 276 articles remained. Upon completion of the abstract/title review, 53 articles were included with an interrater reliability of 96.4%. After completion of full manuscript review, 34 articles were included and data extraction was completed in Covidence. Conclusion: Various music-based interventions were identified with promising results relating to communicative outcomes in adults with aphasia. The findings, including patient population characteristics, music-based therapies by speech-language pathologists and outcome measures will be presented.

DO PRESCHOOL-AGE AUTISTIC CHILDREN WITH A HISTORY OF REGRESSION HAVE A DIFFERENCE IN EXPRESSIVE AND RECEPTIVE LANGUAGE SKILLS WHEN COMPARED TO AUTISTIC CHILDREN WHO DO NOT?

Presenter(s): Emma Erlenbeck, Savannah Morisot
Communication Arts and Sciences
Mentor(s): Courtney Venker (College of Communication Arts Sciences), Jennifer Johnson (College of Communication Arts Sciences)

Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by restrictive and repetitive behaviors and difficulties with social communication. Approximately 32% of children with ASD experience regression (Tan et al., 2021). Regression is defined as the loss of previously acquired skills. In this research, we investigated whether this loss was associated with differences in expressive and receptive language. The participants were preschool-aged children with ASD who were placed into two groups based on parental reports of skill loss. There were 10 participants in the regression group with a mean age of 45.1 months. In the non-regression group, there were 23 participants with a mean age of 45.83 months. For the regression group, the mean score for auditory comprehension (AC) was 63.3 with a standard deviation (SD) of 18.61. The AC standard scores ranged from 50-98. The mean score for expressive communication (EC) was 68.3 with a SD of 13.38. The EC standard scores ranged from 52-93. In the non-regression group, the mean AC score was 62.48 with a SD of 13.33. The range was 50-89. For EC, the mean score was 68.52 with a SD of 11.67. The range was 50-89. There was no statistically significant difference between the groups in AC (p=.89) or EC (p=.96). This suggests that the autistic children who experienced regression did not have lower expressive and receptive language scores. This information is valuable and reassuring for parents determining proper interventio

ACOUSTIC PROFILES OF SPEECH AMPLIFICATION DEVICES ON HYPOPHONIC SPEECH IN PARKINSON'S DISEASE

Presenter(s): Sara Cook
Communication Arts and Sciences
Mentor(s): Thea Knowles (College of Communication Arts Sciences)

Hypophonia, a voice disorder associated with Parkinson's Disease (PD), is marked by diminished vocal loudness and clarity. Amplification devices are a form of augmentative treatment sometimes used to enhance intelligibility and audibility for individuals with hypophonia. This study characterized the acoustic profiles of commercially available speech amplification devices used in managing hypophonia. Seven speech amplification devices were calibrated and utilized to amplify three types of pre-recorded audio stimuli: pink noise, sustained phonation, and a standardized reading passage. Speech recordings were obtained from three individuals with PD and hypophonia. The amplified signals were compared to a control signal amplified through a flat-frequency response speaker. Acoustic measures were taken from the long-term average spectra of each recording and included spectral tilt and energy amplitude in three frequency bands (0-1 kHz, 1-3 kHz, and 3-8 kHz). Across all devices, there was a consistent decrease in low-frequency spectral energy and an increase in mid- and high-frequency energy compared to the baseline. However, there was substantial variability in the magnitude of these acoustic changes among the devices. The baseline voice characteristics of the individuals with PD also influenced the direction and extent of acoustic alterations. Certain devices attenuated, rather than amplified, high-frequency energy in specific cases. The study highlights the importance of consideri

THE ROLE OF INTEROCEPTION IN AUDITORY-PERCEPTUAL JUDGEMENTS OF VOICE BY MUSICIANS AND NON-MUSICIANS

Presenter(s): Elisa Fulper
Communication Arts and Sciences
Mentor(s): Jeffrey Searl (College of Communication Arts Sciences)

A clinician's auditory-perceptual judgements are imperative for making accurate assessments and diagnoses of vocal disorders. This study sought to determine if interoception, one's ability to be in tune with their bodily senses, and musicianship experience impact the accuracy of vocal quality judgements. Participants (n=44) were asked to complete a 10-minute Qualtrics survey. To evaluate interoception, the Multidimensional Assessment of Interoceptive Awareness Version 2 (MAIA-2) was used with the addition of two questions on voice. Audios of individuals with voice disorders were taken from the Perceptual Voice Qualities Database (PVQD) and participants rated those on roughness, breathiness, and strain according to the Consensus Auditory-Perceptual Evaluation of Voice (CAPE-V) guidelines. Questions on musical experience were asked to determine the groups of musicians (n=20) and non-musicians (n=24) along with questions on demographics were asked. Results showed musicians to have significantly higher total MAIA-2 scores than non-musicians and in the subgroups of Noticing, Not Distracting, Attention Regulation, Emotional Awareness, and Self-Regulation. There was no statistical difference between the accuracy of auditory-perceptual judgements between musicians and non-musicians. A higher MAIA-2 score showed no correlation with a greater accuracy of vocal judgement ratings.

EXPLORING THE VARIABILITY OF STUTTERING ACROSS DIFFERENT SPEAKING SITUATIONS

Presenter(s): Emma Buckley, Grace Hetke, Olivia Stachurski, Sarah Gundry
Communication Arts and Sciences
Mentor(s): J Scott Yaruss (College of Communication Arts Sciences), Megan Arney (College of Communication Arts Sciences), Molly Landers (College of Communication Arts Sciences)

Stuttering is a condition that affects speech fluency. Speech transcriptions allow for the transcribing and collection of data from stuttered speech. Using transcriptions one can code stuttering-like disfluencies, which include characteristics of stuttering, such as word and segment repetitions, broken words and more. Typical Disfluencies, such as filled pauses, can also be coded, which are not considered sole characteristics of stuttering. There are multiple components to stuttering and stuttering varies for every individual. We want to understand to what degree different social situations or environments may affect one's stuttering. We use the software programs CLAN and CHAT to quantify and compare stuttering disfluencies between individuals. In conjunction with the environments individuals are stuttering in a particular speech sample, we can use the numeric data produced by CLAN and CHAT to compare the disfluencies across individuals. The transcriptions that we complete through CLAN and CHAT allow us to see the variability within one's speech and how different environments affect one's stuttering. Through our codes, we see how each individual varies through their stuttering-like disfluencies. Quantifying our data allows us to see these differences. Overall, the Spartan Stuttering Lab aims to improve the validity of research on stuttering behavior and to provide reliability amongst transcribers within the lab.

"INSIGHTS INTO AUTISTIC LANGUAGE DEVELOPMENT: A SOCIAL MEDIA ANALYSIS OF GESTALT LANGUAGE PROCESSING"

Presenter(s): Abhinav Anand, Duaa Kazmi, Gowrani Chadalavada

Communication Arts and Sciences

Mentor(s): Courtney Venker (College of Communication Arts Sciences), Zachary Hesse (College of Communication Arts Sciences)

In this study, our goal is to better understand the clinical concept of Gestalt Language Processing (GLP) by analyzing social media content. The theory of GLP (Blanc, 2012) is based on the general principle that children first acquire whole speech phrases or 'gestalts' before developing spoken single words. However, the current status of GLP as a theory lacks a concrete definition. In recent years, GLP has gained traction among clinicians despite this lack of a clear definition (Evans, 2023). To better understand GLP, we will enter the term "gestalt language processing" on TikTok and select the first 10 videos that appear based on relevance. After selecting videos, we will transcribe them and analyze themes that emerge. We will review each video and identify GLP-related themes that emerge. We predict that these themes will include what GLP is; some basic "facts" about it; what intervention approaches it encourages; and why it is useful. In addition to this qualitative coding, we will examine each video for inclusion of these concepts: neurodiversity; creator's professional connections (e.g., working as an SLP); creator's personal connections (e.g., being a parent of an autistic child); and potential financial incentive for the creator (e.g., they offer training courses or other materials at a cost). Analyzing the videos will contribute to our understanding of GLP and help define areas for future research. Regardless of the outcome, the results of this study will ad

ANTI-COUNTERFEIT CAMPAIGNS ANALYSIS

Presenter(s): Logan Baker, Phoebe Tran

Communication Arts and Sciences

Mentor(s): Anastasia Kononova (College of Communication Arts Sciences)

Counterfeiting raises significant economic and health risks, yet current anti-counterfeit campaigns often struggle to effectively engage consumers. This research project addresses this challenge by analyzing past campaigns The project aims to identify key features of campaign messages that either induce or reduce consumers' psychological reactance, a critical factor in attitude and behavior change. Through content analysis of anti-counterfeit campaign messages conducted over the past 15 years, the study seeks to understand the prevalence and impact of reactance-inducing versus reactance-reducing elements in these messages. I am part of the research team responsible for content analysis. We will evaluate how likely it is that consumers who see anti-counterfeiting campaign messages will experience psychological reactance. The results of this research project will aim to inform the development of future anti-counterfeit campaigns. Ultimately, the findings have the potential to reduce counterfeit purchasing behavior and safeguard both consumers and brands against the threats posed by counterfeiting.

MATTERS OF FAITH: NEWS COVERAGE OF CONSTRAINTS ON RELIGIOUS FREEDOM IN CENTRAL ASIA
Presenter(s): Eleanor Pugh
Communication Arts and Sciences
Mentor(s): Eric Freedman (College of Communication Arts Sciences)

Freedom of religion is considered a fundamental human right, enshrined in documents including the United Nations' Universal Declaration of Human Rights and the constitutions of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. However, the regimes of these five Central Asian states routinely curtail freedom of worship, especially for members of minority religions and sects, but even for followers of Sunni Islam, the predominant faith in the region. These infringements often go underreported, as domestic news outlets are limited by state control or fear of reprisals. This study explores how the specialized international news outlet Forum 18 covers religious freedom constraints in Central Asia. Forum 18 is a prominent voice on these issues and is routinely cited by NGOs and governments, including the U.S. Department of State. Its editor describes it as the only news organization dedicated to covering the region's religious developments. This study seeks to understand Forum 18's coverage, which could indicate challenges of reportage in the region and provide information, direct and indirect, about levels of religious repression. All articles about the Central Asian republics from 2023 were retrieved from Forum 18's website and qualitatively coded. Findings underlined the repressive nature of the Central Asian regimes, exemplified by a large presence of anonymous sources and refusals to comment from officials. Forum 18's coverage can contribute at least symbo

DEI AND CHILDREN'S PROGRAMMING: DIVERSITY ON STEM TV
Presenter(s): Ilijah Dean
Communication Arts and Sciences
Mentor(s): Fashina Alade (College of Communication Arts Sciences)

Children's programming has long sparked discussions about race and gender representation. Many argue that early childhood, being a crucial developmental stage, is ideal for introducing Diversity, Equity, and Inclusion (DEI) concepts. However, there's a notable gap in how children access DEI-related content, especially evident in the underrepresentation of minoritized groups in STEM-focused TV shows for kids. This project looks at the integration of DEI principles into foundational STEM programming for children. Drawing from the Parasocial Contact Hypothesis (Schiappa et al., 2005), a central question emerges: What is the impact of children's parasocial contact with diverse media characters? Such connections foster tolerance in adults, and research suggests the same for children. Additionally, according to the Drench Hypothesis (Greenberg, 1988), "critical portrayals" of underrepresented minorities significantly influence viewer attitudes and identification with characters (Lennon, 2023). This raises the question of whether such portrayals would benefit children seeking representation in media.

WHAT DO YOU DO WHEN YOUR CHILD STUTTERS? RESOURCES THAT INFORM PARENTS' TYPICAL RESPONSES
Presenter(s): Anna English, Caroline Crago, Grace Thomas, Madelyn Holmes, Shea Hecht
Communication Arts and Sciences
Mentor(s): Bridget Walsh (College of Communication Arts Sciences)

Parents play an integral role in facilitating speech therapy for young children who stutter. Speech therapists provide parents with strategies to support both the child's fluency and confidence in their communication. However, there are misconceptions about how best to respond to a child's stuttering and limited data identifying the strategies that parents most often use. The objective of our research is to identify how parents respond to their child's stuttering and to document the resources that inform their responses (e.g., speech therapist, own intuition, internet). We sent an online REDCap survey to parents of children who stutter who were between the ages of 5-18 years. Parents selected responses they use when their child stutters from a list of 17 choices. Following this, the survey prompted parents to identify the specific resource that informed each response they selected. Data collection is ongoing; however, to date, we have collected surveys from 46 parents. Our findings will empower SLPs to better counsel parents of children who stutter by correcting misconceptions and reinforcing helpful strategies.

IDENTIFYING THE EXPERIENCES AND CHALLENGES OF PARENTS OF CHILDREN WHO STUTTER
Presenter(s): Cassidy Najor, Danielle Jones, Ella Maloney, Mary Derkacz, Mia Ivanko
Communication Arts and Sciences
Mentor(s): Bridget Walsh (College of Communication Arts Sciences), Chelsea Johnson (College of Communication Arts Sciences), Katelyn Gerwin (College of Communication Arts Sciences)

Stuttering is associated with observable disruptions to speech, yet it can adversely affect an individual's quality of life. Stuttering can also impact families, especially parents who may shoulder some of the burden of stuttering. There are few studies delving into stuttering's adverse impact on parents. This knowledge gap hinders our ability to counsel and advise parents on the ways to best support their child's communication development. We collected online REDCap surveys from parents with children who stutter between the ages of 5-18 years. Parents were asked to evaluate their perspectives and feelings about their child's stuttering and about managing their child's stuttering. The results of this project will identify potential burdens experienced by parents of children who stutter, and ultimately, help speech pathologists provide more informed counseling to families.

HOW DOES THE CASTE SYSTEM AFFECTS INDIAN POLITICS
Presenter(s): Ridhima Kodali
Communication Arts and Sciences
Mentor(s): JeanaDee Allen (College of Communication Arts Sciences)

Several people have been rallying around the US, particularly in Michigan, about the Telugu Desam Party (political party in Andhra Pradesh) leader who was arrested. The honors option from CAS 110 prompted me to delve into whether or not caste affects politics within Andhra Pradesh, a state in India, through a journalistic article. Were people supporting this leader and his party just because of caste? I interviewed several members of the caste system since they lived in it and the Telugu Desam Party. The journalistic article gave me several insights into whether people advocate for political figures based on caste and other factors that largely contribute to this. In addition, I presented and analyzed the article.

THE POTENTIAL BENEFITS OF SELF HELP ON ACADEMIC SATISFACTION AND AS A TREATMENT FOR MENTAL ILLNESS
Presenter(s): Abigail Garrett, Kaycie Lawrence, Kyran Tyler
Communication Arts and Sciences
Mentor(s): Laura Dilley (College of Communication Arts Sciences)

Mental health and education satisfaction are both increasingly prevalent topics. They have been receiving less stigma from the public in recent years and therefore are issues people are finding new and innovative ways to deal with. One of these ways is through "self-help" materials both online and offline, including YouTube videos, blogs, and books. This systematic review is designed to examine the effects, if any, that self-help materials have on mental health and education satisfaction. This systematic review looked at numerous research studies that examined this relationship. From these studies, the research method, participant characteristics, and results were compiled. Based on preliminary inspection of available information, there seems to be a potential benefit of self-help on emotional disorders like anxiety or depression, especially in more severe cases, and an increased sense of community and support surrounding them on the internet. The relationship between self-help and academic satisfaction from these studies was less clear. These results lead to further questions and potential future research about self-help as a viable treatment plan for emotional disorders. If further research confirms this relationship, it could be a beneficial and less expensive way for some people to manage their mental health.

EXPLORING THE ORGANIZATIONAL STRUCTURES WITHIN CSEM MARKETPLACES AND THE FUTURE IMPLICATIONS OF CSEM DISTRIBUTION

Presenter(s): Taylor Murdick
Communication Arts and Sciences
Mentor(s): Karen Holt (College of Social Science), Thomas Holt (College of Social Science)

Throughout the years, the Internet has expanded and improved substantially. This growth, however, has benefited not only the lives of online users but also of child predators. This comprehensive review examines the multifaceted landscape of cybercriminal networks involved in the distribution and production of Child Sexual Exploitation Material (CSEM) on the internet. It begins by outlining the intricate layers of the internet, including the Surface Web, Deep Web, and Dark Web, focusing on the latter as a platform for child exploitive activities. The research then delves into the organizational structures and operational dynamics of CSEM networks, drawing parallels with financial cybercrime markets. By analyzing scholarly articles on cybercrime markets and social organization practices, the research highlights the importance of normative orders, trust, and division of labor within these networks. Case studies of notorious CSEM marketplaces, such as Blue Orchid and Playpen, underscore the operational methodologies and organizational structures in such networks. Moreover, the research then expands upon the future trends in CSEM distribution, including shifts in hosting patterns, consumption behaviors, and the emerging challenge of virtual reality pornography. Notably, it discusses the growing involvement of youth in CSEM production and the implications of technological advancements. By combining empirical evidence and scholarly insights, this research provides a comprehensive un

THE ETHICS OF REPORTING ON CLIMATE CHANGE

Presenter(s): Elizabeth Nass
Communication Arts and Sciences
Mentor(s): Manuel Chavez (College of Communication Arts Sciences)

The ethical standards and boundaries in journalism have changed over the decades alongside media becoming the new media, creating new and more efficient ways to get the news to the general public. With this, new stories graced front pages, a lot of them having to do with environmental issues and climate change in particular. However, with political nuances to the topic along with confusion surrounding the scientific information behind the climate crisis, there have been issues with how to report on climate change in an unbiased and fair nature. Because of this political background that mixes scientific facts with political polarization, there has to be a strict code of ethics when it comes to reporting on climate change, which have, historically, been found to be presented in politically-leaning frames of knowledge. With these shaky ethics on reporting on climate change, major amounts of disinformation has been spread on the topic, muddling what is real, and the newly-coined term, "fake" news. This project will center around how the way we categorize a climate crisis and the way climate has been framed in U.S. politics, resulting in how it is framed in the news media.

THE UNDERLYING EFFECTS OF THE COVID-19 PANDEMIC FOR HIGH SCHOOL STUDENTS
Presenter(s): Devonte Coppin, Grishm Tandon, Luke Padron
Communication Arts and Sciences
Mentor(s): Laura Dilley (College of Communication Arts Sciences)

The COVID-19 pandemic was a generation-defining moment with a multiplicity of effects that will echo for decades to come, particularly for adolescents in school. One defining characteristic of this time can be measured through observing students' mental health; particularly the increase in depressive-like symptoms and substance abuse. Social Psychologists believe that behavior is guided by Dispositional and Situational Attributions, however, these inputs are not independent of each other according to Reciprocal Determinism. Maslow's hierarchy of needs more directly addresses deficiencies in performance; he believed that in order for humans to be most productive a series of needs must be met, ranked by level of importance to human biology and the mind. A collection of studies are used to demonstrate the significance of Maslow's hierarchy and the correlation between the students affected by the events of the pandemic. Quantitative data is the best way to gauge this and contrast the relevance. The results will demonstrate that students' mental health in particular can have a great impact on their performance in school, as well as how they cope with these negativities. The overall premise revolves around the sections of Maslow's hierarchy and how each level is more important to a human's needs than the last. Using statistical data students' mental health and how they measure the effects of changes in the style of learning. Through research, many people will realize the impact the

THE RELATIONSHIP BETWEEN AN INDIVIDUALS MYERS BRIGGS PERSONALITY SCORE AND THEIR SOCIAL MEDIA CONTENT
Presenter(s): Gracie Richardson, Maria Cohen Bichara, Sofia Murray
Communication Arts and Sciences
Mentor(s): Laura Dilley (College of Communication Arts Sciences)

Social media has taken over modern society, opening a new world of social networking and completely changing the way communities express themselves. With the rise of this technology society in the modern era, the prevalence of research that studies human interaction with social media is significantly increasing. With that being said, there are many ways studies attempt to approach human interaction with social media content, with some researchers under personality psychology focusing on measures that can help predict human behavior on social media. In our systematic review, we aim to compile and analyze research that attempts to connect personality psychology and an individual's social media content by studying MBTI. We aim to conclude whether or not the MBTI personality score of an individual can be correlated to an individual's content on social media. The purpose of our research is to understand the individual through their social media presence, such as how different personality types interact with social media or how our differences can be studied using written text. We have compiled multiple findings using MBTI to support our research. All of these studies used the MBTI personality test to either categorize social media users or to correlate their media usage back to their personality. The majority of these studies were conducted in relation to Twitter usage, some extending to sampling Reddit and other internet forums. Of the studies, many of them used uniquely trained

EXPLORING PEER INTERACTIONS IN CHILDREN?S BOOKS FEATURING CHARACTERS WITH AUTISM: A CRITICAL ANALYSIS OF NEGATIVE PEER DYNAMICS
Presenter(s): Kezen Sanchez, Swathi Kambhatla
Communication Arts and Sciences
Mentor(s): Courtney Venker (College of Communication Arts Sciences)

Picture books play an important role in children's development, as they are an engaging source of new information and lessons that a child could learn from and apply in their everyday life. An underrepresented category of children's books is those with autism spectrum disorder (ASD) representation. According to the Centers for Disease Control and Prevention (CDC), ASD has been identified in about 1/36 children (CDC, 2023). The purpose of this study is to analyze negative interactions between autistic characters and their peers in children's books because they may be unintentionally damaging for children's perceptions of autistic individuals. If children are exposed to these negative interactions and reactions within these books, they may be led to behave and think similarly. Children with ASD may also be discouraged or self-conscious if they are exposed to negative portrayals of peer interactions. In this study, the group of books that will be analyzed is from a list provided by The IRIS Center. This list was curated with the intention of being a valuable resource for teachers that accurately portray ASD and could be used as a learning tool for children. A coding system was designed to identify the frequency and types of negative peer interactions encountered in these books such as exclusion or verbal/physical bullying. Preliminary data show that some books display a higher frequency of negative interactions than others. We suggest that books displaying more positiv

WHERE IS THE MEDIAN BETWEEN MEDIA AND ME?
Presenter(s): Alika Sharma, Elizabeth Nwagwu, Sophie Roys
Communication Arts and Sciences
Mentor(s): Laura Dilley (College of Communication Arts Sciences)

In the digital age, media has become synonymous with experiences outside of the screen. People's stories exist online as if they were written in a physical diary. This begs the question of whether themes in media we consume have real-life impact. More specifically for undergraduate students who have reached a pivotal point of their lives. Prior research suggests increased resilience can positively impact academic and life satisfaction. Furthermore, qualitative interviews found digital storytelling can motivate feelings of resilience in students. Our research investigates the impact of digital storytelling on feelings of resilience in college students. We hypothesize that students will have an increase in feelings of resilience after exposure to resilience-related media. Fourteen MSU honors students ranging from ages 18-20 participated in a pretest-posttest experimental design which included a resilience-targeted digital media intervention. This intervention consisted of a motivational video by Lucy Hone titled "Three Secrets of Resilient People". The pretest and posttest were the Brief Resilience Scale (BRS), and State-Trait Assessment of Resilience Scale (STARS). The purpose of these questionnaires was to quantitatively assess feelings of resilience for each student prior to and following the intervention. The quantitative analysis of this study adds to previous research done on the impacts of digital storytelling and resilience on a small scale. Further research is needed t

HOW NEWS OUTLETS USE FACEBOOK TO INTERACT WITH RURAL COMMUNITIES: A CASE STUDY IN MICHIGAN'S UPPER PENINSULA

Presenter(s): Brandi Stover

Communication Arts and Sciences

Mentor(s): Ava Francesca Battocchio (College of Communication Arts Sciences), Kjerstin Thorson (College of Communication Arts Sciences)

Rural communities have been found to be at an inherent disadvantage regarding news. As more local media outlets get consolidated and with the growth of the internet, the circulation of local news coverage in these communities is decreasing. This makes the use of social media an increasingly vital alternative method of receiving local information. But are outlets utilizing these platforms as a way to interact with the communities they serve? Using descriptive statistics, this research aims to analyze how local media outlets are employing Facebook to engage with their audiences and disperse news.

HOW DO JOURNALISTS RESPOND TO HEALTH CRISIS?

Presenter(s): Sabrina Seldon

Communication Arts and Sciences

Mentor(s): Manuel Chavez (College of Communication Arts Sciences)

During disease outbreaks journalists and health professionals play a role in informing the public's perceptions and decisions of policy makers. Journalists' goal is to responsibly inform the public to help control the public's panic and encourage them to follow health protocols. Journalists have to serve as key communicators between health professionals and the public. They work to disseminate accurate information to the public and communicate between health professionals and scientists. The 24-7 news cycle has only added to journalists' pressures as they need to meet the paid demand for updates while demonstrating accuracy.

MISSING PAIGE: THE DISAPPEARANCE OF PAIGE RENKOSKI

Presenter(s): Aidan Binford, Ethan Hunter

Communication Arts and Sciences

Mentor(s): Geraldine Zeldes (College of Communication Arts Sciences)

On May 24th, 1990, Paige Renkoski disappeared after last being sighted on the shoulder of I-96 near Fowlerville, standing outside of her car and talking to an unknown driver. Despite 34 years of efforts from the Renkoski family and the Livingston County Police Department, and over 1200 tips provided to law enforcement by the public about the case, little is known about what happened to Paige. A group of documentary filmmakers led by Dr. Geri Alumit Zeldes have been researching the case, investigating the numerous theories regarding Paige's disappearance, speaking with the Renkoski family about their experiences and receiving new information from the police, including the first public opening of the evidence taken from the scene.

RHETORIC IN INFORMATION SYSTEMS OF TECHNICAL WRITING AND THE DEVELOPMENT OF AN UNDERGRADUATE RESEARCH JOURNAL

Presenter(s): Osafenwen Diawara

Communication Arts and Sciences

Mentor(s): Kate Fedewa (College of Arts & Letters), Sarah Gibbons (College of Arts & Letters), Thomas Day (College of Communication Arts Sciences)

The Professional and Public Writing (P2W) Club is a space for students of the P2W major or with interests in writing. Housed in the Writing, Rhetoric, and Cultures (WRAC) department of the College of Arts and Letters, the club is an opportunity for students to practice skills in rhetoric and writing outside of the classroom. Members have suggested ways to engage with their craft through writing workshops and publishing a resource guide. The purpose of this research is to determine how an undergraduate research journal will be beneficial to the P2W club's engagement, as well as possible approaches for publication. The development of an undergraduate research journal proves to be beneficial for the P2W club because rhetoric shapes systems of information. By engaging in authoritative voices of writing, as found within undergraduate research journals, students gain skills in writing research and collaboration with other students and faculty. Participation also influences career choices. According to the Council on Undergraduate Research, undergraduate research journals "offer a more viable path for students to earn publication". I will conduct surveys and interviews will be to gather feedback from members of the College of Arts and Letters on the development of an undergraduate research journal in the arts and humanities. My presentation will discuss the results of these surveys and a potential path toward a new undergraduate research journal on campus.

TEAM ULTRAVIOLET X REO TOWN COMMERCIAL ASSOCIATION

Presenter(s): Ava Strickler, Emily Paterson, Ismael Jaber, Jamie Arvidson, Jenyse McGinnis, Kelly Severini, Nicole Segura, Yurica Takeda

Communication Arts and Sciences

Mentor(s): JeanaDee Allen (College of Communication Arts Sciences)

MSU Street Team Ultraviolet partnered with the REO Town Commercial Association. Street Teams are student-run, creative collaborations within ComArtSci. Interdisciplinary groups of students partner with nonprofit organizations and assist them with media projects. They have real-world learning opportunities while giving back to the community.Our presentation includes portfolio-worthy products for our nonprofit client. Our work includes social media campaigns, brand guides and strategies, graphic design, videos, professional writing, and more.

EXPANDING THE SOCIAL MODEL OF DISABILITY: DYNAMIC CONCEPTIONS OF NEURODIVERGENT IDENTITIES AND BIASES
Presenter(s): Bee Miller
Communication Arts and Sciences
Mentor(s): Laura Dilley (College of Communication Arts Sciences)

Neurodiversity is a term whose usage has experienced an uptick in professional and popular culture recently. The neurodiversity concept draws on the 'social model' of disability, which focuses on describing disabilities in terms of social and/or environmental barriers. The social model is usually juxtaposed against the 'medical model', which views disability-related identities as deriving from the practice of medical diagnosis and views disability itself as inherent to a person. Conventions around usage of these identity terms and their conceptual associations are in flux as the lexical item and its associated concepts are diffused; nonetheless, misconceptions and biases in perceptions of people who are neurodivergent are still common. The aim of this research is to investigate the relative frequency of profiles of neurodivergent identities in college students in 2024, as well as determine the relative frequency of select biases and misconceptions regarding neurodivergent individuals. It is hypothesized that a substantial proportion of students equate the term 'neurodiversity' strictly with autism. Survey questions will be posed to MSU students through accessing the accredited MSU SONA system. It is expected that this research will provide insight into students' biases, prejudices, and ableism regarding differences and disorder concepts related to mind/brain function as associated with hierarchical power structures in society. This research contributes to elaborating on how t

CHALLENGE INDICATIVE OF JOB CRAFTING BEHAVIOR
Presenter(s): Megan Mallie
Communication Arts and Sciences
Mentor(s): Scott Shank (College of Communication Arts Sciences), Vernon Miller (College of Communication Arts Sciences)

What communication behaviors are associated with job crafting intentions? Job crafting can be surmised as "self-initiated change behaviors that employees engage in with the aim to align their jobs with their own preferences, motives, and passions" (Wrzesniewski & Dutton, 2001). Research identifies several motivations for job crafting: increasing job resources, increasing challenging job demands, and decreasing hindering job demands (Tims 2012). To date, it is unclear how job crafting is accomplished, but we do know it is a communication-related activity. Communication behaviors theorized to be inherent in job crafting include discovery, responding, clarifying, and framing. Our research findings suggest employees use these four communication behaviors to discuss and negotiate changes to their jobs. In particular, employees seeking to make their jobs more challenging engage in discovery ($g = .44$), clarifying ($g = .32$), framing ($g = ,42$) , responding ($g = .48$) in their in-person and online discussions with their supervisors. The exploration of these four communication behaviors, common throughout negotiation literature, are an important step forward in learning how job crafting is accomplished. Future research will explore how the use of these behaviors impact role change success

Criminal Justice & Legal Studies

UNDERSTANDING THE REALTIONSHIPS BETWEEN GARDIANS AND THEIR CHILDREN IN THE COURT SYSTEM
Presenter(s): Autumn David
Criminal Justice and Legal Studies
Mentor(s): Caitlin Cavanagh (College of Social Science)

To understand the realtionship that parents have on their children in the court systems.

TRAUMA EXPOSURE, INTERNALIZING SYMPTOMS, AND RECIDIVISM IN MALE AND FEMALE JUVENILES
Presenter(s): Natalie Hollis
Criminal Justice and Legal Studies
Mentor(s): Caitlin Cavanagh (College of Social Science), Natasha Chlebuch (College of Social Science)

Trauma exposure and internalizing mental health symptoms such as anxiety and depression are prevalent among youth in contact with the juvenile justice system (Vermeiren et al., 2006). Multiple studies show a connection between trauma exposure and behaviors such as delinquency, anxiety, and depression (Wilson, Stover, and Berkowitz, 2009; Finkelhor et al., 2009), which may further contribute to legal problems, system involvement, and difficulty in successfully leaving and staying out of the juvenile and adult criminal justice systems (Ford, 2002). The current study examines the relationship between traumatic experiences, internalizing symptoms, and recidivism in male and female juveniles. Data collected from a partner juvenile and family court allowed the researcher to analyze the correlation between trauma exposure and internalizing symptoms on recidivism risk in male and female juveniles. Specifically, scores from the Massachusetts Youth Screening Instrument - Second Version (MAYSI-II) helped the researcher to test the following hypotheses: (a) male juveniles who score high on the depressed-anxious and traumatic experiences scales will be more likely to recidivate than female juveniles who score high on the depressed-anxious and traumatic experiences scales, (b) female juveniles will overall score higher than male juveniles on the depressed-anxious and traumatic experiences scales but will recidivate less than male juveniles. Results may indicate an increased need for screen

AN IN-DEPTH EXPLORATION ON SEX BIAS IN JUVENILE DELINQUENCY RISK ASSESSMENT
Presenter(s): Riley Starr
Criminal Justice and Legal Studies
Mentor(s): Caitlin Cavanagh (College of Social Science), Natasha Chlebuch (College of Social Science)

The assessment of risk within delinquent juveniles is important for ensuring that our court systems are making equitable and effective interventions. However, some research suggests concerns regarding the potential presence of sex bias within case planning and interventions based off assessment of risk. Girls may also receive poorer treatment within our juvenile justice system and have less opportunity for rehabilitation than boys, which could suggest higher recidivism rates (Cite). These challenges highlight how important it is to look deeper into our risk assessment practices and how they may influence case outcomes in the court system. The purpose of the proposed research is to compare court provided data on male and female juvenile delinquents to better understand what key differences exist and how they're influencing individual case outcomes. Locally sourced data, such as the Youth Level of Service/Case Management Inventory (YLS-CMI), answers this question by looking at differences in risk levels and recidivism rates between female and male youth. By identifying prominent sex-based differences in risk assessments, the results from this study will support a greater understanding of areas where bias may exist in intervention and help our juvenile justice system to strive for greater accuracy, practice, and equity.

COVID-19 IMPACT ON MENTAL HEALTH AND SCHOOL RISK FACTORS
Presenter(s): Samuel Metz
Criminal Justice and Legal Studies
Mentor(s): Caitlin Cavanagh (College of Social Science), Natasha Chlebuch (College of Social Science)

The COVID-19 pandemic brought sweeping changes to our day-to-day lives. As a result, many were quarantined at home without access to social gathering spaces. During this tough time, many juveniles' lives were completely changed and were unable to attend school in person. School behavior and stability are key factors when it comes to determining risk levels in the Juvenile Sex Offender Assessment Protocol (JSOAP). The JSOAP takes mental health into stronger consideration than a typical youth risk assessment used for a large variety of charge types. My research project focuses on the impact of Covid-19 on recidivism rates and risk levels. In this poster, I will examine any potential correlation between an online virtual environment and behavior and stability issues for Juveniles in a juvenile sex offender program in a Midwestern juvenile court. This project will also take into consideration if these issues reoccur (as in recidivism) or are typically just a one-time offense. Data and literature review will be necessary to provide an answer to this question. COVID-19 has caused an increase in in-person activity moving to an online environment. Many parents report their children's mental health has been negatively impacted by COVID-19 lockdowns. It is important that we understand the risks that come with an online environment and the differences it creates to help us to deal with future virtual caused problems. This could help the court system by revealing the issues that arise fr

ASSESSING THE RELATIONSHIP BETWEEN SUBSTANCE ABUSE AND THE SEVERITY AND FREQUENCY OF CRIMINAL OFFENSES AMONG JUVENILES

Presenter(s): Sara Sundaram

Criminal Justice and Legal Studies

Mentor(s): Caitlin Cavanagh (College of Social Science), Natasha Chlebuch (College of Social Science)

Substance use is a growing epidemic that has affected youth immensely. According to the National Center for Disease Statistics, teenagers in Michigan are seven times more likely than the average American teen to have used a controlled substance in the past month. Within the age group of 17 to 25, approximately 8.9% have reported recent use of controlled substances like cocaine, methamphetamines, heroin, and the misuse of pain relievers. In line with this, Michigan has introduced Juvenile Drug Treatment Courts (JDTCs) in select circuit courts. This research aims to assess the relationship between the scores from the Youth Level of Service/Case Management Inventory (YLS-CMI) assessment tool, specifically looking at the risk/needs score of the Substance Abuse section and the overall YLS score, and the severity, as well as frequency of substance abuse behaviors among juvenile offenders, age 14-17 years old. This research will answer two questions using data collection within the Substance Abuse domain of the YLS from 2015 to 2022. Firstly, we will determine whether the petitioner was a chronic substance user. Secondly, we will analyze how the substance use deterred the petitioner's life through risk level. Upon assessing the correlation between these variables and the trends of charge type brought on the petitioner, along with looking at the average YLS scores, we can properly assess whether substance use plays a role in influencing criminal offenses. Furthermore, this research a

LIBERTÉ, ÉGALITÉ, ATROCITÉ: THE ABSENCE OF FRENCH ACCOUNTABILITY FOR CRIMES AGAINST HUMANITY IN THE ALGERIAN WAR

Presenter(s): Avery Underwood

Criminal Justice and Legal Studies

Mentor(s): Emily Conroy Krutz (College of Social Science), Ronen Steinberg (College of Social Science)

The matter of human rights is not solely the case for what constitutes a 'right', or to define the guidelines for preserving those rights. It is also in ensuring accountability and justice for those rights, should they be violated. This comes in the form of loosely upheld international agreements, applied as called for by international prosecuting bodies and reliant on the intent and execution of intergovernmental collaboration to hold each other accountable. In the case for France during the Algerian War of Independence from 1954-1962, charges for crimes, of which France and high ranking officials were questioned over, were never formally investigated on the international level. Despite calls from leading experts on crimes against humanity and the man who coined the term 'genocide' himself, France never faced prosecution by any international entity, nor did they claim any culpability for those allegations. Now, 63 years later, French President Emanuel Macron has admitted on behalf of France their crimes against Algeria and posed declassifying documents on Algeria 15 years ahead of schedule as an act to repair relations and push for an honest future. But the question remains: why was France never tried for crimes against the Algerians in the initial aftermath of the war? Was it mass French censorship, geopolitical alliances, or the failure of global institutions? In my research, I seek to explain why what didn't happen didn't happen

UNMASKING THE BLUE LINE : AN EXPLORATION OF POLICE SEXUAL VIOLENCE IN SOUTH AFRICA BEFORE, DURING, AND AFTER THE COVID-19 PANDEMIC
Presenter(s): Joie Egizio
Criminal Justice and Legal Studies
Mentor(s): Sanja Kutnjak Ivkovic (College of Social Science)

Not only do South African citizens have low trust in their police, but they also fear their police. Instances of Police Sexual Violence (PSV) is defined as the abuse of power and authority by police officials to perpetrate acts such as sexual assault, harassment, or rape. The issue of PSV is rooted in both a power dynamic by police officers and systemic failures within the police. With the physical and mental harm inflicted upon victims, PSV also breaks trust in the police, undermines the rule of law, and creates a toxic culture. This research utilizes 10 South African widely read news sources and numerous Independent Police Investigative Directorate (IPID) reports, covering the years 2016 to 2023, to find instances of PSV documented in these sources. The results revealed that most instances of PSV are one-time events committed typically by a single police officer. Furthermore, only about 27% of victims of PSV are in police custody at the time of the obtrusive behavior, meaning more than half (65%) of victims arrived to police stations for a different reason. In addition, 59% of instances of PSV happen inside a police station or police vehicle. The findings of this study unveil the patterns, and dynamics of PSV in South Africa as documented in these sources. Strengthening oversight, enhancing training on ethics, and fostering community-police partnerships are key to fixing this problem. By addressing these issues urgently and effectively, the South African government ca

Diversity & Interdisciplinary Studies

LOVE-HATE AMBIVALENCE WITH TECHNOLOGY: EXPLORE THE PERCEPTIONS OF MSU AND USSH-HCM STUDENTS WHEN USING DUOLINGO TO LEARN FRENCH AND SPANISH
Presenter(s): Phuc Nguyen
Diversity and Interdisciplinary Studies
Mentor(s): Jean Hardy (College of Communication Arts Sciences)

In the era of globalization, the urgent demand for multilingual capabilities and the robust development of technology have converged to make education increasingly interactive and dependent on digital language learning platforms, notably Duolingo, which has been represented as a key and comprehensive tool in facilitating ideal conditions for language acquisition. Nonetheless, the prevailing research trend on educational technology primarily emphasizes design and technical aspects, often overlooking the socio-cultural dimensions of users' experiences. This study thus explores and explains the perceptions of students in different cultural contexts during their use of Duolingo to learn Romance languages. Based on that foundation, the central research question is: In what ways did Michigan State University and Ho Chi Minh City University of Social Sciences and Humanities students experience Duolingo to study French and Spanish as positive, negative, and ambivalent? Using a qualitative approach, data was collected through in-depth interviews with a purposive convenience sample (n=6) and analyzed using abductive coding through the lens of the social construction of technology theory. The preliminary findings foreshadow an ambivalent love-hate experience with Duolingo among students: they value its convenience but doubt its sufficiency for achieving language proficiency on its own. The study concludes that Duolingo is best used as an auxiliary resource in language learning,

WESTERN CULTURAL INFLUENCES ON EASTERN MUSIC LISTENING EXPERIENCES
Presenter(s): Carina Abbasov, Evelyn Inman, Natalie Liliensiek
Diversity and Interdisciplinary Studies
Mentor(s): Natalie Phillips (College of Arts & Letters)

This presentation discusses a new experiment in a multidisciplinary study conducted at the Digital Humanities and Literary Cognition Lab and the Timing, Attention, and Perception Lab at MSU called "The Role of Narrative Listening in Music Perception." Our research explores whether participants imagine stories while listening to musical stimuli. In a previous iteration of the study, Western participants responding to Chinese music excerpts frequently tied their narrative interpretations of the pieces to individual instruments and centered them on familiar themes, such as rural America, Native Americans, and cowboys. We utilized these patterns to design a new single-instrument experiment, in which participants were prompted to provide narrative responses to a variety of music excerpts, including one that featured the pipa, a Chinese string instrument. This presentation explores the cultural training and biases that the music-inspired stories reveal. When exposed to unfamiliar music, Western audiences leaned on adjacent Westernized media to explain foreign cultural narratives. These narratives are constructed from a simplified idea of what constitutes broadly East Asian cultural motifs. Specifically, the proximity to East Asian cultural influence branches over to what Western audiences have traditionally been exposed to. Most prominent was the association of the pipa, a Chinese string instrument, with the traditional Western notion of the cowboy. Through a comparison of the pipa

BROADENING KNOWLEDGE OF HEALTH INEQUITIES THROUGH ART IN HOSPITAL SETTINGS
Presenter(s): Natalie Seitz, Neha Navathe, Quynh Tong
Diversity and Interdisciplinary Studies
Mentor(s): Natalie Phillips (College of Arts & Letters), Soohyun Cho (College of Arts & Letters)

This project originates from our Mellon founded project, Creativity in the Time of COVID-19: Art as a Tool for Combating Inequity and Injustice, which explores how populations are using creative outlets to foster healing and begin to push back against the systemic inequities exacerbated by the COVID-19 pandemic. Our project, currently in progress, entails a series of traveling exhibitions in different hospitals that will display artworks and narratives by artists from communities that are historically marginalized by healthcare systems. Moreover, these exhibitions will connect these contemporary artworks to historical and educational insights into the relationship between these communities (queer community, BIPOC community, the disabled community, and more) and various healthcare institutions, especially in the context of other health crises such as the Spanish Flu, the Bubonic Plague, and the HIV/AIDS epidemic. Through these exhibitions, we look to highlight the unique burdens that were placed on these minority groups, how they have coped with this stress, and how the healthcare field can address their needs.

UNDERGRADUATE UNDERSTANDINGS OF EQUITY IN RESIDENTIAL COLLEGES
Presenter(s): Abhinav Anand, Amaya Aten, Anum Latif, Christeen Mangalathet
Diversity and Interdisciplinary Studies
Mentor(s): Shahnaz Masani (Lyman Briggs College)

Based on existing research, it is known that STEM faculty has been noted to hold color-evasive ideology (King et al., 2023). Further, research indicates that students of color at predominantly white institutions face an uptick in microaggressions, with students holding color-evasive ideology not finding microaggressions to be offensive (Banks and Horton, 2022). The goal of this research is to gain knowledge regarding how undergraduate students within MSU's three residential colleges understand equity while living and learning within their college. To do so, we will conduct surveys and interviews, probing into questions addressing how students view, experience, and practice equity in their residential colleges. Preliminary findings suggest that 48.6% of students define equity through an equality framework, and 37.1% define equity through an equity framework, with 14.3% defining equity with perceptions of fairness. It is our aim that the completed research can be used to inform future projects, curricula, and interventions.

THROUGH SHATTERED GLASS: RECLAIMING CULTURE, HISTORY, AND HUMANITY FROM ORIENTALISM
Presenter(s): Alissa Hakim
Diversity and Interdisciplinary Studies
Mentor(s): Sitara Thobani (Residential College in Arts & Humanities)

Orientalism describes a discourse in which stereotypes of Arab identity and lands were at one point created- regarded as "Other-" and have since multiplied in various (re)productions of knowledge, thereby defining the region known as the "Orient" outside of reality. Each repetition of Orientalist tropes/ideas enables the continuation of Orientalism and diminishes the possibility for new dialogues to occur. Existing examinations of the ways corporate media and politicians framed/represented Arabs from September 11, 2001 to the present find that American audiences are similarly exposed to orientalist frameworks used to create an "official story." The construction of Arabs as "other" in the public imaginary leads to monolithic conceptions of the community as made up of radical, barbaric savages and is encompassed by the "official story." The current violence in Palestine provides another avenue that connects post-9/11 Orientalism to contemporary racist, islamaphobic, and xenophobic rhetoric used in some of the top news sources in the US. This project adds to existing attempts to challenge the Orientalist paradigm by reclaiming ideas of identity and homeland through Arab American narratives. New productions of knowledge related to Arab identity and land from Arabs further challenge widely-accepted truths. This may open a window for a refoundation of truth and reality regarding the "Orient." Accordingly, the research asks: how can Arab stories challenge orientalist depictions of A

FROM FAIRY TALES TO MOVIE THEATERS: HOW OUR PRINCESS STORIES SHAPE THE SOCIAL CONSTRUCTION OF WOMANHOOD AND FEMININE BEAUTY

Presenter(s): Catelyn Arnold, Kaylin Casper
Diversity and Interdisciplinary Studies
Mentor(s): John Waller (College of Social Science)

Such classic fairy tales as "Cinderella" and "The Little Mermaid" are over a century old and the Walt Disney Company itself turned one hundred years old in 2023. Over this time, these stories and their different versions have played a major role in the evolution of entertainment and storytelling. It is reasonable to assert that authors of these fairy tales and their onscreen adaptations have played a large role in the childhoods of generations of people. However, in seeking to evaluate this claim it is necessary to look into exactly what these stories and Disney's adaptations have been portraying and the stereotypes and gendered narratives that they present. Our research includes a literature review and an in-depth analysis of four fairy tales and their movie adaptations. These tales are "Snow White," "Cinderella," "Sleeping Beauty," and "The Little Mermaid." They are analyzed by means of a methodology consisting of coding for ten variables: female stereotyped activity, non-female stereotype activity, female stereotyped characteristic, non-female stereotyped characteristic, mentions of beauty/femininity, mentions of eurocentric features, mentions of evilness, and mentions of age. Our analysis shows a heavy emphasis on, and valorization of, stereotypically, European feminine features and gendered activities within the characterization of the leading female protagonists. The messages these adaptations portray greatly affect the way in which children grow to view their rol

INTERDISCIPLINARY STUDY BASED ON WEST BENGAL

Presenter(s): Colin Reese, Isabella Tillotson, Madison MacDonald
Diversity and Interdisciplinary Studies
Mentor(s): Sejuti Das Gupta (James Madison College)

An interdisciplinary study based on West Bengal India, looking into connections between natural and socio-economic facts, namely, agricultural production, migration, and gender.

BREAKING THE CYCLE: RETHINKING SEXUAL HEALTH CARE IN EMERGENCY SETTINGS
Presenter(s): Destiny Kanning
Diversity and Interdisciplinary Studies
Mentor(s): Christine Perry-Ockerman (College of Osteopathic Medicine)

This project investigates the overutilization of emergency services for sexual health concerns and explores interventions to improve resource access and patient decision-making. Utilizing a mixed-methods approach, the study conducts a case study of local emergency departments to analyze patient demographics, utilization patterns, and challenges. Concurrently, surveys are administered to consenting patients to assess awareness of overutilization and the impact of reeducation measures on healthcare decision-making. Findings highlight the significant burden of sexual health concerns on emergency services and underscore the importance of targeted interventions. By bridging research with practical solutions, this study aims to empower individuals, optimize emergency services utilization, and enhance overall sexual health outcomes within communities.

SECOND-WAVE FEMINISM AND THE MODERN TERF
Presenter(s): Sasha Franklin
Diversity and Interdisciplinary Studies
Mentor(s): John Waller (College of Social Science), Samyuktha Iyer (College of Social Science)

The last decade has seen a massive increase in attention to transgender issues and a resulting backlash against the trans community, including from some feminists. Existing literature has yet to explore how the ideas of second-wave feminism relate to the modern 'Trans-Exclusionary Radical Feminist,' or 'TERF' movement. This research compares the works of feminists of the 1960s and 70s to the online discourse of trans-exclusionary feminists today. While modern trans-exclusionary feminists draw on the ideas of earlier activists, their writings are characterized by a much greater focus on transgender issues than earlier ones, which focused on women's issues but sometimes used transgender individuals as discussion points.

NAVIGATING THE SYSTEM: HEALTH LITERACY AND BARRIERS TO ACCESSIBLE HEALTHCARE AMONG MICHIGAN'S ELDERLY POPULATION
Presenter(s): Emma Nicolaysen
Diversity and Interdisciplinary Studies
Mentor(s): Bevertone Anyonga (College of Social Science), Matthew Grossmann (College of Social Science)

Access to healthcare is a fundamental right, yet disparities persist in healthcare systems on the state and national level. The inability to access adequate care is often exacerbated by factors such as health literacy, most notably among older adults. Senior citizens are more likely to face barriers in utilizing online health resources, addressing the risk of cognitive decline, and contending with the lack of translation and plain language services used by healthcare providers. This study will examine the multifaceted relationship between health literacy and access to healthcare in Michigan and beyond, aiming to inform policy to reduce disparities and improve health outcomes in Michigan. Through secondary data analysis, this study aims to comprehensively evaluate the impact of health literacy levels on healthcare access across Michigan's diverse elderly demographics. We will utilize existing national health surveys and statewide health assessments to comprehensively analyze health literacy trends in Michigan, comparing these trends against national benchmarks. Our data sources will allow us to assess the state's geographical, financial, and cultural barriers to healthcare access. Furthermore, we will examine strategies implemented by government and community organizations in Michigan to bolster health literacy and the documented effectiveness of such methods. Through the review of health literacy data in Michigan, this study aims to present actionable insights and eviden

STEM UNDERGRADUATE LEARNING ASSISTANTS' ABILITY TO NOTICE RACIALIZED CLASSROOM EVENTS
Presenter(s): Faith Persyn, Loreta Prenaj
Diversity and Interdisciplinary Studies
Mentor(s): Regan Levy (Lyman Briggs College), Shahnaz Masani (Lyman Briggs College)

Undergraduate learning assistants (ULAs) are near-peer instructors that facilitate learning by practicing student-centered, active pedagogies, often engaging more directly with students than faculty. However, despite their important role in STEM classes, little is known about how ULAs understand and practice equity. Prior research shows that STEM faculty at predominantly white institutions (PWIs) often perpetuate inaccurate narratives of meritocracy, objectivity and neutrality when describing their classrooms and disciplines with color-evasive ideologies that explain away racial phenomena without explicitly naming race or racism as a cause of oppression (Russo-Tait 2022, Robertson et al., 2023). Undergraduates also hold color-evasive ideologies, and those who do are less likely to recognize microaggressions in classroom scenarios (Banks & Horton 2022). Michigan State University is a (PWI) with many courses that are supported by ULAs. Given the documented pervasiveness of color-evasive ideology at PWIs, we ask 'How effectively do ULAs notice racialized events in STEM classrooms?', and 'How and to what extent do ULAs draw on color-evasive narratives to explain these racialized events.' To answer these questions, ULAs were asked to engage in noticing racialized events in narrative cases that describe STEM classrooms and explain why those events are problematic. We find that ULAs often struggle to notice racialized events, and when they do, they draw on co

SISTER CIRCLE RESEARCH
Presenter(s): Abigail Rodriguez, Alana Mapp, Kellsey Hall, Natalia Khoshnam
Diversity and Interdisciplinary Studies
Mentor(s): Candace Moore (International Studies & Program), Sitara Thobani (Residential College in Arts & Humanities), Tama Hamilton Wray (Residential College in Arts & Humanities)

In this study, we investigate the impact of the RCAH Sister Circle Check-In sessions on the sense of belonging among women of color in a predominantly white institution. Employing a mixed-method approach, we analyze both quantitative data on attendance patterns and perceived comfort levels, as well as qualitative narratives from participants. Our research aims to uncover the intricate dynamics of 3rd spaces in fostering belonging for marginalized groups in higher education. This study seeks to offer valuable insights that can inform the development of inclusive strategies and programs within academic settings.

STUDENTS' EXPERIENCES COLLABORATING WITH FACULTY TO DEVELOP INTERDISCIPLINARY CURRICULUM
Presenter(s): Ben Rodi, Madison Kortman, Moaid Shaik
Diversity and Interdisciplinary Studies
Mentor(s): Marisa Brandt (Lyman Briggs College), Megan Halpern (Lyman Briggs College)

This research project emerges from an NSF-sponsored grant designed to bring together undergraduate students and faculty members to develop a novel interdisciplinary curriculum in the faculty's courses that engages issues of science, technology and society. Our focus was to try to better understand the role of students in this project, focusing on their experiences as captured through written reflections on participating in a two-day series of collaborative workshops based in interdisciplinary science and technology studies (STS) pedagogies. Qualitative analysis of these student reflections, photographs, and field notes from the workshops brought to light five important themes regarding student experiences in these collaborations: creativity, innovation, diversity, comfortability, and constraints. Through the utilization of in-person student-teacher collaboration and workshops, we were able to extrapolate key data through field notes and personal reflections. These themes are important because they help us understand how students and faculty from different backgrounds approach teaching and learning around complex, interdisciplinary issues. These experiences collaborating with faculty are both humanizing and empowering for students, though not without constraints and challenges.

WILL POLITICS RUIN YOUR RELATIONSHIPS? WHAT THE NEWS DOESN'T TELL YOU
Presenter(s): Isabella Guerrazzi
Diversity and Interdisciplinary Studies
Mentor(s): Eddie Boucher (College of Social Science)

Throughout the country, people have differing political opinions, views, and perspectives. However, these differing views widely affect our relationships with friends, family, and romantic partners. This is not just the heated Thanksgiving dinner, but the livelihood of our most meaningful connections. In time, people have become more invested, and opinionated when it comes to politics and elections that they simply end long-term relationships with people due to their differing stances. Certainly, the media plays a huge role in giving us our opinions and sometimes those opinions can be based on false information. As a result, negative results can come from this problem. Some results of this can be higher divorce rates, poor mental health, lack of meaningful relationships, and poor child-upbringing. Politics can be a controversial topic, however, what is the underlying factor that destroys human relationships without us even noticing?

YOUR(IN)CHARJ: CLIMATE CHANGE, HEALTH, AND RACIAL JUSTICE IN URBAN AND RURAL COMMUNITIES OF LANSING
Presenter(s): Caroline Beckrow, Lekhana Gogineni, Minal Patil, Rhian Solomon
Diversity and Interdisciplinary Studies
Mentor(s): Mark Axelrod (James Madison College), Shahnaz Masani (Lyman Briggs College)

YOU'RE (in)CHARJ (YiC) is a Youth-Led Interdisciplinary Research Experience for Climate, Health, and Racial Justice. This is an undergraduate student-led and faculty-advised research initiative comprising of fourteen students across all three residential colleges at Michigan State University. These residential colleges each have their own discipline of focus; Lyman Briggs specializes in natural sciences, James Madison on public affairs, and the Residential College of Arts and Humanities centers around community engagement. Our method for the research is Community-based participatory action research (CBPAR). CBPAR approaches research as a collaborative effort between our team and the communities we are working with. The research initiative examines the effects of climate change, health, and racial justice in both rural and urban spheres of greater Lansing. By dividing researchers into two specialized groups, the rural team works alongside MSU students and faculty of the CAMP (College Assistance Migrant Program) to understand and support migrant farm workers and students in and around Lansing. The urban team is actively pursuing partnerships in historically redlined areas of Lansing to explore the impact of tree canopies, sun exposure, air quality, and transportation. Through our research and advocacy efforts in the rural and urban communities, the team aims to enact lasting and sustainable positive change, with goals to inspire a more just and equitable future for all resident

HOTEL EMPLOYEES? INDOOR ENVIRONMENTAL QUALITY PERCEPTIONS: A COMPARATIVE ANALYSIS OF SUSTAINABILITY PERCEPTIONS ACROSS GENDER, GENERATION, AND OCCUPATION TYPE GROUPS
Presenter(s): Autumn Mellino, Live Cannella, Olivia Brenner
Diversity and Interdisciplinary Studies
Mentor(s): Mi Ran Kim (Eli Broad College of Business)

This study explores the importance of diversity and inclusion to sustainability. Understanding is gained by analyzing the satisfaction and importance of indoor environmental quality (IEQ) attributes, such as air quality, lighting quality, thermal comfort, acoustical quality, and individual workspace, to diverse groups of employees in the hospitality industry. This study also compares the satisfaction and importance of indoor environmental quality (IEQ) of hotel employees between various genders, generations, and occupation types. 73 hotel employee data were analyzed. The findings of this study can help further understand the relationship between sustainability and diversity, equity, and inclusion.

WELCOMING PEOPLE WITH DISABILITIES WITHIN THE HOSPITALITY INDUSTRY
Presenter(s): Aislin Riccardelli, Kara Muckstadt, Paige Japlit
Diversity and Interdisciplinary Studies
Mentor(s): JaeMin Cha (Eli Broad College of Business), Seung Kim (Eli Broad College of Business)

Interest in hiring and effectively utilizing employees with disabilities has increased among hospitality scholars and industry practitioners. Despite this growing attention, significant research gaps remain concerning the effective workforce of employees with disabilities. To address these gaps, we conducted a systematic review of 35 academic articles focusing on hospitality employees with disabilities, aiming to identify key themes. In addition, we also analyzed real-world business cases from industry publications. Our study highlights key themes such as benefits, challenges, obstacles, training needs, technological applications, and best practices. The goal of our research is to explore strategies for bridging the gaps related to hiring, training, stereotyping perception, and education among future hospitality management leaders with respect to employees with disabilities. Furthermore, we aim to emphasize the importance of embracing hospitality employees with disabilities in the workplace to advance and promote Diversity, Equity, and Inclusion (DEI).

THE SOCIO-CULTURAL DIFFERENCE FOR SYRIAN REFUGEES IN GERMANY
Presenter(s): Leah VerPlank
Diversity and Interdisciplinary Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

This presentation examines the complex interaction of sociocultural differences between Syrian refugees and the host country of Germany. Focusing on how to better understand and navigate the variations of these differences will better shed light on the challenges and opportunities that will arise with a significant change in culture. Exploring the traditions, value systems, and backgrounds of Syrian refugees, this presentation will show the impact of these differences on almost every aspect of life. This presentation will dig into the language barriers, religious practices, familial structures, and social customs, looking to highlight the points on challenges and opportunities that Syrian refugees are currently facing or will be facing shortly. Although the unique backgrounds of each individual are very different from one another, any individual can help in a variety of ways. Moreover, this presentation's goal is to explain how and why this topic is of significant importance. By understanding the perspectives and experiences of Syrian refugees who are displaced or living in Germany, this presentation aims to give empathy, cultural sensitivity, and a strategies to foster harmony and mutual understanding of diversity. Framing real-life stories, statistical data, and scholarly research, this presentation will promote inclusivity and advocate an integrated society that embraces diversity as a strength. The sociocultural differences between Syrian refugees and German society

PROPAGANDA AND HUMAN EXPERIENCE: A STUDY OF THE EFFECTS OF DER STÜRMER ON JEWISH INDIVIDUALS
Presenter(s): Isabel Buckles
Diversity and Interdisciplinary Studies
Mentor(s): Lynn Wolff (College of Arts & Letters)

Der Stürmer was a weekly newspaper published by Julius Streicher in Germany and Nazi territories, that had the sole aim of creating racial hatred towards the Jewish population. As a result, Streicher and the newspaper were attributed with indoctrinating German youth into antisemitism. However, due to the wide circulation and public presence of the paper Jewish youth were also deeply affected and witnessed the effects of the paper on their community. In addition to providing historical background on the role of propaganda in the Holocaust, the objective of this presentation is to highlight the process that the Stürmer used to create hatred and its effects on German Jewish youth. Examples from Jewish survivor testimonies, in particular individual accounts of their experiences with the Stürmer in their youth are utilized to analyze this issue. These testimonies provide insight into the atrocities that the Jewish youth experienced as a movement of mass hatred grew opposed to them. Consequently, human testimony can be seen as a valuable source that should be used to reach a deeper understanding of the Holocaust.

BABI YAR MASSACRE AND THE GLOBAL DISPLACEMENT OF HOLOCAUST SURVIVORS
Presenter(s): Bailey Flick
Diversity and Interdisciplinary Studies
Mentor(s): Amy Simon (James Madison College), Deborah Margolis (Libraries), Lynn Wolff (College of Arts & Letters)

This oral/visual presentation will encompass months of research pertaining to the Babyn Yar Massacre and the subsequent movement of Jewish populations with a more personal focus on specific survivors from the Babyn Yar Massacre. This project includes visual aids created by the researchers to help guide audiences along the presentation. This project seeks to help audiences understand how Jewish populations were affected by the Babyn Yar Massacre specifically and the Holocaust more generally, the importance of understanding and properly memorializing survivor accounts, and how populations spread during and after the Holocaust. The addition of detailed accounts of Babyn Yar survivors supplement the provided data, offering an understanding of the personal struggle of Holocaust victims, while also shedding light on an often overlooked tragedy. Video testimonials of survivors obtained from the USC Shoah Foundation Archive and secondary literature were used as main sources for the research into these topics.

IMPACTS OF THE HOLOCAUST ON JEWISH SURVIVORS' EDUCATION
Presenter(s): Aislinn Johnson
Diversity and Interdisciplinary Studies
Mentor(s): Amy Simon (James Madison College), Deborah Margolis (Libraries), Lynn Wolff (College of Arts & Letters)

My research addresses the lasting impacts of the Holocaust on education. I'm particularly interested in Jewish survivors and any hardships they faced while trying to receive an education of any level both during the years of National Socialism and after World War Two. This is important because education is highly valued in society today and a majority of jobs require some type of schooling whether that be university, trade school, or on-the-job experience. Many aspects of a child's life were put to a halt during the Holocaust and one that is not commonly thought of is education. This research focuses on survivor stories surrounding education during the Holocaust in Europe and experiences in postwar America. I have used video testimonies from Jewish survivors along with two books that highlight key facts about the Holocaust and discuss the survivors in America. In my presentation, I will present the analysis of the interviews along with comparing any differences in experiences when compared to survivors' experiences in America. The objective of this presentation is to bring awareness surrounding the ways in which the Holocaust affected a child's life specifically in terms of their education. The survivors recount various experiences, ranging from antisemitism in European schools to poor support systems designated to help Jewish survivors in America. Exploring education is significant in understanding the Holocaust because it helps highlight the lasting effects of this historic

EXAMINING CAMP LIBERATION THROUGH MEDIA
Presenter(s): Logan Leppek
Diversity and Interdisciplinary Studies
Mentor(s): Lynn Wolff (College of Arts & Letters)

As the generation who lived through the Holocaust unfortunately begins to thin, we see a rise in antisemitism and a significant decrease in education regarding the Holocaust in America. The question is, how do we replace the emotional impact that the Holocaust had without talking to those who directly lived through the horrific events? Is reading about the Holocaust enough? Are lectures from our teachers and professors serving the emotional impact that students need to get a significant education? Words are not enough to educate. In hopes of raising this emotional impact and halting the rise of antisemitism, education on the Holocaust must provoke strong emotions from students by not only reading and hearing lectures but also by viewing difficult images to grasp as well as interacting with oral testimonies. Throughout this research, we have looked at saddening numbers to prove this lack of education, which correlates with the antisemitic rise. We interviewed local high school teacher Aaron Griener about how he applies this emotional attachment to his students. We will look at the effects of this education by diving camp liberation through the way so many students are currently learning about it, then with the added emotional effects to see the difference in how most education currently is and how it needs to be. As I said, Words are not enough, and neither is our current way of educating nationwide.

EXPLORING THE IMPLICATIONS OF AI IN PLAGIARISM DETECTION SOFTWARE FOR INTERNATIONAL AND MULTILINGUAL STUDENTS

Presenter(s): Jana Hassan, Nadiah Mohamed Hasnol, Phuc Nguyen, Shahed Mady, Viv Martinez-Sandoval
Diversity and Interdisciplinary Studies
Mentor(s): Cheryl Caesar (College of Arts & Letters), Joyce Meier (College of Arts & Letters)

In today's age of rapidly developing technology, the increased usage of AI-generated answers within classrooms is steadily increasing. Although AI softwares such as ChatGPT can aid learning to a certain extent, faculty members are clamping down on their plagiarism policies to ensure that students are submitting their original work. For example, AI detectors within websites such as Turnitin are useful to identify artificially generated answers by their machine-like English usage. However, there can be serious repercussions for international and multilingual students who speak English as a second language because of their inability to produce standard American English, often leading to academic dishonesty accusations. Our team, composed of international and multilingual students with various linguistic backgrounds, advocates for various injustices and challenges that we face in our university. Our previous work has included topics such as cultural differences within metaphors, active participation in class, grammatical influences across languages, and issues within online Zoom classrooms. Continuing our research on recent digital developments, we are now tackling this complicated issue of plagiarism accusations among these students and how cultural backgrounds can influence our understanding of these predomin

INTERSECTIONALITY IN THE HALLS OF POWER: A COMPREHENSIVE STUDY OF DIVERSITY IN THE UNITED STATES CONGRESS AND STATE LEGISLATURES

Presenter(s): Lowell Monis
Diversity and Interdisciplinary Studies
Mentor(s): Matthew Grossmann (College of Social Science)

This project explores the multifaceted dimensions of diversity, including religious, ethnic, racial, economic, and gender factors, within the U.S. Congress and state legislatures, seeking to understand how the intersections of these identities influence political representation, decision-making, and public policy. It aims to provide a holistic understanding of diversity in U.S. legislative bodies, contributing to discussions on equity, inclusivity, and the complex interplay of diverse perspectives in the democratic process. The work is data-driven, studying datasets with information regarding congressional and state legislature demographics, while giving birth to a more comprehensive and tidier dataset specific to diversity factors, using R to create enlightening plots to ease the study of such vast, historic data. While the exact conclusions of the study slowly arise, it aims to answer critical questions, including whether diversity is influenced by population diversity or partisanship, and whether certain regions better reflect their diversity. It will also examine if Congress follows or leads state legislators in diversity, the position of more diverse legislatures on the political axis, and the economic factors affecting diversity in legislative bodies. The implications of these results concerning political polarization and the political leanings of legislators will be explored. This research is paramount in guiding policy interventions a

DIVERSE NARRATIVES OF BLACKNESS IN HEALTHCARE: UNDERSTANDING DISPARITIES IN PREVENTIVE SCREENINGS
Presenter(s): Aya Abu-Zama, Kailyn Butler, Neal Sanghvi
Diversity and Interdisciplinary Studies
Mentor(s): Nilufer Akalin (Lyman Briggs College)

Following the enactment of the Affordable Care Act (ACA) in 2010, the U.S. healthcare landscape broadened access to affordable healthcare, emphasizing preventive services. Michigan expanded its Medicaid program under the ACA, and placed significant emphasis on preventive screening efforts. However, as explored in the existing literature, the implementation of federal laws does not guarantee equitable access to or distribution of preventative care services. This research project, titled "Diverse Narratives of Blackness in Healthcare: Understanding Disparities in Preventive Screenings," seeks to scrutinize the distribution disparities of preventive screenings in Lansing. The focus is on how Black individuals experience three essential components of preventative care: (1) access to healthcare services; (2) health education; (3) interaction with physicians. This qualitative study involves in-depth interviews with U.S.-born African Americans and immigrants from Haiti, Congo, and Somalia residing in Lansing, Michigan, spanning over two years. The primary objectives are twofold: first, to delve into diverse narratives and experiences of Black individuals, mainly differentiated based on whether born in or an immigrant to the U.S., concerning their access to preventive screenings; and second, to identify and comprehend factors (i.e. socioeconomic status, immigration status) contributing to the inequitable distribution of preventive screenings in the Lansing community. Anticipated

BENEATH THE SURFACE ~ HANDICAP VICTIMS
Presenter(s): Salena Vo
Diversity and Interdisciplinary Studies
Mentor(s): Deborah Margolis (Libraries)

The Holocaust is a worldwide commonly known genocide that impacted the lives of millions of Jewish people. Throughout our lives when we are learning about the Holocaust, the focus tends to always be on the Jewish. However, there were so many other victim groups outside of that and many within. What I hope to do is expand people's knowledge and bring insight into the disabled victim group that was targeted during that time. During these past two semesters, I was able to dive into Dorris Bergen's, *War and Genocide*, along with the USC Shoah Archive. Through countless research and gathering of evidence, I have created a presentation that highlights how the lives of the disabled were altered. The Nazis singled out anyone they deemed mentally or physically disabled for torment and persecution. I tried my best to grasp the way that those people were belittled, tortured, and a million times mistreated. From what I learned through watching interviews, readings, and research, I managed to construct a presentation that will discuss the exclusion that the disabled victims faced during those trying times.

WAR-TORN CLASSROOMS: UNDERSTANDING THE EDUCATION CRISIS THAT DOMINATES YEMEN
Presenter(s): Anna Guerrieri
Diversity and Interdisciplinary Studies
Mentor(s): Ayman Mohamed (College of Arts & Letters)

Since the independence of north and south territories, tensions in Yemen have only risen. 2015 launched a period of economic isolation, naval blockades, and airstrikes between Houthis and a Saudi-backed coalition that have, today, marked Yemen as one of the world's worst humanitarian crises. What's even more concerning is the state of Yemen's youth, specifically the education system. About half of the country's population is school age yet due to the state of war, academia has become an afterthought. Following surveys conducted by researcher pair, Abdulghani Muthanna and Guoyuan Sang, Yemen's dire conditions are brought to light thanks to first-hand accounts. Nadwa Al-Dawsari's viewpoint on tribal dynamics allows a further zoom into this community where ultimately a lens of intersectionality can be applied to focus on the situation with respect to the children. The outside perspective into Yemen has proven inadequate and this work aims to uncover the truth about Yemen's youth from the inside out. In fortunate societies, the importance of education is taken for granted. However, what Yemen will reflect is that their lack of a proper curriculum is a double-edged sword. Not only does deficient schooling impact the kids, but the next generation, leaving this already struggling country with little hope for a stronger future.

WHEN THE BAND OF BROTHERS TAKE THE STAGE
Presenter(s): Rileigh Wine
Diversity and Interdisciplinary Studies
Mentor(s): Deric McNish (College of Arts & Letters)

This presentation explores how theatre can be used as a therapeutic tool for veterans, and why the use of William Shakespeare's text is particularly effective in this application. Through archival research, text analysis, and interviews with theatre professionals, this research contributes to the larger conversation surrounding a need for more innovative and accessible ways for veterans to process their war-time experiences. Theatre is a cathartic artform that allows performers to immerse themselves in the experiences and feelings of various characters and stories. This research explores this aspect of theatre and analyzes the various qualities of Sahakepserae's text that make it such an effective tool for veterans. Some of these qualities include: Shakespeare's emotive characters, the rhythm and style of his writing, and the veteran and soldier stories that are explored in his plays. This presentation includes data from studies and primary-source interviews that have been gathered from theatre companies that provide programming for veterans. It describes the methods these theatre companies use to create safe and collaborative spaces for veterans to process their trauma and build a supportive community. The findings of this research highlight the importance of providing accessible, creative, and innovative programs for veterans to support their transition back to civilian life.

Education

STUDENT SUPPORT PROGRAMS VS. CHATGPT: THE IMPACT OF EMERGENT TECHNOLOGY ON LIBRARY SERVICES AND UNDERGRADUATE ACADEMIC CULTURE
Presenter(s): Casey Orr
Education
Mentor(s): Adan Quan (College of Social Science)

Emergent technologies, like ChatGPT and Artificial intelligence (AI) programs, have impacted the function, role, and usage of library student support services. This ethnographic study examines students and student employees in a university library to investigate the impacts of emergent technologies on student study habits and library service usage. Through participant observation and ethnographic interviews, this study found that emergent technologies, like Artificial Intelligence, have replaced library services as students' go-to source of academic help. While effective and valuable to student patrons, support services are generally underutilized compared to the popularity of internet-based resources. However, patron and non-patron students wish to retain these services despite their decreasing influence and offer suggestions for change. Students believe programs can adapt to emergent technologies and student cultures and continue to serve the modern undergraduate academic community.

CONCEPTUAL CURRENTS: UNDERGRADUATE UNDERSTANDINGS OF ION FLUX MECHANISMS
Presenter(s): Aeryn VanDerSlik
Education
Mentor(s): Jennifer Doherty (Lyman Briggs College)

Understanding the mechanisms underlying the movement of ions (i.e., charged particles) across neuronal membranes is challenging for undergraduates. This movement is driven by both concentration and electrical gradients, therefore students must understand how these two driving forces interact to cause net ion movement. The goal of the current study was to gain a deeper understanding of student's mechanistic reasoning using the principle of flow down gradients (rate of ion flow = electrochemical gradient/resistance). We interviewed 31 students from two different institutions (community college vs. R1 institution) in different majors (allied health vs. biology) at different points of their academic careers (before vs. after college physiology courses, first year vs. senior). In these interviews, students were asked to reason about potassium ion movement across a neuronal cell membrane. We analyzed the transcripts using the knowledge-in-pieces framework and the constant comparative method. We found three patterns in the way that students use knowledge elements related to ion movement that varied in the level of sophistication: students reasoned using electrochemical gradients, just concentration gradients, or no gradients. The most common pattern we observed was students who did not use electrochemical gradients but used concentration gradients to reason (n = 14).

Our results indicate that instructors working with students learning neurophysiology might need to be more explicit a

DEVELOPMENT OF PIGMENT CHROMATOGRAPHY EXPERIMENT FOR UNDERGRADUATE STUDENTS
Presenter(s): Cam Stout
Education
Mentor(s): Johanna Herman (College of Natural Science)

Chromatography is a complex methodology to separate a mixture of chemicals by molecular weight. It is used to identify chemicals that are unknown to safely dispose of by EHS and it is a cheap and easy option when compared to other options. One applicable purpose of chromatography is to separate dyes and pigments from a plant. Using the absorption of the separated dye or pigment, it can be analyzed to view what colors are being absorbed within the dye or pigment. Chromatography of plant pigments in an academic setting allows students to understand its value in industry while being able to learn in a safe environment.

KELLOGG BIRD SANCTUARY VISITOR EXPERIENCE INTERNSHIP
Presenter(s): Ada Varga
Education
Mentor(s): Lisa Duke (College of Agriculture & Natural Resources), Misty Klotz (College of Agriculture & Natural Resources)

This summer, I was the Visitor Experience Intern at the Kellogg Bird Sanctuary. Environmental education at a young age sparks curiosity about nature and its processes. The understanding of our role in nature, and connection to it, can inspire youth to develop solutions to current environmental issues we face today. To achieve my internship goals of connecting people to nature through environmental education, I designed and executed 6 Wild Wednesday programs, led sanctuary tours, and assisted with an overnight camp designed for children. I was also responsible for opening and closing the store, greeting customers, answering questions regarding birds and the facility, and creating self-guided educational activities.

DEVELOPMENT OF THE ONLINE FAMILY-MEDIATED INTERVENTION IN INCREASING SOCIAL/COMMUNICATION DEVELOPMENT IN CHILDREN WITH AUTISM
Presenter(s): Brennan Haugen
Education
Mentor(s): Atikah Bagawan (College of Social Science), Sarah Douglas (College of Social Science)

Involving parents and neurotypical (NT) siblings of children with Autism Spectrum Disorder (ASD) as intervention agents has shown to be beneficial for the child with ASD and to increase the skills of the intervention agents. Research has shown that interventions informed by behavioral approach has been successfully used to support skill acquisition in children with ASD effectively and efficiently. In addition, interventions that are informed by developmental approach focuses on providing developmentally appropriate practice for children by considering how their current developmental stage affects their program and intervention. The goal of developmentally appropriate practice is to ensure that children have more opportunities to work on their strengths and be included in social opportunities. Given the benefits and complementary nature of behavioral and developmental approaches, professionals have begun to combine the approaches within interventions, referred to as Naturalistic Developmental Behavioral Interventions (NDBI). NDBI is an approach that builds skills from multiple developmental domains in the child's natural environment with their natural partners that focuses on the child's strengths and plan for generalization to ensure effective learning. Natural partners for children include their family members. Therefore, it important to use family-centered approach with the framework of family systems theory to support and train family members to build family capacity. Buil

IDENTITY PERCEPTION THROUGH CHILDREN'S LITERATURE
Presenter(s): Aja McAllum, Kalleigh Chamberlin
Education
Mentor(s): Laura Apol (College of Education)

The topic of identity expression in education has been a hot topic for a long time, and it being present in children's literature is no exception from the scrutiny of many. This research will explore how children's literature shows identity and answer the question: does identity or a literature experience dictate how one picks up on certain notions? We will travel to 3 urban schools, and in each school we will gather a group of 12th graders. From there we will split the group in half and give one group a paper about how to analyze children's books. They both will then read the same 4 books and will be asked the same questions. We will interpret the data to question whether your identity and/or literature background can affect how identity is recognized in children's books.

THE PYRAMID MODEL APPROACH: AN EXAMINATION OF THE LITERATURE
Presenter(s): Siying Rao
Education
Mentor(s): Charis Wahman (College of Education)

There is an increase in the number of children with adverse childhood experiences (ACEs) entering early care environments. Young children who have experienced trauma often demonstrate behaviors that warrant intensive and individualized supports. The Pyramid Model framework is a responsive approach for supporting young children with significant social-emotional needs. This presentation evaluates the effectiveness of the Pyramid Model Approach for young children in the current literature. Recommendations for future research will be discussed.

FROM CLASSROOM TO CONCEPT: EXPLORING STUDENT PERCEPTIONS OF PHYSIOLOGY'S CORE PRINCIPLES
Presenter(s): Elijah Cole
Education
Mentor(s): Jennifer Doherty (Lyman Briggs College)

Evidence supports that when students use scientific principles to guide their mechanistic reasoning in biology, they are able to construct more fluid and correct mechanistic explanations. The NGSS, NSTA, and others have called for educators to teach using core principles, model based inquiry, and general models. Alternatively, little research has been conducted towards student's perceptions on the usefulness of general models or guiding principles on their ability to reason. The aim of this study was to investigate student's perceptions on the usefulness of using principle to reason. Students at Michigan State who had completed a semester of biology two, taught through a principle based framework, were contacted. Eleven student volunteers were interviewed over zoom using a semi structured interview protocol. Zoom transcripts were cleaned and wiped of personal information. The constant comparative method was used to identify common patterns among students, and these themes were used as a coding rubric. Example patterns include the following: Helpful to guide reasoning, Foundational in future classes, Foundational in developing toolbox, Helpful to reason to a new phenomenon, and Helpful to aid in self efficacy of reasoning. The patterns were then used to analyze student responses in order to develop a rubric based on the percentage of students aligned with the pattern. This study will be useful to educators attempting to implement principle based frameworks into their classroom

IMPACT OF A SCIENCE RESEARCH CURRICULUM ON ELEMENTARY AND MIDDLE SCHOOL STUDENTS' INTEREST IN SCIENCE
Presenter(s): Michael LeTarte
Education
Mentor(s): Brian Keas (Office of Undergraduate Education)

An integral part in STEM education is designing curricula in such a way so that it is approachable, captivating and inspiring. STEM material can carry with it, especially in elementary and middle school classrooms, a reputation to be both unengaging as well as expensive for more appealing projects. However, to detach from this common notion of STEM material, The MothEd project is a low-cost project intended to make STEM education more accessible to students in elementary and middle school classrooms through a co-design process with K-8 teachers, university researchers, and educational technology experts. This current study aims to quantify the effectiveness of the newly implemented curriculum across both elementary and middle school classrooms, as well as to understand how the project affected STEM interest and disposition in students. By employing surveys before and after the curriculum was implemented, 39 elementary school students and 271 middle school students' responses were collected and evaluated. Survey responses indicate a larger increase in the development of positive attitudes towards science in elementary students compared to middle school students. Suggestions are provided that will assist the MothEd project co-design process in future iterations and to determine if differences in implementation styles contributed to the elementary vs. middle school differences.

CRITICAL MAKING AS A TOOL FOR ENHANCED PROBLEM-SOLVING STRATEGIES
Presenter(s): Arunima Nimbokar, Chloe Sayre, Darshil Mukesh Desai
Education
Mentor(s): Burcu Ozkum (College of Social Science), Isaac Record (Lyman Briggs College)

Our research seeks to understand the relationship between a teaching practice called "critical making" and student attitudes and knowledge of problem-solving strategies. The study centers on three main questions related to problem solving : participants' initial reaction to a challenging problem, approaches considered to tackle the problem, and problem solving methods they are aware of or have experienced. Our team used pre and post surveys, classroom observations, and interviews across three sections of Dr. Isaac Record's LB 322: Advances in Science and Technology (N=90) to gain insight into these questions.

STREAMLINING SCIENTIFIC WRITING FOR STUDENTS: THE ROLE OF ONLINE LANGUAGE SIMPLIFICATION TOOLS
Presenter(s): Rhea Raut
Education
Mentor(s): John Zubek (College of Natural Science)

Professional skills development in higher education ranks both highly important but only moderately addressed by STEM faculty and students. Teaching science students to communicate more effectively and simplify difficult concepts has been lacking in the undergraduate curriculum. For students that want to work in the medical field, efficient communication is a necessity. With the advent of online language simplification tools, students can improve and reduce the complexity of their written message. In this study we evaluated two online language simplification tools with 173 undergraduate science majors from Michigan State University. Each student was randomly assigned into three variable writing feedback groups. Each group was provided the same scientific abstract in which they had to simplify and rewrite their message towards a targeted audience. The findings show that although these language simplification tools were intuitive for students to use, they were no better at assisting students when simplifying a written message than utilizing Flesch Kincaid grade level feedback. However, it was found that online language simplification tools were useful at recognizing scientific jargon and improving reading comprehension but much less so for resolving contextual complexity.

SENSE OF BELONGING IN LYMAN BRIGGS
Presenter(s): Faiz Hussain, Isaiah Thomas, Jules Shaman
Education
Mentor(s): Burcu Ozkum (College of Social Science), Isaac Record (Lyman Briggs College)

Sense of belonging has become a key predictor of student persistence and achievement in science. Our team surveyed students in an upper division course about their sense of belonging in Lyman Briggs College, in their major, and on their team within the class. To gain a deeper understanding of student responses, we also interviewed students to ask how they understood "sense of belonging" and what contributed to their sense of belonging. We also looked for changes across the course, and for patterns within demographic categories.

INSTITUTIONAL DIVERSITY IN A TEST-OPTIONAL WORLD
Presenter(s): Claire Smith
Education
Mentor(s): Barbara Schneider (College of Education)

The objective of my study is to analyze college admission requirements in light of increasing test-optional college applications, specifically, the rate of test score submissions in relation to student demographics. I will observe this over a period of four years (2019-2022) and look at various college categories (e.g., private selective). The primary perspective I have taken into consideration while designing this project is the widely held belief that standardized tests, specifically the SAT, are racially biased and exacerbate the systemic biases that exist within education. Many studies prove that there is racial bias embedded in standardized testing. If students were not required to submit test scores, would there be an uptake in the number of minority students enrolled in the more competitive institutions? That is the question that many parents, students, and university employees have asked in light of COVID and the push for test-optional applications, and that is the question I aim to answer with my study. My research began with an analysis of the common app data that reported on the demographics of students reporting test scores. I then moved to IPEDs data and selected 20 schools that fell into one of four categories: public selective, public non-selective, private selective, and private non-selective. I also conducted individual interviews with admissions representatives from 2-3 schools per category. These interviews addressed specific information on 2020 and 2021 fi

POWER OF PERCEPTION: HOW BELIEFS ABOUT GENDER ROLES SHAPE WRITING PERFORMANCE IN GRADES 4-5
Presenter(s): Colleen Blackwood, Ellie Friedman, Isabella Berch
Education
Mentor(s): Adrea Truckenmiller (College of Education)

Writing research suggests that students' beliefs on writing can be related to their performance (Pajares, 2010). Motivation surveys can be administered alongside assessments to capture students' perceptions of the writing process. We examined results from a motivation survey administered to fourth and fifth grade students (N=___). Through a factor analysis, we determined that the thirty-seven item survey both aligns with and expands on common dimensions of motivation theory and strongly presents four categories, or factors, related to students' perceptions of informational writing (Graham et al., 2012). By further analyzing the relationships between these "factors" and students' performance using a sequence-based scoring method called CIWS, we can understand the salience of students' motivation on their writing outcomes.

CHATMSU
Presenter(s): Daniel Francisco Helo Puccini, Prabhaav Pillai Ravikumar Pillai
Education
Mentor(s): Laura Dilley (College of Communication Arts Sciences)

Generative Artificial Intelligence has become a universal tool for students worldwide, assisting by acting as a mediator between large knowledge repositories and specific academic needs. By recollecting statistical patterns in large corpora of text, Large Language Models (LLMs) may pick up inherent biases present in their training datasets. When applied to tasks in education, AI tools can distort the truth, often citing from non-reputable sources and "hallucinating" information. Nonetheless, most of the information outputted tends to be taken at face value by users due to psychological factors related to ease of use and accessibility. Eventually, this may lead to a negative impact on learning outcomes. The focal point of this research is to gauge the extent of this negative effect by analyzing data from Michigan State University (MSU) students. Specifically, we wish to gather quantitative and qualitative data on academic records, student surveys, and common LLM prompt results. By performing comparative analysis, we aim to test the hypothesis that there is a correlation between LLM usage and academic impacts. This research, focused on a major university setting, could lay the groundwork for developing informed guidelines and best practices for AI integration in education nationwide.

EXAMPLE AND SET USE IN CONJECTURING AND PROVING FOR CALCULUS II STUDENTS
Presenter(s): Abigail Lippert
Education
Mentor(s): Kristen Vroom (Lyman Briggs College)

Students often have difficulty in the transition between the calculus track and proof based classes such as Linear Algebra. It is important that we find ways to better support students in this transition in order to foster an inclusive and diverse mathematics community. One way of doing this can be incorporating conjecturing and proving activities into calculus curriculum. We completed a teaching experiment with two students to discover how their use of examples and sets helped them in conjecturing and proving with sequences. We found three main ways that the students used examples and sets: classifying examples from the initial set of sequences, seeking diversity and using lack of examples from an expanded initial set of sequences, and attending to properties, searching for structure, and building formality with the set of all sequences. This work has important implications for how we can better support students in calculus II classes.

THE IMPACT OF COVID-19 DURING UNDERGRADUATE EXPERIENCE AND ITS EFFECTS ON GRADUATE SCHOOL ENROLLMENT: A COMPARATIVE STUDY OF PRE-COVID AND COVID-ERA COHORTS
Presenter(s): Jade Sabourin, Justin Babbitt, Kriti Shirodkar, Zahra Chambers
Education
Mentor(s): Sharlyn Ferguson-Johnson (College of Education)

The COVID-19 pandemic significantly impacted higher education. Prior research focused on the pandemic's effects on student mental health, academics, and undergraduate enrollment. Graduate school enrollment intentions, however, remain under-explored. This study investigates the relationship between experiencing COVID-19 as an intended science major undergraduate, and interest as well as enrollment in graduate school. We surveyed 1,639 students [66% women, 53% White, 31% Asian, 9% Black, 6% Hispanic, 2.1% Other], separated into five cohorts: Cohorts 1-4 did not experience COVID during their undergraduate education (1,158), and Cohort 5 did (473). Students were asked their enrollment status in graduate school 1-2 years post-graduation, science motivation. We hypothesized that students impacted by the pandemic would have enrolled in graduate school at a lower rate than previous cohorts, and have lower average science motivation. Independent samples t-tests compared the rate of graduate school enrollment between cohorts. Analyses revealed a surprising outcome: students who experienced COVID were more likely to enroll in graduate school compared to those who didn't (Cohort 1-4: 31%, Cohort 5: 37% enrolled). ANOVA tests revealed Cohort 5 demonstrating significantly higher motivation at graduation. Household income emerged as a significant predictor of graduate school enrollment for the entire sample, while experiencing difficulty finding a desired job during COVID was the

TEAMWORK & CRITICAL MAKING: EFFECTS OF CRITICAL MAKING ON STUDENT'S PERCEPTION OF TEAMWORK
Presenter(s): Mia Dionise, Shri Keerthi Alla
Education
Mentor(s): Isaac Record (Lyman Briggs College)

How do attitudes and knowledge of teamwork skills change over the course of a semester-length team-based project? Our team used pre and post surveys, classroom observations, and interviews across three sections of Dr. Isaac Record's LB 322: Advances in Science and Technology (N=90) to gain insight into this question. The class uses a method called "critical making," which uses "material forms of engagement with technologies to supplement and extend critical reflection" (Matt Ratto, 2011) to organize responses to "wicked problems," problems that are "ill-defined, ambiguous and associated with strong moral, political and professional issues'' (Ritchey, 2005), such as poverty and climate change. In practice, students worked in groups to research the problem and devise responses. The responses included a scholarly report and a low-fidelity prototype (non-functioning model) of the proposed solution. The instructor's course design aims to coach students in team-working skills such as facilitating discussion, resolving disagreement, and making collaborative decisions and put those skills into practice through work on a problem that requires genuine collaboration.

DO PEERS OR DO GRADES HAVE A GREATER INFLUENCE ON HOW COSTLY UNDERGRADUATES PERCEIVE STUDYING SCIENCE OVER TIME?
Presenter(s): Dorothy Zhao
Education
Mentor(s): Lisa Linnenbrink-Garcia (College of Education), Sharlyn Ferguson-Johnson (College of Education)

Expectancy-value theory holds that students' expectancies for success and valuing of academic tasks and subjects set the stage for their achievement motivation, and likewise are predictive of their academic achievement. Extensive research has investigated the roles both students' expectancies for success and task values play in students' academic achievement, yet to date, a relatively small proportion of this work investigates the influence of the third facet of EVT: perceptions of perceived cost - or the perceived sacrifices a student believes they must make in order to engage successfully in a task. Motivation researchers have yet to clarify how perceptions of cost influence students' science persistence, achievement, and belongingness to and within the field (e.g., with peers) over time. As such, this is the focus of this study. Study sample encompassed 1,920 undergraduates [58% female; 15% first-generation; 74% White, 13% Asian/Asian American, 6% African American/Black, 3% Hispanic/Latinx, 3% other] followed from their first year until their fourth year. The three subcomponents of perceptions of cost (effort, psychological, and opportunity cost) were measured using items adapted from Perez et al. (2014) and Flake et al. (2015); science GPA on a 4.0 GPA scale; and peer belonging using a 10-point Likert scale. Cross-lag structural equation models were used to identify longitudinal associations between GPA, peer belonging, and perceptions of cost over time. Findings suggest

LOOKING TO YOUTUBE FOR CHEMISTRY EDUCATIONAL VIDEOS? HOW STUDENTS CAN SEARCH SMARTER
Presenter(s): Leah Zajac, Sophia Gudinas
Education
Mentor(s): Ryan Sweeder (Lyman Briggs College)

YouTube is known for having videos for everything, but over half the people who use YouTube do so to learn something new, including chemistry concepts. Most research regarding the use of online videos for educational purposes focuses on the benefit of the interactive nature of YouTube and fails to address content or quality. One challenge is that creators are not required to follow best practices for video quality, content accuracy, or use of multimedia principles to support learning. This absence of standards may cause problems for learners who lack the expertise to determine what information is useful or problematic, leading to learning incorrect information. This research project attempts to target that very issue by creating and testing a research-based framework for evaluating the quality of chemistry videos. With this framework, creators will have discrete guidelines for developing videos of higher quality for educational purposes. Data were collected using the framework to analyze a number of highly viewed videos focused on covalent and ionic bonding. In this poster we share the criteria used to analyze these videos, along with the results from this analysis of the most viewed videos.

EXPLORING POTENTIALS OF CHATGPT FOR TEACHING TECHNICAL WRITING
Presenter(s): Matthew Hernandez
Education
Mentor(s): Caitlin Kirby (College of Arts & Letters), Imari Tetu (College of Arts & Letters)

ChatGPT and other Large Language Models (LLMs) have the potential to revolutionize communication, with significant implications for fields such as technical writing. This study involved technical writing students from five courses at Michigan State University, engaging them in a two-phase experiment where they first crafted technical instructions for various Google Suite applications, then performed usability tests on these instructions as well as comparable sets generated by ChatGPT using the same prompt. The usability testing groups were assigned randomly, with students not informed whether they were testing ChatGPT's instructions or human-authored instructions. Our methodology included content analysis to assess the clarity and effectiveness of the instructions. Key metrics gauged through exit surveys encompassed the completeness, understandability, and helpfulness of the instructions, along with overall satisfaction and specific feedback on the instructions' strengths and areas for improvement. Additional insights were gleaned from the facilitators' notes, which highlighted areas where users faced confusion or challenges. This study spans five classes, totaling 74 participants with informed consent. The courses included XA 242 (Intro to Experience Architecture), XA 466 (Capstone Course), WRA 320 (Technical Communication), and two sessions of WRA 202 (Intro to Professional and Public

Engineering, Computer Science & Mathematics

ASSESSING THE IMPACT OF DIGITAL FEEDBACK SIGNS ON DRIVING BEHAVIOR
Presenter(s): Grant Gulker, Josh Janiskee
Engineering Computer Science and Mathematics
Mentor(s): Dong Zhao (College of Agriculture & Natural Resources)

Digital Speed Feedback Signs (DSFS) are a crucial element of intelligent transportation systems, designed to notify drivers of their current speeds. However, assessing DSFS presents certain challenges, including the monitoring time, complexities in data reference, and ethical considerations during on-site observations. This research presents a new approach for evaluating the effectiveness of DSFS, particularly focusing on their impact on driver behaviors; using a previously developed virtual reality-based driving simulator. The primary objective of this study was to assess the relative efficacy of DSFS in comparison to static speed signs, and understand the influence of digital feedback on driver behavior. Participants engaged in virtual reality experiments where they encountered both traditional/static and digital speed signs. The research examined the driving routes, modifications in speed, and other behavioral variations. The statistical analysis findings suggested that the DSFS effectively communicates drivers' current speeds in a timely manner, resulting in prompt reactions and heightened driver vigilance compared to roads without such signage, emphasizing the significance of visible speed readings over conventional car dashboard displays.

EFFECTS OF CELLULOSE NANOCRYSTAL INTEGRATION ON METHACRYLATE-BASED DENTAL ADHESIVES

Presenter(s): Allison Huckins

Engineering Computer Science and Mathematics

Mentor(s): Caroline Szczepanski (College of Engineering), Denghao Fu (College of Engineering)

Dental adhesives are a main constituent in dental restorations (e.g., fillings). However, many fillings only last 5-7 years. A contributing factor to this short lifetime is heterogeneity of the adhesive layer, which allows for significant water uptake and degradation. In this work we investigate how the integration of a bio-sourced nanomaterial, cellulose nanocrystals (CNCs), may improve the moisture sensitivity and associated durability of dental adhesives. CNCs are a derivative of cellulose that can be obtained through acid hydrolysis. CNCs have the unique properties of a high aspect ratio, high surface area, high mechanical strength, and a liquid crystalline nature. Furthermore, CNCs are inexpensive, sustainable, and eco-friendly. To study the influence of CNCs on the adhesive layer, two adhesive resins were investigated. One was a heterogeneous network with a higher cross-link density while the other was more homogeneous with lower cross-linking. To both formulations 0.5 weight % CNCs were added. Adhesive performance was characterized using mechanical (three-point bending, dynamic mechanical analysis (DMA)), imaging (Atomic Force Microscopy (AFM)), and water sensitivity analyses. AFM imaging showed that the CNCs in the heterogeneous formulation aggregated and did not distribute

MICROFLUIDIC MIXER EFFICIENCY: AN ANALYSIS OF VARIOUS DESIGNS AND LENGTH OPTIMIZATIONS OF 3D-PRINTED MICROFLUIDIC MIXERS

Presenter(s): Anton Akroush

Engineering Computer Science and Mathematics

Mentor(s): Andrew Mason (College of Engineering), Anna Inohara (Division of Student Life and Engagement), Arsh Ahtsham (College of Engineering), Derek Goderis (College of Engineering)

Microfluidics, the manipulation of fluids at sub-millimeter scales, has fueled advancements in technologies like pollutant analysis, disease detection, and lab-on-a-chip design over the last decade. A crucial component in microfluidic devices is the microfluidic mixer, whose job it is to combine fluids moving within a circuit. This study investigates the design and performance of three CAD-designed microfluidic mixers, focusing on two key aspects: length and design. Three specific mixer designs were created using Fusion 360 and then 3D printed for analysis: Mixer 1: A Y-shaped mixer incorporated within a rectangular microfluidic circuit. Mixer 2: A zigzag microfluidic mixer also housed within a traditional rectangular circuit. 3: A coil-shaped mixer designed within a 3D cube, shorter in length than Mixers 1 and 2. The results demonstrate that the coil-shaped mixer (Mixer 3) achieved comparable mixing performance in a smaller volume compared to the traditional Y-shaped mixers (Mixers 1 and 2). This highlights the potential for miniaturization and more compact microfluidic devices. Furthermore, the study examines the advantages of 3D printing for microfluidic mixer fabrication. Compared to the widely used soft lithography technique, which primarily operates in 2D, 3D printing allows for the creation of more intricate and cleaner mixer designs. 3D-printed mixers can incorporate structures of higher complexity (spanning the

WHY ARE MICHIGAN ROADS FULL OF POTHOLES? AN ANALYSIS OF THE STRUCTURE OF CONCRETE UNDER A SCANNING ELECTRON MICROSCOPE.

Presenter(s): Adam Sypitkowski

Engineering Computer Science and Mathematics

Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

In the construction industry, concrete is utilized for its strength and versatility. However, as concrete structures age, their strength may become compromised leading to collapses and rough surfaces. This research paper analyzes the structure of concrete after being exposed to outside elements. To determine the impact weathering had on concrete, a Scanning Electron Microscope (SEM) was used. In the experiment, different slabs of concrete were subjected to different elements including prolonged exposure to heat, cold temperatures, water, and weight. The results were then compared to a control which underwent no stress and remained at room temperature for the duration of the experiment. In the research, it was observed that concrete was affected by different factors as shown through SEM imaging by using both backscattered and secondary electrons. The implications of this study could inform the construction industry on the limitations of using concrete as a building material. This could open a discussion on using other materials in conditions where concrete would be unsuccessful.

SIMULTANEOUS ISOLATION OF FOODBORNE PATHOGENS USING CARBOHYDRATE-COATED MAGNETIC NANOPARTICLES

Presenter(s): Katherine Heinecke

Engineering Computer Science and Mathematics

Mentor(s): Anthony James Franco (College of Agriculture & Natural Resources), Evangelyn Alocilja (College of Agriculture & Natural Resources)

The CDC estimates 48 million people are affected by foodborne pathogens annually [1]. Monitoring the presence of foodborne illnesses is one way to prevent infections and outbreaks. Current methods for simultaneously detecting multiple pathogens are time-consuming and tedious as they are time consuming and require different conditions. In recent years, magnetic nanoparticles have been used to concentrate cells from various samples in conjunction with nano-biosensors to detect foodborne pathogens. The potential of using carbohydrate-coated magnetic nanoparticles (MNPs) to simultaneously isolate and concentrate foodborne pathogens was investigated. An optical density (OD) curve was created to determine the concentration of bacteria spiked into the growth media. These OD curves and their corresponding regression equations can then be used to determine bacterial concentration. Determining the bacterial cell concentration allows for manipulation through dilutions in phosphate buffer saline. Allowing for the creation of binary mixtures of different bacterial strains of the same cell concentration. The capture efficiency of MNPs can then be measured for each individual bacteria in the mixture. Thus, the necessary bacterial concentration level of a specific bacteria to be detected with a biosensor, even when other bacteria are present, can be calculated. Electron microscopy confirms that the MNPs interact with the pathogens, making them easier to detect with a biosensor. This data is

EVALUATION OF STRESS-STRAIN AND FRACTURE BEHAVIOR IN PATTERNED HYDROGELS
Presenter(s): Emily England
Engineering Computer Science and Mathematics
Mentor(s): Allie Vanzanten (College of Engineering), Caroline Szczepanski (College of Engineering)

Hydrogels are elastic and hydrophilic soft matter materials that have important uses in a variety of biomedical and robotic applications. The implementation of 3D patterned structures in hydrogel systems allows for the engineering of materials that more closely mimic the biological microenvironment, and patterned hydrogels have been fabricated to elicit smart deformation properties in response to stimuli. However, further investigation is needed on the tensile stress-strain behavior and fracture mechanics of this patterned structure. The degree of cross-linking is an important determiner of the mechanical properties of a hydrogel, but it is also critical to consider how changing the hole and strut sizes in patterned samples may affect the final stress, strain, and method of fracture of the hydrogel. This work aims to investigate how the implementation of simple honeycomb patterned structures in poly(ethylene glycol) hydrogel systems affects the way the material responds to externally applied forces.

ENHANCING LOWER LIMB PROSTHETICS: INTEGRATING THREE-SPRING MECHANISM AND BIOMATERIALS FOR IMPROVED AESTHETIC CUSTOMIZATION
Presenter(s): Grace Sharon, Katherine Turner
Engineering Computer Science and Mathematics
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

Exploring the integration of a novel three-spring mechanism into lower leg prosthetics, aiming to enhance both functionality and user experience. While taking on the endeavor of innovating a new design of the three-spring mechanism, our research involved a comprehensive review of existing literature, computational modeling, and iterative prototyping to assess their feasibility and performance in lower leg prosthetics. Leveraging advanced 3D printed biomaterials, the study investigates the durability and biomechanical properties of these prosthetic devices. Additionally, the project delves into the customization potential enabled by incorporating color pigments into the biomaterial, allowing for personalized aesthetics that align with individual preferences and identity. By examining the interplay between mechanical performance, material durability, and aesthetic customization, this research seeks to advance the field of prosthetic design and improve the quality of life for amputees.

DUCKWEED HEALTH ASSESSMENT VIA OXYGEN PRODUCTION ANALYSIS
Presenter(s): Leah Jarmolowicz
Engineering Computer Science and Mathematics
Mentor(s): Dawn Dechand (College of Agriculture & Natural Resources)

Due to its small size, rapid reproduction, and limited lifespan, duckweed is becoming increasingly prevalent in the laboratory setting as a model plant. Potential opportunities for duckweed in food, fuels, and bioremediation become better understood as its presence in research expands. Current commonly used methods to assess the health of duckweeds in the laboratory include growth rate by mass or frond number, frond color, or molecular biomarker analysis, each of which has its own limitations. Additionally, up to 7 days are required for these assessments. Very few studies have attempted to fully comprehend the optimal in vitro conditions for duckweed. The purpose of this poster is to summarize our findings on assessment of duckweed health in a laboratory setting using a variety of oxygen production assessments. Sterile duckweed were cultured in axenic conditions and then transferred to reactors containing half-strength Schenk-Hildebrandt media. At the end of the experimental period, a variety of oxygen production assessments, including gaseous and aqueous measurements, were employed and compared across light vs. dark conditions. Results from these assessments were compared with 7-day growth rates as measured by frond mass. The results of this research, in combination with an analysis of past studies, are expected to establish oxygen production as an effective metric for evaluating duckweed health in a laboratory setting. This research will advance the use of health assessment

DISCOVERING THE MOST ACCURATE MODEL TO PREDICT FUTURE INSURANCE POLICIES
Presenter(s): Noah Gscheidmeier
Engineering Computer Science and Mathematics
Mentor(s): Gee Lee (College of Natural Science)

Insurance data is used by actuaries to predict the future, to provide insurance companies with the information needed to provide their clients with the money they would need for any type of insurance. There are many models used, but which one is the best? We coded and worked with many different models used to insurance purposes to find which correlated the best with future data. We used models such as poisson distrubtion models, negative binomial models, and found some of the zero-inflated versions of those models too. Through our work, we found the performance of each model, to answer the question: Which model correlates the best with future insurance data?

SOFT BIOELECTRONICS AS PRECISION NEURAL INTERFACES
Presenter(s): Charlie Meilinger
Engineering Computer Science and Mathematics
Mentor(s): Jinxing Li (College of Engineering), Vittorio Mottini (College of Engineering)

Electromyography (EMG), including surface EMG (sEMG), is essential in biomedical research for assessing muscle function and diagnosing neuromuscular disorders. However, conventional rigid electrodes face challenges in conforming to diverse skin topographies, leading to compromised signal quality and limited applicability. Here, we introduce a stretchable bioelectronics platform designed to adapt to complex skin features seamlessly. Our device, crafted from intrinsically stretchable materials, significantly enhances both conformability and adaptability across various skin types. Compared to commercial electrodes, our stretchable platform reduced electrode-skin impedance by 1000X, elevated the signal-to-noise ratio by six-fold, and amplified the EMG amplitude eight-fold. These enhancements enable reliable sEMG mapping over expansive body areas, allow for wireless prosthetic control with 97.7% accuracy in gesture differentiation, and facilitate 24-hour monitoring with minimal signal degradation. Beyond traditional applications, our platform opens doors to more inclusive and effective rehabilitation therapies, continuous health monitoring, and human augmentation in virtual reality environments. Our study addresses a critical gap in existing sEMG technology by offering improved signal quality and adaptability, thereby advancing the inclusivity of human-machine interfaces.

HOW YOUR COMPUTER SCREEN WORKS
Presenter(s): Robert Cesario
Engineering Computer Science and Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

The structure and composition of the modern LCD screen plays a key role in how images are displayed, so understanding those aspects of the sample will allow for further understanding of the function of modern electronic displays. The purpose of this research is to determine those properties by analyzing the screen using both a scanning electron microscope and an optical microscope. The topography and structure of the sample will be determined by imaging the electrons shot at and scattered off of the sample. The composition of the screen will be determined by analyzing the x-rays produced when bombarding the sample with electrons and matching their spectra to the known spectra of the elements on the periodic table.

SEARCH AND RESCUE IN MOBILE ENVIRONMENTS
Presenter(s): Balaji Ganeshbabu
Engineering Computer Science and Mathematics
Mentor(s): Shaunak Bopardikar (College of Engineering)

This project leverages ROS Turtlebots for addressing a search and rescue challenge, where the seeker robot receives information about a broadly defined moving area which the target robot is expected to be located. The objective is to develop an efficient solution for locating and potentially rescuing the target robot within this specified region.

OPTIMIZING EXTRACTION AND CHARACTERIZING ADHESION PROPERTIES OF SEED MUCILAGE FOR INSIGHTS INTO PLANT EVOLUTION
Presenter(s): Shubhan Nagarkar
Engineering Computer Science and Mathematics
Mentor(s): Caroline Szczepanski (College of Engineering), Sabrina Curley (College of Engineering)

Upon hydration, the seeds of many plant species, such as chia, release a polysaccharide hydrogel (mucilage) known for significant bioadhesion due to hydrogen bonding. It is established that mucilaginous seeds with higher surface adhesion have lower mortality rates and exploitation. Here, quantifying the adhesive strength of plant-specific mucilage is used as a preliminary tool to shed light on the evolutionary advantages of mucilage envelopes. Prior to adhesive characterization, mucilage extraction was optimized using complete seed hydration, physical separation using razor blades and wire meshes, and solvent-based separation. With this extraction, bulk quantities of uniform dehydrated mucilage were produced for three species (Plantago ovata, Linum grandiflorum, Lepidum sativum) then rehydrated to a controlled swelling ratio. A lap-shear adhesive testing protocol was developed to test mucilage adhesion at dry, ambient, and saturated humidity levels to mimic various environmental conditions. Polyethylene terephthalate substrates and test strips were selectively plasma-treated to create hydrophilic and hydrophobic adhesive test conditions. The results showed that 24 of the 32 hydrophobic specimens delaminated before testing, compared to 6 of 28 in the hydrophilic group. Additionally, the highest maximal shear adhesion was observed in Plantago ovata mucilage, followed by Linum grandiflorum. Finally, for non-delaminated samples, the specimens in dry and ambient conditions demonst

CLINICAL AND RESEARCH TOOLS FOR THUMB FORCE MEASUREMENT: ARE CLINICAL TOOLS GRASPING THE WHOLE PICTURE?
Presenter(s): Ryan Harth
Engineering Computer Science and Mathematics
Mentor(s): Adam Chrzan (College of Engineering), Tamara Bush (College of Engineering)

Roughly 40% of people over the age of 55 are living with thumb osteoarthritis (OA), a condition that causes pain, swelling and stiffness that can affect a person's movement. OA is only growing with the aging population. It is important to accurately track recovery of the thumb after surgery or throughout therapy. The current tools to assess thumb force do not isolate the thumb, and some do not even include the thumb during measurement. The goal of this study was to assess the differences between current clinical tools, gold-standard research tools that isolate the thumb, and a clinically translatable device that mimics the gold-standard approach to measure thumb force. Six participants (3 female, 21(2) years, 3 Male, 23(3) years) were tested in multiple thumb postures using 4 different force measurement devices for seven positions. The average maximum force across multiple attempts in each position was recorded for all participants. The average maximum force values generated from the clinical measures were 82 pounds, 19.7 pounds and 8.4 pounds. The average maximum force generated from the research methods were 8.48 pounds, 6.61 pounds, 5.91 pounds and 4.34 pounds. The research devices were on average lower than the clinical measures. With these new research methods, isolated thumb force can be obtained, and patients and therapists can better understand the impact of therapy or surgery.

DEVELOPMENT OF CITIZEN-SCIENCE MEASUREMENTS OF INFILTRATION TO ASSESS THE ROLE OF PLANTS IN STORMWATER TREATMENT SITES

Presenter(s): Megan Ransler

Engineering Computer Science and Mathematics

Mentor(s): Dawn Dechand (College of Agriculture & Natural Resources)

Evaluation of hydraulic properties of soils, especially infiltration rates, is crucial for the management of irrigation, agricultural runoff, and urban stormwater. Management practices that utilize infiltration to capture and treat runoff are common in both Michigan communities and agriculture. The effects of vegetation on infiltration rates of soil varies and studies often have conflicting results about whether deeper and longer tap roots, or shorter fibrous root systems are more effective. Ultimately, our project aims to characterize this relationship between infiltration rate and plants with respect to location, plant type, and season in engineered bioretention sites. Citizen science is a potential method for collecting the numerous samples needed to develop this relationship. Using advanced and standardized methods, we have characterized the infiltration rates in two stormwater sites on the Michigan State University campus. We have also designed a low-cost, easy-to-use infiltrometer. This design will be used and combined with a citizen-science approach with university students and high school students to assess infiltration rates at the same sites. We will compare the data collected through citizen science with our established methods to validate this approach. Based on previous results, we expect to see that locations with plants with tap roots, such as cattails, have a generally higher infiltration rate compared to areas without any vegetation or

GRIP FORCE DIFFERENCES DURING ACTIVITIES OF DAILY LIVING BETWEEN HEALTHY PARTICIPANTS AND PERSONS WITH FUNCTIONAL MOVEMENT DISORDER

Presenter(s): Ava Carson

Engineering Computer Science and Mathematics

Mentor(s): Garrett Weidig (College of Engineering), Tamara Bush (College of Engineering)

Functional Movement Disorder (FMD) is a neurological disorder that causes irregular movements in the human body. The biomechanics of persons with FMD are not well understood and can make monitoring rehabilitation progress difficult. The goal of this work was to identify differences in grip force between healthy and FMD individuals during a simulated drinking task. Another goal was to compare pre and post-therapy grip force to quantify treatment progress. Force data from 9 participants were used for this study - 2 with FMD and 7 healthy individuals. Participants were asked to lift a cup to their mouth to simulate drinking. Participants gripped the cup such that their thumb contacted a button which concealed a single axis load cell to collect the force. FMD participants were tested twice: once pre-treatment, and once after a week-long rehabilitation program. Data were analyzed and the maximum and average force were recorded for each participant. The average and maximum grip force exerted by the FMD participants were larger than that of the healthy individuals. The average healthy average grip force of the healthy participants was 6.62 Newtons (N), whereas the average grip force used by the participants with FMD before therapy was 13.87 N and 12.40N. Both FMD participants' average grip force were reduced post-treatment (decrease of 8.88%, 48.88%), indicating successful therapy intervention. Understanding how individuals interact with objects during act

UPCYCLING MULTI-COLOR PET WASTE: A LOOK INTO THE ROBUSTNESS OF THE AMMONOLYSIS OF POLY(ETHYLENE TEREPHTHALATE)

Presenter(s): David Dang
Engineering Computer Science and Mathematics
Mentor(s): John Dorgan (College of Engineering), Richard-Joseph Peterson (College of Engineering)

Poly(ethylene terephthalate) (PET), primary used in the packaging industry, is a plastic whose waste has been improperly managed. The use of this plastic is continuing to increase, creating a growing need for proper waste management that is economically feasible. New chemical upcycling technologies, such as ammonolysis, have been studied and provide a route to a circular economy [1,2]. However, it remains uncertain how robust this process is. An industrial scale process must be able to handle several types of PET, including different grades, copolymers, and colors. Color-added PET is of a lower grade than its clear counterpart and includes added pigments, an impurity in the recycling process. Thermoform waste PET of various colors (blue, black, green white, and brown) were converted to terephthalamide via ammonolysis to determine how the pigment would affect the purity of the final product. Two solvents, ethylene glycol and methanol, were used to perform this reaction to determine their effects on the purity. Proton NMR was used to determine the purity. While most of the pigment was found to wash into the solvent at the end of the process, some of the pigment remained in the product. These results indicate similar terephthalamide purity can be obtained from lower quality, pigmented PET, demonstrating the robustness of this upcycling process. References: 1. Richard-Joseph L. Peterson, Robert Y. Ofoli and John R. Dorgan. Upcycling zero-valued poly(ethylene terephthalate): chemi

PREDICTING POST-THUMB SURGERY OUTCOMES USING MECHANICS BASED DATA TO INFORM CLINICAL DECISIONS

Presenter(s): Macy Spevacek
Engineering Computer Science and Mathematics
Mentor(s): Adam Chrzan (College of Engineering), Tamara Bush (College of Engineering)

Background: The thumb is responsible for approximately 50% of overall hand function. The joint at the base of the thumb is the second most common site of osteoarthritis in the hand, causing tenderness, pain, reduced strength, and stiffness. This affects up to 7.9% of men and 15.1% of females aged 55-59 and increases to more than half of females as they age. Objective: Literature is lacking when it comes to looking at the results of thumb strength after surgery and rehabilitation. The goal of this work was to determine changes in pain levels and force of the thumb pre-surgery to post-surgery. It was hypothesized that those with higher force levels pre-surgery would lose force post-surgery. Method: 19 participants (Aged 65.2 ± 8.6 years) completed clinical force procedures (tip pinch, key pinch, grip strength) and a lab-developed procedure. Testing occurred pre-surgery and 6 months after receiving a common thumb arthritis surgery. Patients reported their pain on an analog scale (0-100) during testing. Results: Pain decreases in the patients, but it does not indicate how someone could recover post-surgery. The average pre-surgery grip strength was 203.9±118.3 N and the 6-month post was 218.6±74.5 N. However, this was much higher than the other force measures which showed similar patterns. This suggests that measurement approaches have variation and potential trade-offs between pain reduction and loss of force. Impact:

ANALYZING VARIOUS SUTURE MATERIALS USING A SCANNING ELECTRON MICROSCOPE (SEM)
Presenter(s): Shahd Alnasser
Engineering Computer Science and Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Effective wound closure is necessary to allow for optimal healing. To determine how different wounds require different suture materials, a scanning electron microscope can be used to analyze different suture materials' composition such as hair strands, nylon, polyester, polypropylene, and silk.

INTRODUCTION TO PUBLIC KEY CRYPTOGRAPHY
Presenter(s): Aaditya Moudgil, Jason Thieu, Mehak Banga, Nishit Nagpal, Shreyas Sajith
Engineering Computer Science and Mathematics
Mentor(s): Preston Wake (College of Natural Science)

Modern cryptography relies on number theory for information security worldwide. This work explores two concepts in number theory: modular arithmetic and the discrete logarithm problem. Modular arithmetic forms the basis of cryptographic operations, facilitating secure encryption and decryption through trapdoor functions. The discrete logarithm problem supports systems like Diffie-Hellman Key Exchange and ElGamal encryption. Implemented in Python, this work demonstrates the practical application of these concepts through the ElGamal cryptosystem and the Baby Step-Giant Step method. By delving into the intersection of number theory and cryptography, this work highlights the pivotal role of mathematical principles in protecting sensitive data in today's communication and storage systems.

MECHANICS-BASED ANALYSIS OF REACH AND GRASP KINEMATICS ASSOCIATED WITH FUNCTIONAL MOVEMENT DISORDER
Presenter(s): Joshua France
Engineering Computer Science and Mathematics
Mentor(s): Tamara Bush (College of Engineering)

Background: Persons with Functional Movement Disorder (FMD) have erratic movements that are difficult to quantify. As such, it can be challenging to understand the degree to which treatments (physical and occupational therapies) are effective for a patient. This study aims to develop a quantitative analytical process to evaluate the effects of physical therapy on their movements through velocity and smoothness analyses. Methods: Motion capture data were collected for healthy, pre-treatment FMD, and post-treatment FMD groups during a simulated drinking task. The motion tracking data of the wrist was analyzed in MATLAB to quantify improvement after the week of intensive treatment. The first metric analyzed was average velocity. The second metric analyzed was related to the smoothness of movement and was quantified by the number of peaks in the motion data in the Y (medial/lateral) direction. Results: FMD participants' average velocity increased by an average of 3.57% after therapy, but the average number of peaks in their movement decreased by an average of 24.02%. This indicated that smoothness was a better metric for quantifying and tracking symptoms associated with FMD in comparison to velocity. Impact and Conclusion: The results gathered and analysis processes created from these data will better inform physical therapists about patient recovery by adding a quantitative component to the existing qualitative measures.

CHALLENGES OF HETEROLOGOUS PLANT DEFENSE RECEPTOR EXPRESSION IN YEAST
Presenter(s): Samantha Schulte
Engineering Computer Science and Mathematics
Mentor(s): Daniel Woldring (College of Engineering)

There have been no small number of bacterial infections throughout history that have devastated entire crop populations. To defend against such infections, plants possess an innate immune system, consisting of receptors for highly conserved signatures of microbes, termed microbe-associated molecular patterns (MAMPs). Perception of pathogenic bacteria in *Arabidopsis thalianais* facilitated by FLAGELLIN-SENSING2 (FLS2), a leucine-rich repeat receptor-like kinase (LRR-RLK) that binds bacterial flagellin. Wild-type FLS2 binds flg22, a peptide (derived from pathogenic *Pseudomonas*) representative of the most conserved domain of flagellin. Modified versions of FLS2 have demonstrated increased sensitivity to flg22 *in planta*, as well as responses to flagellin from different pathogenic bacterial species. However, *in planta* mutagenesis studies are time-consuming and low-throughput. Yeast surface display (YSD) offers a promising alternative that would allow for efficient screening of large libraries to identify modified FLS2s with improved pathogen recognition. We have cloned FLS2 into a YSD expression vector and induced protein expression in *S. cerevisiae*. Low expression levels and a lack of function were seen. This absence of binding was likely due to challenges in heterologous expression such as differences in secretory pathways and associated post-translational modifications between species. We are exploring an alternative species of yeast

CHEMICAL UPCYCLING OF PET INTO TEREPHTHALOYL CHLORIDE
Presenter(s): Cooper Rokop
Engineering Computer Science and Mathematics
Mentor(s): Elanna Neppel (College of Engineering)

Polyethylene terephthalate (PET) is one of the most abundant plastics in the United States. It is often used in packaging for items such as food, cleaning supplies, and disposable bottles. The widespread use poses a significant challenge to environmental sustainability and human health, as the accumulation of plastic within the environment can lead to the production of toxic by-products and create microplastics which are captured in the food chain. PET is often discarded due to its low economic value and hindrances in the recycling process. Chemical recycling can mitigate these effects by creating a product of higher value, otherwise known as upcycling. Hydrolysis is an effective chemical recycling method to convert PET into terephthalic acid. However, terephthalic acid has limited applications in synthesis, and is most often used to create lower quality products compared to virgin materials. Terephthaloyl chloride, the acyl chloride of terephthalic acid, is used in a variety of applications, such as a water scavenger and a cross-linking agent. Using terephthalic acid obtained from the hydrolysis of waste PET, terephthaloyl chloride was synthesized by reacting terephthalic acid with thionyl chloride and dimethyl formamide in reflux. The product was crystallized using diethyl ether to a purity of greater than 99%. This process creates a versatile product with high purity from waste PET.

MICROJOINING CLEAR POLYSTYRENE TO POLYSTYRENE USING A 10.6MM CARBON DIOXIDE LASER
Presenter(s): Dhruv Singh
Engineering Computer Science and Mathematics
Mentor(s): Brian Johnson (College of Veterinary Medicine)

The development of throughput-compatible and adaptable manufacturing techniques is crucial to address the growing need for new approach methods in drug and chemical screening. The ability to create closed fluidics is essential for those creating devices directly into the bottom of standard ANSI/SLAS polystyrene (PS) microplates using computer numerical control (CNC) machining. While dedicated laser welding or ultrasonic systems are available, they are often unavailable to laboratories looking to employ microfluidics in their research. To address this need we focus on utilizing a conventional 10.6µm, 60-watt carbon dioxide laser to bond clear plasma treated PS cell culture plates to clear PS sheets. We have employed a systematic design of experiment (DoE) to explore the design space to identify the settings of laser power, speed, and density that will yield a functional bond. Bonds are further characterized using a pressure test, vacuum test, and leak test to quantify the integrity of the bond. Using these methods, we have identified multiple parameter combinations that create a functional bond. Further work will be performed to further differentiate the identified parameters and select optimal settings. Our initial work has demonstrated the broad utility of using a standard CO_2 laser cutter to bond clear-clear PS.

NANOSTRUCTURAL EXAMINATION OF DRYER SHEETS VIA SCANNING ELECTRON MICROSCOPY
Presenter(s): Aaryaman Bisht
Engineering Computer Science and Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

The reason I am choosing dryer sheets for my topic of research is because, departing from conventional practices, we explore the hypothesis that the chemical composition and surface-modifying properties of dryer sheets may interact with specimen surfaces, introducing unique characteristics to SEM images. Various commercially available dryer sheets, distinguished by fabric softeners and anti-static agents, and used or un-used are systematically tested on metallic, mineral, and biological samples. Seeing the images would be extremely interesting and seeing the difference after being used in a dryer and before is something which will mean to be completely different.

THE DEVELOPMENT OF MAGNETIC FIELD PROBES USING ANISOTROPIC MAGNETO-RESISTIVE SENSORS
Presenter(s): Ariel Block
Engineering Computer Science and Mathematics
Mentor(s): Sanghoon Kim (Facility for Rare Isotope Beams), Ting Xu (Facility for Rare Isotope Beams), Wei Chang (Facility for Rare Isotope Beams), Yue Hao (Facility for Rare Isotope Beams)

In Super Conducting Radio Frequency cavities, the dissipation of energy from within the cavity's walls in the form of magnetic vortices poses an adherence for the sake of optimization of the machines' performance, as well as its cost efficiency. To accurately detect and eliminate these, a 3-dimensional mapping of the magnetic field lines surrounding the cavity must be created using a detector/sensor that can actively withstand the near 70K temperatures of Liquid Nitrogen. Initially, researchers were tempted to utilize Fluxgate Magnetometers to carry out this task, as they are efficient, sensitive, and unidirectional sensors that could be paired together for this cause, but were quickly turned away due to their cost ineffectiveness. An option that is much more substantial in fulfilling these requirements while staying within budget, however, are Anisotropic Magnetoresistive (AMR) sensors which use the AMR effect to alter the Vout of the system depending on the angle and strength of the applied magnetic field lines, and adapt the sensitivity of this reading more based off the decrease in the environmental temperature and the supply voltage (Vcc). These sensors' capabilities need to be tested further before implementation, therefore, they will be ran under various testing conditions to be calibrated according to the Fluxgate Mangetometers' readings in miliGauss to get an understanding of how its values alter according to the field lines present.

COLLATZ CONJECTURE: QUANTIFYING THE CHAOS
Presenter(s): Andrew Koch
Engineering Computer Science and Mathematics
Mentor(s): Ryan Maccombs (College of Natural Science)

This project explores the Collatz conjecture, a famous unsolved problem in mathematics. Our research focused on creating a new format to analyze the number sequences produced by the Collatz operations. By taking a unique approach, we created a number table from a series of infinite arrays to look for patterns generated by the conjecture. By looking at the problem in a new way, we discovered patterns that haven't been highlighted in previous studies. This framework allowed for the detailed analysis and the development of mathematical equations for recurring patterns within the infinite sequence of numbers. These equations can be used to track any movement throughout the number table and may be used in the future to help explain these movements and provide insight in to the conjectures nature. While we didn't solve the Collatz conjecture, our work adds a new perspective to the field. We believe our method of analyzing the patterns can give us new insights into the Collatz conjecture and suggest new paths for future research in this feild and beyond.

FEDUP: SECURE AGGREGATION IN DECENTRALIZED FEDERATED MACHINE LEARNING
Presenter(s): Avi Lochab, Daniel Francisco Helo Puccini, Sid Bhattacharya, Uzair Mohammed
Engineering Computer Science and Mathematics
Mentor(s): Josh Siegel (College of Engineering)

Federated learning (FL) enables a collaborative environment for training machine learning models without sharing training data between users. This is typically achieved by aggregating model gradients on a central server. Decentralized Federated Learning (DFL) is a rising paradigm that enables users to collaboratively train machine learning models in a peer-to-peer manner, without the need for a central aggregation server. However, in order to effectively implement DFL in real-world use cases, volatile network connections and malicious actors must be taken into account. However, recent research has focused on byzantine-robustness in centralized federated learning with static network topologies. Thus, the need for an aggregation method that enables DFL nodes to sustain malicious actors and unstable network conditions has arisen. We investigate the effects of various aggregation methods in the presence of byzantine events and volatile network conditions. Finally, we propose an aggregation method that utilizes thresholding and Trimmed Mean to secure model aggregation for nodes in a dynamic DFL setting.

STUDY OF PLUME AND AEROSOLS PRODUCED BY HIGH VELOCITY AIR JET HAND DRYERS
Presenter(s): Alyssa Murphy
Engineering Computer Science and Mathematics
Mentor(s): Kaisen Lin (College of Engineering)

Hot-air operated hand dryers were first introduced in the 1990s and are now used in bathroom settings as a main hand drying method. While this method is quick and seemingly effective, hot-air hand drying may cause the aerosolization of harmful bacteria and other microorganisms that are present on washed hands. The goals of this study are to explore how high velocity air dryers mobilize bacteria from washed hands to air and to determine where these germs are dispersed around an indoor space. A 6'x12'x9' enclosed test chamber with installed commercial hand dryers was built to simulate a bathroom. To simulate drying hands with microbes present after hand washing, we pipetted E.coli culture onto gloved hands, distributed evenly across hands, and dried hands for 10 seconds. In order to identify the aerosol plume generated by the hand dryer, and to measure the mobilization of microbes around this space, we collected passive and active air samples to quantify the airborne bacteria concentration. Passive sampling included 45 petri dishes placed at various vertical and horizontal positions around the chamber. Active samplers included collecting airborne bacteria on a gelatin filter by pulling air with a pump sampler. Results indicated that there's a concentration gradient throughout the chamber. When comparing both dryers, the greatest release of particles from hands is produced by Xlerator . This work will enable current hand dryer companies to engineer new dryers that mitigate the s

COMPARING FITNESS FUNCTIONS WITH HUMAN JUDGEMENT FOR IMAGE SEGMENTATIONS
Presenter(s): Andrew Hart
Engineering Computer Science and Mathematics
Mentor(s): Dirk Colbry (College of Natural Science)

This study investigates the alignment between human judgment and four different fitness functions concerning the closeness of image segmentations of the same original image. Utilizing image segmentations created by the SEE-Insight research team, an experiment was conducted where the team, serving as participants, evaluated the segmentations of three images: a park scene, mushrooms, and a water bottle. The objective was to determine which fitness functions most closely approximate human perceptual judgment, utilizing a linear regression analysis to compare the distances from ratings derived from human judgment with the distances generated by the fitness functions.

ENHANCING RESEARCH MANAGEMENT AT MSU'S ICER THROUGH THE COLDFRONT PORTAL: A COMPREHENSIVE UPDATE FOR IMPROVED DATA ANALYSIS AND REPORTING
Presenter(s): Juan Carlier Blanco
Engineering Computer Science and Mathematics
Mentor(s): Dirk Colbry (College of Natural Science)

The Institute for Cyber-Enabled Research (ICER) provides computational resources and support to accelerate academic progress across the MSU community. To help manage and track ICERs efforts they are implementing a new ColdFront Portal tool. The ColdFront project will integrate MSU's internal research database with the large-scale computing resource usage. This integration is crucial for gathering comprehensive data on academic products, departmental engagements, and the financial impacts of ICER-supported projects, thereby ensuring a richer, data-driven understanding of ICER's contribution to MSU's academic community. This presentation will delve into the technical aspect of integrating ColdFront into ICER systems, the challenges faced during the implementation process, and the projected impact of these enhancements on the ICER community and MSU at large. Through this initiative, we aim to provide a clearer representation of the academic initiatives supported by ICER, demonstrating the invaluable resources these projects bring to the university.

A WATER-PROOF, SKIN-COMPATIBLE HYDROGEL WITH HIGH ADHESION FOR BIOELECTRONICS
Presenter(s): Khang Nguyen
Engineering Computer Science and Mathematics
Mentor(s): Caroline Szczepanski (College of Engineering), Denghao Fu (College of Engineering)

Stretchable bioelectronics is emerging as an effective option to measure biological tissue activities and signals. One of the popular methods to apply bioelectronics is to employ hydrogels at the interface between the bioelectronics and wet biological tissues, due to the easy processability, low cytotoxicity, and high wet adhesion. However, current hydrogel technology is prone to swelling and weak adhesion, due to the irreversibility of covalent bonds. Consequences include measurement inaccuracies from electrical signal destabilization and potential tissue damage upon removal. In our study, we designed four formulations of the hydrogel adhesives, using 30 wt% acrylic acid (AAc) or 30 wt% acrylamide (AAm) synthetic monomer, and chitosan, a naturally-derived monomer. Two concentrations of chitosan (2 and 0.75 wt%) are used. The hydrogel sheet was processed using UV photopolymerization in a glass mold. Adhesion strength was evaluated using lap-shear, 180 peel, and T-peel tests following ASTM standards. Real-time FTIR data was collected from the photopolymerization process to measure vinyl group conversion rates. We finally perform uniaxial testing, measuring tensile strength and fracture toughness. Real-time FTIR data show that AAc hydrogels have a faster conversion rate than AAm hydrogels, regardless of chitosan concentrations. We observed that the AAm hydrogels have a stronger fracture toughness and tensile properties compared to the AAc hydrogels at their respective chi

DATA ANALYSIS FOR NUCLEAR STRUCTURE
Presenter(s): Aditya Pandey
Engineering Computer Science and Mathematics
Mentor(s): Sean Liddick (Facility for Rare Isotope Beams)

This project focuses on analysing data collected from detectors during experiments and classify the pulses into distinct groups. These groups are then used to analyse time-series data.

INFORMATION THROUGH COLOR IN MICROFLUIDICS
Presenter(s): Nireimathiyan Sundaramsomu
Engineering Computer Science and Mathematics
Mentor(s): Aqeel Hussain Naqvi (College of Engineering), Bige Unluturk (College of Engineering)

There are many strategies to send information through devices in microfluidic molecular communication. They range from encoding information in the size, shape, or concentration of molecules to manipulating droplets of carrier molecules which corresponds to various modulation schemes. We propose a new modulation scheme by encoding information into the color of molecules. By assigning 3-bit values to primary and secondary colors, we created 8 symbols. We sent binary information via the three different streams of red, green, and blue colored water at the inlets of our microfluidic chip and the secondary colors that formed when they mixed in the channels. Typically, fluid flow in the microscale is laminar which prevents liquids from mixing, especially in the low flowrates found in microfluidics. However, we mixed the colored streams by using a unique channel design that forced turbulent flow in the device. Once the colors propagated toward the receiver side of the channel, we used a microscope to record videos of the stream. Then, we used snapshots of the video at different times to create a graph that showed a clearer picture of the information received. We analyzed the results and decoded the message sent. We repeated the experiment for different flowrates to determine the extent of mixing and optimum flow rates, symbol duration, and color thresholds to maximize the data rate and minimize the bit error rate.

CENTER OF PRESSURE VARIABILITY ACROSS VARIOUS POSTURES IN A RECLINER.

Presenter(s): Joshua Twumasi
Engineering Computer Science and Mathematics
Mentor(s): Justin Scott (College of Engineering), Tamara Bush (College of Engineering)

Understanding the center of pressure (COP) variations in different recliner postures is crucial for ergonomic design and improving user comfort and health, in particular for individuals with limited mobility. Among this population, some of the most commonly used postures include those with back recline and tilt-in-space. The goal of this work was to investigate how the COP location on the seat pan changed in four recliner postures for participants using a foam and ROHO cushions. The postures included those with no back recline or seat pan tilt, back recline with no seat pan tilt, seat pan tilt with no back recline, and back recline with seat pan tilt (tilt-in-space). A custom recliner with independent back and seat pan movements was created for this study. A pressure mat was used to collect pressure data on the seat pan for four participants in the four postures described for both cushions. The average COP location was calculated for each of the four postures. The findings reveal similar patterns in the foam cushion and the ROHO cushion where the COP shifted posteriorly in both positions with back recline relative to those without. In the position with only seat pan tilt, the COP shifted anteriorly. Understanding COP variability in recliner postures offers insights for ergonomic chair design and clinical applications. The findings show how postures influence the location of the COP, which can be used to increase comfort and prevent health complications rel

MECHANICAL ANALYSIS OF A RECLINER LINKAGE SYSTEM

Presenter(s): Abbey Yager
Engineering Computer Science and Mathematics
Mentor(s): Justin Scott (College of Engineering), Tamara Bush (College of Engineering)

In commercial recliners, the linear actuator that drives recline movements is often connected to a crossbar that extends across the width of the chair. The force exerted by the actuator causes considerable bending stress within the crossbar due to the large moment arm acted upon by the actuator, and could be a point for potential failure. Therefore, this project's objective was to analyze a prototype recliner's linkage system to identify the internal stresses of the crossbar. The analysis was used to evaluate cross sections of steel bars that would limit the deflection to less than 5 mm. The free body diagram was analyzed when applying 56 kg (half of the prototype's weight capacity) to the center of the seat back. The accelerations of the chair components while reclining were measured experimentally, and the stresses in the steel crossbar were calculated for multiple different cross sections to determine deflection. When analyzing the deflection, the square shaped hollow bar had the least amount of it compared to the square shaped solid bar and solid rods, making it the ideal shape for the linkage system of the recliner. This work led to a better understanding of the bending behavior of the crossbar under loading, as well as which shape would be ideal to limit the bars' deflection. The results will be applied to create an optimal design of the recliner mechanisms for power reclining chairs.

COMPOSITIONAL LEARNING: ARE LANGUAGE MODELS LIKE CHATGPT ABLE TO DO IT?
Presenter(s): Sania Sinha
Engineering Computer Science and Mathematics
Mentor(s): Parisa Kordjamshidi (College of Engineering)

Mastering the ability to combine basic concepts and construct more intricate ones is crucial for human cognition, especially when it comes to comprehending human language and visual perception. Despite its integral role in intelligence, there is a lack of a formal definition for computational modeling that clearly elucidates the various aspects of compositionality. This research aims to comprehensively examine existing literature from both the AI and cognitive studies perspectives to discuss, formalize, and analyze the definitions, tasks, evaluation benchmarks, and datasets associated with compositionality. We delve into earlier as well as more recent studies on large language models to gain a deeper understanding of the cutting-edge compositional capabilities exhibited by the latest generation of AI models. Our objective is to identify abstract concepts of compositionality in cognitive and linguistic studies and establish connections between these concepts and the computational challenges faced by language and vision models in compositional reasoning and their evaluation methods from both experimental and theoretical perspectives. We highlight the challenges that computational models encounter in acquiring compositional learning and the obstacles in conducting thorough evaluations, ultimately pinpointing important directions for future research.

LEARNING A ROBUST MINUTIAE EXTRACTOR VIA AN ENSEMBLE OF EXPERT MODELS
Presenter(s): Arhan Mulay
Engineering Computer Science and Mathematics
Mentor(s): Anil Jain (College of Engineering), Steven Grosz (College of Engineering)

Recognizing the limitations manual methods face when creating ground truth minutiae sets for fingerprint recognition, we propose an ensemble method that leverages the strengths of two well-known expert SDKs: Innovatrics and Verifinger. By combining the predictions of these two expert systems, our method aims to create a more comprehensive ground truth minutiae set, serving as a foundation for training fingerprint-matching models. We introduce four ensemble configurations using union and intersection techniques to capture a comprehensive set of minutiae, addressing the limitations inherent in any single extractor. Using the ensemble minutiae ground truth, we trained fingerprint recognition models using two distinct architectures: U-Net and Vision Transformers (ViT). These were evaluated using authentication scores and statistics were computed against a hand-marked ground truth dataset. Our experiment results were encouraging across both architectures, particularly for difficult test sets like NIST SD 302. Training with a ViT architecture led to a 1.59% improvement in matching accuracy, increasing from 92.79 % for the model trained on Innovatrics ground truth minutiae to 94.38% for the model trained on the ensemble ground truth. The U-Net architecture performance improvement was 1.74%, from 92.00% to 93.74%. These were both significant improvements from the results obtained from the Innovatrics and Verifinger SDKs. These results demonstrate the effectiveness of ensemble ground

Environmental Science & Natural Resources

MOLECULAR LEVEL UNDERSTANDING OF NEW AGE PFAS MIXTURES IN SOILS
Presenter(s): James Hager, Libby Ashby
Environmental Science and Natural Resources
Mentor(s): Angela Wilson (College of Natural Science), Narasimhan Loganathan (College of Natural Science)

Over the past 60 years, industrial and commercial sectors have been utilizing synthetic organofluorine compounds known as Per- and Polyfluoroalkyl Substances (PFAS). Due to their highly persistent and bio accumulative nature, PFAS are commonly known as "forever chemicals". In recent years, increasing studies have well-documented the toxicological behavior of PFAS, which clearly suggest that their exposure could potentially cause serious health implications to humans and wildlife. Soil is a major component in many exposure pathways that eventually lead to human consumption of PFAS. However, the influence of clay components on various PFAS mobility in soils remain poorly understood and having such comprehensive details will be important to understand the site specific PFAS behavior around contaminated soils. The behavior of new age PFAS molecules in different components of soils was examined under ambient thermodynamic conditions. Different types of new age PFAS molecules were investigated in this study with multiple prevalent soil minerals. The selected PFAS molecules vary significantly in the terminal functionalities and the batch column experiments show completely contrasting adsorption behavior in near- and sub-surface environments. This presentation will clearly demonstrate the critical interactions that dictate the adsorption of these PFAS molecules and how such interactions vary greatly between different minerals. This will provide more knowledge on PFAS contaminated

EMERGENCE OF CALICIOPSIS IN GREAT LAKES REGION
Presenter(s): Max Helser
Environmental Science and Natural Resources
Mentor(s): Becky Harkness (College of Agriculture & Natural Resources), Timothy Miles (College of Agriculture & Natural Resources)

Caliciopsis pinea, an ascomycete fungus that causes Caliciopsis canker disease (CDD) on *Pinus strobus*, was considered to be a native saprotroph upon its discovery in 1880. CCD was documented in the US for the first time in 1920. Since then, disease reports associated with *C. pinea*. have increased in both frequency and severity over the last two decades, with seedling mortality reported in some regions. Ascocarps of *Caliciopsis* species previously undocumented in the Great Lakes Region were observed on *Acer rubrum, Quercus velutina, Pinus resinosa, P. banksiana* and *P. strobus* in Michigan. ITSrDNA barcoding revealed three new species of *Caliciopsis* on these hosts. Additional observations and measurements were taken to compare morphologies between isolates and species and multi-gene phylogenetic analyses were completed. Trees were generated from both single-locus and concatenated alignments using maximum parsimony, maximum likelihood, and Bayesian analyses. The discovery of these previously unknown *Caliciopsi* spp. highlights the fungal diversity present in Michigan's forests.

A NOVEL, LOW-COST SYSTEM TO MEASURE CO2 DISSOLVED IN WATER
Presenter(s): Sage Stockdale
Environmental Science and Natural Resources
Mentor(s): Kelly Aho (College of Natural Science)

Streams and rivers are a major part of the carbon cycle and are responsible for a significant amount of carbon dioxide released to the atmosphere. Due to anthropogenic climate change, it is vital to understand carbon dioxide sources and cycling. Hydrologic regimes could have a large impact on carbon concentrations, particularly in smaller headwaters where there is more of an influence of carbon from soil being flushed into the river after a rainfall event. Currently, measuring carbon dioxide concentrations in rivers relies on field measurements taken manually or by expensive monitoring systems (~$15,000). This creates a barrier in obtaining data and therefore a lack of knowledge about carbon fluxes in watersheds. To address this barrier this project is developing a low-cost CO2 sensor system (< $600) capable of gathering data continuously in the field for long-term deployments. This new measurement system will allow for observation of seasonal variances, as well as shorter-term variances due to precipitation and metabolism disturbance in streams and rivers of various sizes

KENT COUNTY PARKS AND RECREATION
Presenter(s): Mia McNinch
Environmental Science and Natural Resources
Mentor(s): Josh Matzen (Kent Country Parks)

Kent County Parks (KCP) includes 43 parks, greenspaces, and trails, amassing almost 7,500 acres of land within the county. KCP is the oldest and largest county parks department in Michigan, employing around 140 seasonal parks workers every year (Kent County Parks, 2022). This past summer, I completed an internship working as a seasonal parks' employee focused on horticultural and landscape management. I worked hands on managing invasive plant species, ensuring wildlife health and safety, and maintaining four parks in the northeast section of Kent County. Through working alongside my park manager and other parks employees, I learned the various tasks and management strategies needed to effectively run and maintain public natural areas to benefit both the natural life and the visitors that utilize the area. I have gained experience working with large-scale natural area management and furthered my knowledge of essential ecological management tools and methods.

ASSESSING THE MAGNITUDES OF NITRATE LEACHING IN MICHIGAN SANDY SOILS BETWEEN AGRICULTURAL FERTILIZERS
Presenter(s): Aviana Anton, Caden Wade, Leyna Rassi
Environmental Science and Natural Resources
Mentor(s): Younsuk Dong (College of Agriculture & Natural Resources)

Nitrate leaching is a byproduct of the use of intensive fertilizer application during the agricultural process and can cause adverse effects to both human and environmental health. This is especially a problem in rural Michigan, as its soil is primarily composed of sand and allows water, and subsequently nitrogen fertilizer within the water, to quickly permeate through. By choosing a fertilizer with less severe nitrate leaching capabilities, a farm can reduce their ecological footprint without disrupting its productivity. Our project aims to gain a better understanding of the nature of nitrate leaching between different types of common commercial fertilizers and gather concrete numbers to operate with for possible solutions to nitrate leaching regarding fertilizer selection. Four common fertilizers, Diammonium Phosphate (DAP), Monoammonium Phosphate (MAP), Granular Prilled Urea (Urea), and Mixed Blend were selected. Five containers were packed with sand and fertilizers were applied at 9 grams of pure nitrogen, with one container acting as a control which did not receive fertilizer. Prior to our experiment, we predicted that Urea would produce the highest nitrate levels due to its high water solubility. Our findings show that DAP leached the most nitrate (114 mg/L at maximum) and MAP leached the least nitrate (5.48 mg/L at maximum).

PLANT ID TECHNICIAN INTERNSHIP IN MICHIGAN'S NORTHERN HARDWOOD FORESTS
Presenter(s): Alec Fowler
Environmental Science and Natural Resources
Mentor(s): Evan Farinosi (College of Agriculture & Natural Resources), Michael Walters (College of Agriculture & Natural Resources)

Lumber harvesting methods in Michigan northern hardwood forests have variable effects on species diversity and animal behaviors. Often, lumber harvesting sites harvest specific groups of trees to promote forest regeneration for future harvesting. The exact species which regenerate in each geographic region in relation to each harvesting method is not known, and so species abundance for each site would need to be surveyed. This task was divided between two crews of three people. On each site, quadrats were used and flagged at 30m intervals on 6 transects.

Species within the quadrat were recorded, as well as their height and cover percentage. Species observed on each site were added to a running species list, both on and off transects. We observed what species regenerated in the northern lower and upper peninsula of Michigan for each harvesting site. More species were observed in the western part of the peninsula in comparison to the eastern side. Additionally, disturbed areas on sites such as roads created by logging equipment showed higher species diversity. This project observes succession across multiple field seasons and is set to take place over the span of several years or even decades. The data contributes to a longitudinal study providing insight on species succession within lumber harvesting sites.

DEVELOPMENT OF A PORTABLE CARBON DIOXIDE SENSOR FOR ENVIRONMENTALLY CONSCIOUS IRRIGATION
Presenter(s): Kylie Jamrog
Environmental Science and Natural Resources
Mentor(s): Younsuk Dong (College of Agriculture & Natural Resources)

In recent years, activities like fossil fuel burning and deforestation have caused an increase in atmospheric greenhouse gas (GHG) concentrations. Carbon dioxide (CO_2) is the biggest GHG contributor to climate change, and accounts for around 60% of global warming. The current CO_2 atmospheric concentration is around 418 ppm, and this value continues to rise. Climate change has a strong effect on agriculture. As precipitation and temperature trends become more extreme, farmers are becoming more reliant on precision irrigation to optimize soil moisture conditions. In addition to supporting crop health, irrigation has effects on atmospheric GHG concentrations. Irrigation can increase soil carbon sequestration, a process that helps mitigate atmospheric CO_2 levels. Increased irrigation can also support denitrification, which releases GHGs like nitrous oxide (N_2O) into the atmosphere. This project focuses on the development, calibration, and testing of a sensor system for use in monitoring emissions. By implementing this device in a lab jar test, the correlation between carbon sequestration and irrigation can be analyzed, with varying soil textures and irrigation strategies. This data can be used to develop an optimized irrigation strategy for the limitation of GHG emissions.

GREEN SPACE COLLABORATIONS
Presenter(s): Joshua Doyle
Environmental Science and Natural Resources
Mentor(s): Elizabeth Perry (College of Agriculture & Natural Resources)

My presentation will share the results of my independent study looking at best collaboration practices used by those who create or better greenspaces in south-east Michigan. The research was carried out in a series of interviews with six different individuals, each interview taking 1 hour. Six open ended questions were put forth ranging from project identification to accountability within collaborations. In hopes to gain a comprehensive assessment of the collaboration these greenspaces require, representatives from the nonprofit, private, and public sectors were selected for interview. With my time, I plan to highlight a handful of key concepts that were communicated during these interviews.

NATIVE SPECIES SURVEY ON AN ORGANIC HERB FARM IN WASHINGTON STATE.
Presenter(s): Alyssa Mollema
Environmental Science and Natural Resources
Mentor(s): Summer Ragosta (Amway at Trout Lake Farms LLC)

Trout Lake Farm, LLC (TLF) is a certified organic herb farm in Trout Lake, WA that supplies feedstock to a leading nutritional supplement company. The goal of this study was to provide a baseline understanding of pollinator habitat on farm property, as well as the proportion of native species found along farm borders and field edges. Methods included random sampling of uncultivated areas on farm property for native and non-native plant cover, as well as sampling both cultivated and uncultivated areas on property for pollinators. Results show that 12 percent of the farm's property can be considered beneficial habitat for pollinators and other key wildlife, and 6.3 percent of the farm's property is covered by native species. Pollinators were observed to be more abundant within the crop fields, and the most abundant pollinator observed was the non-native honey bee (Apis mellifera).

REVITALIZING THE RED CEDAR: COMBATING INVASIVES AND FOSTERING BIODIVERSITY AT MSU
Presenter(s): Madelin Snook
Environmental Science and Natural Resources
Mentor(s): Carolyn Miller (University Arts & Collections)

This internship at the W.J. Beal Botanical Garden focused on addressing the ecological challenges posed by invasive species and soil erosion along the banks of the Red Cedar River, traversing Michigan State University's campus. As an Invasive Species Scholar, the main focus was to identify, treat and remove invasive species around campus, but especially ones that were negatively contributing to the condition of the river and its surrounding ecosystem. This focus also extended into researching native-to-Michigan plant species that not only prevent soil erosion, but can also benefit surrounding plant species and organisms such as birds, butterflies and bees. The advantage of this being that we introduce/reintroduce threatened or endangered species to the area, as well as advance on the education that the W.J. Beal Botanical Garden can provide to others. Through these hands-on activities, the results of this project are still ongoing, but with the progress that has been made, these efforts are sure to support a flourishing diversity around campus and the preservation of the Red Cedar River.

THE EFFECTS OF ENVIRONMENTAL CONDITIONS ON THE GROWTH OF MANOOMIN (ZIZANIA AQUATICA) AT COREY MARSH ECOLOGICAL RESEARCH CENTER
Presenter(s): Jordan Zapata
Environmental Science and Natural Resources
Mentor(s): Jennifer Owen (College of Agriculture & Natural Resources)

Wild rice (manoomin; *Zizania aquatica*) is an ecologically and culturally important grass, creating habitat for wildlife and food for people for thousands of years. In Michigan, wild rice has seen large population declines due to habitat degradation. Reintroducing an extirpated species can be an important tool for ensuring the survival of the species, and for restoring a degraded ecosystem. However, biotic and abiotic conditions may prevent a species from establishing. Because of the scale of wild rice habitat degradation, altered wetland sites may be important candidates for reintroduction. Therefore, understanding the environmental conditions of a potential site is crucial for reintroduction planning. Our research was conducted during summer of 2022 and 2023 at Corey Marsh Ecological Research Center in Clinton County, Michigan. Our research objective was to test the effects of fluctuating water depths and herbivory pressure on the growth of wild rice. Wild rice seeds were sown in four plots, each with varying water depth. Each plot included two replicates, one with wire exclosures to exclude herbivores, and one without. Average stem length and water depth were measured throughout the growing season (April-August). We hypothesized that average stem length (as a measure of plant growth) of rice would be longer in the exclosure plots and shorter in plots with large fluctuations in water depth. The results of this experiment will increase our understanding of the enviro

HOW A NUANCED MODEL OF HABITABILITY CAN INFORM THE SEARCH FOR LIFE BEYOND EARTH

Presenter(s): Cesarine Graham
Environmental Science and Natural Resources
Mentor(s): Matthew Schrenk (College of Natural Science)

Until recently, most models of habitability have relied upon the presence of liquid water at the planetary surface. However, recognition of microbial ecosystems supported by chemical disequilibrium and the presence of subsurface oceans on icy moons of the outer solar system have expanded the range of potentially habitable environments. These moons have become a prime target for exploration in the coming decades and in the search for life beyond Earth. However, to date, most habitability models have considered all of Earth's lifeforms as just one bin, ignoring the nuanced adaptations of individual species, their constraints, and the biosignatures they produce. In this work, we developed species-specific habitability models which we superimposed upon the physical-chemical landscape of Earth and other ocean worlds. For this study, we extracted data on the physical and chemical limits of model microorganisms commonly found at deep-sea hydrothermal vents, the sulfate-reducing bacterium Maridesulfovibrio, and the sulfide-oxidizing taxon Sulfurovum. These organisms were chosen as a test system for this study as deep-sea vents are hotspots for chemical disequilibrium due to mixing between reducing and oxidizing fluids in a manner that has been present since early in Earth's history and are likely present on Europa, Titan, and Enceladus. We used this data to develop habitability models of where these particular strains could exist on Earth and tested these models against published dat

UNRAVELING THE GENETIC IMPACT OF STREAM CONNECTIVITY RESTORATION IN MINNESOTA BROOK TROUT
Presenter(s): Emily Bardwell-Patino
Environmental Science and Natural Resources
Mentor(s): Mariah Meek (College of Natural Science)

Human activities such as infrastructure development can have a significant impact on the connectivity of freshwater stream ecosystems. Culverts are commonly built to connect water sources under roads and can act as partial or complete barriers to fish movement. This poses a significant challenge to the conservation of species like brook trout (Salvelinus fontinalis), which rely on connected stream habitats. Populations with the inability to disperse through a culvert may experience reduced gene flow, leading to decreased genetic diversity. Restoring culverts to enhance stream connectivity and passability may mitigate these barriers, potentially influencing gene flow and genetic diversity. Here, I investigate the genetic impacts that culvert restoration may have on brook trout populations in a Minnesota stream. Using genomic data from individuals located upstream and downstream of culverts before and after restoration, this study explores how restored stream connectivity influences population structure, gene flow, and genetic diversity in brook trout. These findings advance our understanding of the effects of stream barriers and restored connectivity on fish population dynamics and are essential to inform conservation management strategies for the long-term persistence of brook trout populations under changing environmental conditions.

DETERMINATION OF LEAF ABSCISSION IN COMMON DECIDUOUS TREES OF MICHIGAN
Presenter(s): Easton Bovee
Environmental Science and Natural Resources
Mentor(s): Tammy Long (College of Natural Science)

Phenology is the study of cyclic patterns in nature like insect emergence, mammal hibernation, and leaf abscission (leaf fall). Weather conditions like temperature, day length, and precipitation are known to influence phenological patterns, but it remains unclear how climate change will affect the timing of leaf abscission. The Michigan Department of Natural Resources reported that significant amounts of Michigan forests are stocked with deciduous trees, or those that undergo autumn leaf abscission. Among the most prolific are red maple, sugar maple, American beech, red oak, and white oak. This study explores the effect of spring precipitation on autumn leaf abscission in these species. We compared the effects of mean daily precipitation, mean precipitation event size, and precipitation variability on leaf abscission onset (10% leaf fall), midpoint (50% leaf fall), and duration (the difference between onset and midpoint) for the years 2017-23 excluding 2020. We found that higher mean daily precipitation and mean event size correlated with earlier leaf abscission, but duration did not meaningfully change. Precipitation variability did not significantly influence abscission timing. Climate change models predict higher levels of spring precipitation in Michigan, which could lead to earlier abscission in Michigan trees. The timing of leaf abscission has important consequences for ecological processes like nutrient cycling and habitat creation as

VARYING OXYGEN SATURATION IN VITRO TO DETERMINE OXYGEN THRESHOLD OF IODATE REDUCTION IN SHEWANELLA ONEIDENSIS
Presenter(s): Ian Carley
Environmental Science and Natural Resources
Mentor(s): Dalton Hardisty (College of Natural Science)

Oxygen minimum zones (OMZs) are layers in the water column that have low oxygen due to biological, chemical, and physical processes. These areas have been observed to be highly redox and biologically active, cycling different trace elements such as iodate and iodide. Redox reactions involving iodine species can be used to track ocean dynamics in ancient oceans but also exist all over the world today. However, the mechanisms by which these reactions occur are not well understood. Shewanella oneidensis are metal-reducing bacteria commonly found in warm and temperate regions worldwide and are part of the marine environment microflora. Shewanella are known reducers of iodate in anaerobic conditions, however, the exact oxygen saturation at which Shewanella begin to reduce iodate to iodide is unknown. By varying oxygen levels in our cultures in an environmental hypoxia chamber, which allows for controls on CO_2 and O_2 at 0-25% and 0-20% range, respectively. We intend to quantify the rate dependency of iodate reduction on O_2 and the O_2 threshold at which iodate reduction becomes favorable. This would allow for a more precise understanding of iodine cycling in today's OMZs and ancient oceans, giving insights into the mechanisms of these redox reactions.

RNA IN DAIRY COWS
Presenter(s): Ashley Freestone
Environmental Science and Natural Resources
Mentor(s): Cynthia Collings (College of Agriculture & Natural Resources)

In 2021 the average American consumed 667 pounds of dairy according to the USDA. Despite dairy being such a large part of our food supply, the practice of obtaining cow's milk is largely unchanged. The Zhou lab at Michigan State University works to increase lactation production in dairy cows through the treatment of BCAA in dairy cows. After treatment, samples were taken from the liver, muscle and adipose of the cow. I worked with these samples to test their RNA, DNA and protein concentrations. These concentrations were then used to test the lactation potential of the dairy cow. Through this experience, I was able to work hands-on with lab protocols, equipment and learned about research in academia. During my time in the lab, I was able to see the process of working through a scientific question and how the results of the experiment can alter your steps going forward. Science is always evolving and there is a constant need for scientific research.

EXPLORING ECO BEHAVIORS THROUGH SURVEYS AND CONVERSATIONS
Presenter(s): Lauren Garrison, Nora Gleason, Sophia Mettes
Environmental Science and Natural Resources
Mentor(s): Katherine Alaimo (College of Agriculture & Natural Resources)

Many people are aware of the climate and nature crises, yet they don't know what to do or if their actions will make a difference. The purpose of the Earth is My Home initiative is to encourage people to have conversations about the actions they are taking to improve the environment, encourage them to take meaningful action, and appreciate people for the actions they take. This research was conducted to determine which eco-actions people are currently doing and actions they would be willing to take in the future. A checklist of eco-actions was created in six areas: nature, home energy, food, waste, transportation, and advocacy. The survey was designed in Qualtrics and included environmental values, the checklist, and demographics. Survey participants were recruited with flyers and in person interactions at one public events, a library, and a local farmers market. Surveys were completed by over 100 participants of which approximately half were college students. Participants reported their actions in all six checklist categories with food and waste being the most popular categories, and advocacy the least popular category. Almost all participants agreed that "It is important to take action to care for nature every day" but fewer said they "tell other people that [they] appreciate the actions [others] take to care for nature". Participants reported doing now and planning to do a range of eco-actions. This study demonstrates that many people are taking action for the earth an

UNDERSTANDING BIOLOGICAL ADAPTATIONS TO OCEAN WORLD ANALOG CONDITIONS BY STUDYING THE PROTEOMIC RESPONSE OF MARIDESULFOVIBRO HYDROTHERMALIS TO HIGH PRESSURE
Presenter(s): Ella Cardoza
Environmental Science and Natural Resources
Mentor(s): Matthew Schrenk (College of Natural Science)

A large volume of habitable space on both Earth and other bodies of the solar system exists at elevated hydrostatic pressures. A particularly attractive target for astrobiological exploration are the icy Ocean Worlds of the outer solar systems (e.g., Europa, Enceladus), where high pressure (HP) may intersect with permissive temperatures and energy sources introduced through hydrothermal circulation or water-rock reactions. Unfortunately, studies of microbial responses to high hydrostatic pressure are relatively limited, focused primarily on survival and growth rather than activity. The proteomic response of a model piezophilic bacteria, *Maridesulfovibrio hydrothermalis* AM13, was investigated as a function of pressure stress to explore the relationship between HP microbial activity and physiological adaptations and consider its consequences for astrobiological exploration. The results of this work are informative to astrobiological exploration of Ocean Worlds in several respects. Firstly, the work will clarify how microbial populations are adapted to extreme environments, particularly at the limits of activity (rather than growth). Second, the work might provide a definitive view into subsurface ocean world habitats influenced by a range of parameters linked to energy availability, temperature, salinity, and importantly pressure. Finally, this work could help identify novel, piezophile-specific biosignatures that can be targeted in HP Ocean World habitats. In oth

CREATING AND USING AN INLAND LAKE AQUATIC PLANT DATABASE TO DETERMINE DISTRIBUTION PATTERNS AND ENVIRONMENTAL PREFERENCES OF CARNIVOROUS BLADDERWORT SPECIES
Presenter(s): Lucy Breda
Environmental Science and Natural Resources
Mentor(s): Daniel Hayes (College of Agriculture & Natural Resources), Jeremy Hartsock (College of Agriculture & Natural Resources)

Aquatic plant distribution and abundance in Michigan's inland lakes on a species level is a large knowledge gap in scientific literature. As such, we sampled 75 lakes in northern Michigan to better understand the status of aquatic plant communities and created a database to share this information among stakeholders. To test the utility of the database, we examined the distribution and environmental parameters for bladderwort species. Overall, bladderworts are present in a large number of the lakes we surveyed (45 of 75). From the many environmental factors we attempted to correlate with the presence of bladderworts, no single factor appeared to be a definite predictor of the presence of bladderworts. Thus, bladderworts can exist across a wide range of lake water chemistry and amount of disturbance, such as shoreline development and herbicide treatment history. In doing this research, we found that this database is user friendly and similar investigations can be done to understand distribution and environmental preferences of other aquatic species, native, rare, and problematic invasives.

UNDERSTANDING THE DYNAMICS OF BRICK-AND-MORTAR AMPHIBIAN RETAILERS IN THE UNITED STATES
Presenter(s): Kira Dowell
Environmental Science and Natural Resources
Mentor(s): Alexa Warwick (College of Agriculture & Natural Resources), Giavanna Haddock (College of Agriculture & Natural Resources)

Amphibians play a crucial role in insect control, ecosystem balance, and serve as environmental indicators. The introduction of diseases through the human behavior-driven pet trade threatens these vital populations. With 300 native amphibian species at potential risk in the U.S., understanding this human impact on the amphibian trade is vital for their protection. Here, we extensively explore economic factors influencing animal movement in the U.S. amphibian pet trade with a focus on brick-and-mortar amphibian retailers, which potentially drives pathogen spread. Quantitative data collection in the United States categorizes small-scale and large-scale retailers in the two subregions of the Midwest, being the East North Central (ENC) and West North Central (WNC). The study considers factors such as amphibian presence on websites, explicit mentions, and evaluations of social media content, to determine if the potential businesses are amphibian retailers. Results reveal that in the ENC there are 136 active small-scale retailers and 82 in WNC, contrasting with 358 large-scale retailers, Petco, and PetSmart specifically, in ENC and 187 in WNC. This comparison highlights the substantial influence of large-scale retailers on the amphibian trade market. The findings underscore the need to consider retailer impact on consumer spending, regional shopping preferences, and target demographics for education and outreach on ethical pet amphibian care in the future.

A GLIMPSE INSIDE THE FOUNDATIONS IN EUROPE

Presenter(s): Amarildo Hysa

Environmental Science and Natural Resources

Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Through this work, I would be able to analyze the structure of a certain type of cement utilized in construction in Europe, specifically Albania, and then build on the following components: CORE STRUCTURE: Analyze the pore structure of the concrete. A lower porosity is generally desirable as it indicates a more compact and less permeable structure, which can enhance durability. CRACK FORMATION: Identify any signs of cracks or voids within the concrete matrix. Excessive cracking can weaken the structure and reduce its durability. MICROSTRUCTURE: Look for microcracks and other defects in the microstructure that could potentially weaken the concrete. MINERALOGY: Analyze the mineralogical composition of the concrete to understand the types and amounts of phases present. Different mineralogical compositions can influence concrete properties. SEM can provide detailed information about the microstructure, other tests and analyses, such as compressive strength tests, permeability tests, and chemical analyses to comprehensively evaluate concrete quality.

AN ANALYSIS OF CERAMBYCID DIVERSITY AND FOREST COMPOSITION IN CAMPUS NATURAL AREAS

Presenter(s): Drew Lacommare

Environmental Science and Natural Resources

Mentor(s): Deborah McCullough (College of Agriculture & Natural Resources)

Longhorned beetles (Coleoptera: Cerambycidae), lay their eggs in niches on the bark of dying trees or recently fallen logs. Larvae hatch in early or mid summer, then feeding in galleries in phloem and sapwood. Cerambycids play important roles in decomposition and nutrient cycling in forest ecosystems. However, for many species, little is known about their biology and preferred hosts. We captured adult cerambycid beetles in baited traps in 2023 in three MSU Campus Natural Areas: Toumey, Hudson & Biebishiemer Woodland. We recorded overstory tree species and tallied coarse woody debris (CWD) in each site. Relatively fresh CWD could have served as brood material for adult beetles. Freshly cut white oak (Quercus alba) sentinel logs were placed in each site to assess colonization of the logs by cerambycids. Abundance of captured adult cerambycids, overstory tree composition and CWD were similar among all 3 sites. Cerambycid diversity, however, was notably high despite the small size (5 to 9 ha) and fragmented distribution of these woodlots. Some portion of captured beetles may have developed in fresh CWD within sites but many likely immigrated into these woodlots. Fresh cut oak logs laying on the ground were heavily colonized by cerambycids but upright logs were much less attractive to egg-laying beetles.

ASSESSING THE EFFECTIVENESS OF DIY 2-LITER BLACK LIGHT MOTH TRAPS FOR EDUCATIONAL USE

Presenter(s): Grace Best
Environmental Science and Natural Resources
Mentor(s): Brian Keas (Office of Undergraduate Education)

A prior investigation examined the efficacy of economical moth traps priced at $30 each, offering a feasible option for those unable to access more expensive alternatives. These low-cost traps are designed for integration into educational settings, but they are equally suitable for individual use in recreational trapping. In this study, we developed an even more budget-friendly trap fashioned from 2-liter drink bottles, priced at just $2 each, with an 11 cm diameter. These traps underwent assessment alongside a 3D printed trap ($60, 12 cm diameter) and a commercial trap ($215, 29 cm diameter) over nine trap nights in a suburban woodlot during the summer of 2023. As anticipated, the commercial trap yielded the highest moth captures, followed by the 3D printed trap and the 2-liter traps. Moth family and species diversity exhibited a similar trend, correlated with the varying funnel sizes and black light output among the trap types. Importantly, in terms of cost efficiency, the 2-liter traps outperformed the others, offering a lower cost per moth compared to the 3D printed and commercial traps. The extremely low cost of the 2-liter traps makes them an ideal choice for K-8 classroom activities. Each student or small group can utilize their own trap for personalized research projects, fostering hands-on scientific experiences and enhancing overall learning engagement.

IMPACTS OF CLIMATE CHANGE ON FREEZE-THAW CYCLES IN MIDWESTERN CITIES

Presenter(s): Curtis Chou, Sydney Ceyzyk
Environmental Science and Natural Resources
Mentor(s): Gerald Urquhart (Lyman Briggs College)

The susceptibility of infrastructure to damage from freeze-thaw cycles (FTCs) is well established, particularly in regions with frequent occurrences of these events. This phenomenon, driven by the expansion and contraction of water within structures, poses significant challenges and financial burdens for governments tasked with maintaining roads, buildings, and sidewalks. With climate change exerting its influence, alterations in FTC frequencies are anticipated. In this study, we examined weather station data from midwestern cities in the continental United States to assess shifts in FTC occurrences. After manually downloading annual weather data for airports near major and minor cities, we used a Python program to quantify the number of days each winter where the temperature rose to or above 33° F and dropped to or below 32° F. The results of our study are consistent with the prediction of a warming climate. Our analysis shows a divergence in FTC patterns, with southern cities experiencing a decrease in frequency while northern cities are having increased frequency of FTCs. This research underscores the imperative for proactive infrastructure management strategies to mitigate the anticipated impacts of changing freeze-thaw dynamics. Keywords: Freeze-thaw cycles (FTCs), Infrastructure, Climate change. This research was part of a team project conducted by the authors listed above. We have divided the topic into two presentations or posters, one by Curtis Chou and one by

AN EXPLORATION OF INTERSPECIFIC AVIAN INTERACTIONS
Presenter(s): Caroline Roche, Giovanni DePasquale, India Hirschowitz
Environmental Science and Natural Resources
Mentor(s): Emily Parker (College of Natural Science)

Bird populations are changing in both size and location in response to climate change. Birds occur throughout the globe, and occupy a wide array of functional groups. The goal of the Avian Metanetwork is to categorize interactions between North American bird species, and model how these might change over time and space in response to climate change. Interaction data is gathered from Cornell's Birds of the World species accounts and will be combined with the Breeding Bird Survey and eBird occurrence records for network modeling. The Metanetwork created an open access database of interactions between North American bird species and establish interaction networks that model through time and space.

DUMPING MORE CHUNKS
Presenter(s): Mason Hambley
Environmental Science and Natural Resources
Mentor(s): Nathan Moore (College of Social Science), William McConnell (College of Social Science)

MSU aims to be at the forefront of recycling but the Combo Exchange system has caused parts of the campus to fall behind in this goal. In particular, the generation of waste from Sparty's mobile ordering locations such as at 1855 Place and Holmes Hall has been somewhat concerning. The goal of this project was to target a particular source of waste, pizza boxes, and try and improve the rates of recycling. Recycling stamps were chosen as the preferred method to try and make an impact as they are cost effective and can be widely applied to many pizza boxes with minimal effort. Pizza boxes were chosen as many people are unaware of their recyclability (even with small amounts of cheese and grease) and they constitute a major amount of old corrugated cardboard (OCC) waste generated. This project was done at the Holmes Hall Sparty's Mobile Ordering Location where researchers collected data on how many boxes were recycled on site versus the amount of boxes that were sold that day. A baseline rate of recycling was observed for two weeks. After the baseline measure was collected a recycling stamp was introduced onto the top of the pizza boxes and the rate of recycling was observed for another two weeks. Afterwards to see if the stamp had a lasting effect on students' recycling behavior the rate of recycling was observed without the stamp for two weeks following the treatment. Overall, the stamp proved to be ineffective at changing students' recycling behaviors.

DIFFERENCES IN MICROBIAL COMMUNITY COMPOSITION WITHIN THE SAGINAW AQUIFER, THE PREDOMINANT SOURCE OF DRINKING WATER FOR MID-MICHIGAN
Presenter(s): Carol Hogan
Environmental Science and Natural Resources
Mentor(s): Matthew Schrenk (College of Natural Science)

The Saginaw aquifer provides access to clean drinking water to Michigan residents from the Lansing area to Saginaw Bay. However, the biogeochemistry of this critical resource is poorly understood. The Saginaw aquifer is primarily composed of sandstone which allows groundwater to flow through the pores while transporting dissolved chemicals and bacterial cells. Additionally, groundwater in the lower peninsula flows from mid-Michigan to Lake Huron towards Saginaw Bay, displaying different ages of water, young to old. Groundwater age was determined using Tritium and Carbon-14 dating. Groundwater samples were collected from mid-Michigan towards Saginaw Bay to better understand the relationship between biogeochemistry, groundwater age, and microbial communities. Field observation showed biogeochemical differences between Lansing and Grand Ledge. For example, groundwater in Lansing tends to be harder and more iron rich than Grand Ledge. Cell counts determined from Grand Ledge groundwater contains more biomass than Lansing groundwater. Additionally, four sites located far from each other displayed unique biogeochemistry and a previously unobserved bacterial species. The identification of the bacteria and characterization of the microbial communities were carried out by DNA extraction and metagenomics. All geospatial data is mapped using ArcGIS Online to further analyze geospatial relationships. Documenting changes in groundwater along its flow path helps identify interactions

ASSESSING THE PHYSICAL RESILIENCE OF TRAILS FOR SUSTAINABLE USAGE-SUSTAINING THE HURON-MANISTEE NATIONAL FOREST TRAIL SYSTEM
Presenter(s): Madison Janes
Environmental Science and Natural Resources
Mentor(s): Dan McCole (College of Agriculture & Natural Resources), Elizabeth Perry (College of Agriculture & Natural Resources)

As park and protected area visitation rises, enhancing their sustainability is crucial. Trail quality is crucial for land managers balancing recreational access and natural preservation and for visitors seeking high-quality recreation experiences. Every trail in a protected area is unique but may share similarities with others, prompting managers to sustain multiple trails within one system. The US Forest Service strives to sustain a vibrant trail system for present and future generations. The HMNFs hosts the Manistee River Trail (MRT) and part of the North Country Trail (NCT), the US's longest trail, which forms the 23-mile loop known as the Manistee River Loop Trail. The MRT offers access to dispersed campsites and water points while boasting scenic views of the Manistee River and flatter terrain. The NCT offers a challenging hike with undulating terrain, suitable for beginners. This loop is popular across the Midwest and cherished by Michiganders. This diverse trail system is ideal for studying social-ecological sustainability. HMNFs requested research support from Michigan State University to conduct a trail sustainability assessment. The assessment measures trail durability across seasons, with physical measurements taken on the MRT in summer 2023 and the NCT in fall 2023. The researchers evaluated trail characteristics, including tread type, position, with, and alignment, with assessments made every 1,000 feet, totaling 94 intersects, and over 2,500 data points collecte

EARTH EDUCATION AT TERRA MARIN

Presenter(s): Morgan King
Environmental Science and Natural Resources
Mentor(s): Eva Farre Prokosch (College of Natural Science), Tammy Long (College of Natural Science)

In the summer of 2023, I was offered a seasonal job at Terra Marin Schools, a private school and summer camp in Marin County, California. My job title was "Lead Earth Educator", and I was responsible for approximately 7-15 children (ranging from 3 to 10 years old) daily in public park settings. My goal was to create effective, interesting, and meaningful lessons that helped the children I was working with understand and connect to the natural world around them.

DOES INVASIVE CRAYFISH PRESENCE IMPACT MACROINVERTEBRATES?

Presenter(s): Max Petsch
Environmental Science and Natural Resources
Mentor(s): Brian Roth (College of Agriculture & Natural Resources)

The invasive Red Swamp Crayfish (*Procambarus clarkii*) was detected in Michigan waters in 2017. Originally native to the southeastern United States, they are established in several locations around the state of Michigan. Red Swamp crayfish are demonstrated to cause ecosystem harm to native crayfish, aquatic communities, and erosion of waterbody shorelines in other invaded locations. However, their impact on Michigan ecosystems is unknown. The goal of this study is to investigate relationships between *P. clarkii* abundance and macroinvertebrate sample counts. Routine trapping surveys were conducted on ponds known to contain *P. clarkii* between 2017-2023 to provide catch per unit effort data on these ponds. Macroinvertebrate surveys were performed using dipnets and ponar grabs, and each sample was processed to count the number of total macroinvertebrates. Results demonstrate a negative correlation between CPUE for all crayfish species and macroinvertebrate counts. Contrary to our expectations, an increase in percentage of *P. clarkii* does not have substantial influence on macroinvertebrate counts. Ponds that contain the highest percentage of *P. clarkii* had the highest macroinvertebrate counts. With low R-squared values and large standard error bars, continued monitoring of benthic invertebrate populations is likely necessary to accurately represent any relationships.

CALIBRATION OF MUSCLE LIPID CONTENT IN LAKE WHITEFISH (COREGONUS CLUPEAFORMIS)

Presenter(s): Jenus Shrestha
Environmental Science and Natural Resources
Mentor(s): Cheryl Murphy (College of Agriculture & Natural Resources), Rachel Leads (College of Agriculture & Natural Resources)

Lake whitefish (*Coregonus clupeaformis*) are an ecologically, economically, and culturally important species distributed throughout the Great Lakes. Because of their importance as a fishery resource, there is great research interest in whitefish stock assessments, recruitment, population health, and condition. Lipid content is one important parameter that can help evaluate individual and population health of fishes as it is often associated with increased energy reserves, improved survival, and greater reproductive success. However, traditional methods for measuring lipid content in fishes require lethal sampling and time-consuming analyses. Alternatively, microwave meters can be used as a non-lethal and non-destructive method for quickly estimating fish lipid content. The aim of the present study was to assess the effectiveness of a microwave meter as an indicator of lipid content in lake whitefish. To do this, lake whitefish (n=30) were collected in northern Lake Huron. A microwave meter was used to non-invasively estimate lipid content at several locations on each individual. Lipids were then extracted in the laboratory using a chloroform-methanol solvent extraction, and muscle lipid content was calculated as percent by wet mass. The sensitivity of the microwave meter was determined based on the correlation between lipid content and values obtained from the microwave meter. Microwave meter readings taken above the lateral line, anterior to the dorsal fin c

EXPLORING NICHE PARTITIONING OF DENDROBATIDAE AND AROMOBATIDAE IN BOCA DEL TORO OF PANAMA

Presenter(s): Hannah Vanslembrouck
Environmental Science and Natural Resources
Mentor(s): Justin Lawrence (Lyman Briggs College)

Abstract: Niche partitioning is a process by which competing species subdivide their shared resources in order to coexist. This process allows for greater biodiversity, prevents competitive exclusion, and explains the high diversity in places such as the tropics. In various locations in Panama, multiple poison frog species coexist within the same habitat. We focused on four species of striped poison frogs including both toxic (Phyllobates lugubris, Andinobates claudiae) and nontoxic (Silverstoneia flotator, and Allobates talamancae) species, all of which are native to the Bocas del Toro archipelago in western Panama. These represent two families, Dendrobatidae and Aromobatidae, in the superfamily Dendrobatoidea. Dendrobatid poison frogs acquire defensive alkaloids from their diet (with mites and ants being the main sources of alkaloids); we examined how these diets varied among species, location, and whether the individual is toxic or nontoxic. Stomachs were dissected, contents were photographed and measured using ImageJ. The measurements were used to identify the invertebrates into broad categories: mites, termites, and ants. These data were then compared between and among species to determine similarities and differences in diet. We found that toxic species tend to eat

a high amount of mites. Non-toxic species typically eat a minimal to negligible amount of mites and a high amount of ants. Preliminary data suggest there is variation in the general composition of diets among

SEARCHING FOR HARMONY IN THE OUTDOORS: AN EXPLORATION OF HUNTING AND FISHING PARTICIPATION IN MICHIGAN
Presenter(s): Jerome Hamilton
Environmental Science and Natural Resources
Mentor(s): Daniel Kramer (James Madison College), John Waller (College of Social Science)

Hunting and fishing are important because of the physical and mental health benefits that they offer to participants and the monetary support that they provide for conservation in the United States. However, hunting has struggled to become relevant to a diverse audience of Americans resulting in declining numbers nationally, and many recreators of color face constrains to participating in fishing. These trends threaten conservation funding and signal disparities in the ability to accrue health benefits from these activities. In an effort to increase participation, scholars have gathered information about the motivations and constraints of hunters and anglers, and have studied the behavioral intentions of prospective hunters and anglers; however, little research has attempted to connect the motivations and constraints of prospective hunting and fishing participants to that of the current participants. Therefore, it is the purpose of this study to understand the constraints and motivations of hunters, anglers, and general outdoor recreationists through a survey of Michigan recreators. In addition, rather than only asking about constraints, the survey will ask each participant to identify solutions that they believe are most likely to improve their access to and enjoyment of outdoor recreation areas. The results of this study are expected to inform the development of successful campaigns that recruit and retain diverse hunter and angl

MICHIGAN IMPROVED WATER POLICY
Presenter(s): Anneke Spoelma, Ayanna Soto, Maren Williams
Environmental Science and Natural Resources
Mentor(s): Younsuk Dong (College of Agriculture & Natural Resources)

We plan to research Florida, California, Washington, and Texas comparing their water policies to Michigan. In the end, we will propose new water policies which should improve Michigan's water efficiency and water use. Currently, Michigan sits at 43rd on the Alliance for Water Efficiency Scale while states with less water are ranked much higher, including California (1), Texas (2), and Washington (4), and Florida (18). Our group will do in-depth research into water policies in states that rank high on The Alliance for Water Efficiency scale, to find common themes and potential solutions for the water problems Michigan faces. Research will consist of literature reviews of different policies and bills, focusing on what efforts seem to be most effective. We will interview Michigan government officials concerning their perspective of water policy in Michigan. Following completion of policy research, we will develop a legislative proposal for Michigan through analysis of water policy in other states. The proposal will address key issues facing Michigan's water quality and conservation efforts and propose solutions that would advance the state's current standing on the Alliance for Water Efficiency Scale.

MAPPING HUMAN IMPACT: A MULTIVARIATE INDEX FOR LAKES ACROSS THE US
Presenter(s): Navid Ali
Environmental Science and Natural Resources
Mentor(s): Patrick Hanly (College of Agriculture & Natural Resources)

Freshwater resources face increasing depletion due to human activities associated with agricultural and urban expansion. However, the comprehensive impact of these stressors on a broader scale remains largely understudied. This research addresses this gap by utilizing structural equation modeling (SEM) to develop and assess a multivariate index of human disturbance factors affecting lakes across the conterminous United States. Drawing from datasets including the 2017 National Lake Assessment, EnviroAtlas database, and USGS datasets, alongside the LAGOS-US research platform, we quantified anthropogenic disturbance factors affecting each lake and their sources. Our analysis produced a SEM flow diagram, revealing statistically significant connections ($p < 0.05$). Urban development was found to promote an increase in mercury (SEM, $p < 0.001$) and marginally in e-coli (SEM, $p = 0.055$), while being associated with a decline in Dissolved Organic Carbon (DOC) (SEM, $p < 0.001$). Agricultural development led to increased atrazine concentration and contributed significantly to eutrophication, albeit with a decline in DOC (SEM, $p < 0.05$). Soil characteristics positively correlated with DOC concentration, conductivity, microcystin level, and eutrophication, while negatively associated with mercury concentration (SEM, $p \leq 0.025$). Additionally, negative correlations were observed between lake morphometry and DOC concentration and eutrophicat

DEVELOPING QPCR FOR THE QUANTIFICATION OF NOVEL PHYLA IN 50,000-YEAR-OLD DEEP SOIL
Presenter(s): Shannon Carraway
Environmental Science and Natural Resources
Mentor(s): James Tiedje (College of Agriculture and Natural Resources)

We have explored the unknown deep soil microbiome by way of deep wind-deposited loess soil from two sites in Western Iowa that were sequentially deposited during the Wisconsin Glaciation starting 75,000 years ago. We hypothesize that some of these microbes are unique due to their carbon scarce conditions. Characterization of such microbes can give insight into the ecological and physiological traits that allow survival within starvation environments. We extracted microbial cells and DNA from soil cores that reached ~20 m deep and, by 16S sequencing, found a novel dominant phylum, GAL-15. We performed plate counts, long-term inoculations, 16S, ITS, Shotgun, and Nanopore long-read sequencing to better define the microbial community profile by soil depth. Development of qPCR methodology is underway to quantify total bacteria and GAL-15 in our samples and to detect its growth. Plate counts indicate a viable community of ~5x10^4 CFU/g at 13 m depth. 16S sequencing showed Proteobacteria and Actinobacteria to be predominant, and 14.6% as the highest relative abundance of GAL-15 occurring at 14 m. With no culture of GAL-15, we had its 16S gene commercially synthesized using a dominant environmental amplicon to use as the model for the qPCR standard. 18S and ITS sequencing found that almost all eukaryotic population in deep soil is fungal, qPCR will compare this population to that of prokaryotes. Further qPCR results are ongoing but will be directed in partnership with sequencing data

CONDUCTING TRACE ANALYSES OF VITAMIN B1 AND B12 FROM FRESHWATER AQUATIC ENVIRONMENTAL SAMPLES USING LCMS/MS

Presenter(s): Meghana Karumuri

Environmental Science and Natural Resources

Mentor(s): Hui Li (College of Agriculture & Natural Resources)

This project aims to develop a trace analysis protocol specifically tailored at detecting Vitamin B1 and B12 in freshwater environmental samples using liquid chromatography-mass spectrometry (LCMS/MS). Recognizing the significance of these micronutrients in aquatic ecosystems, where their limitation, as well as co-limitation with nitrogen and/or phosphorus, often lead to widespread ecological consequences, precise and stable measurement techniques are a necessity. In collaboration with Binbin Wang and Dr. Jason Knouft from St. Louis University, the results of our research will be used to examine the role of vitamin B1 (thiamine) and its precursor in shaping the community composition of primary producers and influencing the microbiome within freshwater environments. B1 measurements will also be used to help achieve the broader goals of: (1) identifying sources, fate, and degradation of vitamin B1 in the environment; (2) estimating the release of thiamine from human activities and the subsequent impacts on the receiving environment; and (3) characterizing the influence of vitamin B1 on the occurrence of algal blooms and nutrient cycling. Several of the organisms responsible for causing harmful algal blooms (HABs) are auxotrophic for vitamin B1 and B12, suggesting that these micronutrients are essential for their proliferation. While our results are still pending, this research will allow us to elucidate the complex relationships between micronutrients like vitamin B1 and B12 an

ESTABLISHING A WILDLIFE MONITORING PROGRAM AT COREY MARSH ECOLOGICAL RESEARCH CENTER

Presenter(s): Riley Korus

Environmental Science and Natural Resources

Mentor(s): Jennifer Owen (College of Agriculture & Natural Resources), Rose Stewart (College of Agriculture & Natural Resources)

MSU's Corey Marsh Ecological Research Center (CMERC) is a 350-acre property located ~ 20 minutes NE of campus. The center was established in 2018 to serve as a site for long-term research of inland wetland ecosystems. The property has a long history of intensive agricultural use and an early research focus at CMERC has been to determine the extent to which this history has impacted local biodiversity and ecosystem function. To assess the status of mammalian populations at CMERC and inform future research priorities, we deployed 17 trail cameras during the summer of 2023 following a standardized protocol (~ 300 m apart in a grid format across the property). Camera placement spanned multiple habitat types including wet prairie, emergent wetland, and forested wetland. These cameras continue to operate year-round, and photos are reviewed using Timelapse Image Analyzer (S. Greenburg, U of Calgary) to document species type and quantity in each image. Early analysis of the species richness of CMERC shows a diverse and abundant mammal presence. Since the beginning of this project, we have analyzed 125,081 photos and detected 16 mammal species. We predicted observations of two elusive species known to inhabit the area: river otter and bobcat. Of these two, the bobcat is the only species observed so far, but there have been other unexpected species that have been identified in the area. These results provide essential baseline data for future research and restoration efforts, as well a

REPRODUCTIVE SUCCESS OF CAVITY NESTING BIRDS IN POST-AGRICULTURAL WET MEADOWS

Presenter(s): Kelly Craig

Environmental Science and Natural Resources

Mentor(s): Jennifer Owen (College of Agriculture & Natural Resources)

Currently <1% of wet meadows remain from their original extent in North America, primarily degraded for agriculture. Human land use activities can cause lasting changes to soil composition and hydrology, which leaves wetlands susceptible to invasions from non-native plant species. Spread and dominance of non-native plants can have a rippling impact across trophic levels, leading to habitat loss and degradation and causing declines in plant and insect diversity. In turn, these can impact site fidelity and reproductive success for birds breeding in these ecosystems. Our study was conducted on a historically drained wet prairie for agriculture which is now dominated by reed canary grass (*Phalaris arundinacea*). From 2020 - 2023, we used 11 nest boxes to study the reproductive output and life history traits of two avian indicator species, the Eastern bluebird (*Sialia sialis*) and tree swallow (*Tachycineta bicolor*). This baseline data is essential for understanding community-level impacts of future restoration efforts. Each summer, we recorded timing of nest initiation, number of nest attempts, number of eggs laid, and number of nestlings that survived to fledging. A nest was defined as successful if at least one nestling fledged the nest. Across all seasons, bluebirds had 17 successful nests (31% of total nests), while tree swallows had 26 successful nests (48% of total nests). Within species, 68

IMPACTS OF PER- AND POLY-FLUOROALKYL SUBSTANCES (PFAS) ON THE GROWTH OF ADULT AND JUVENILE FATHEAD MINNOWS (PIMEPHALES PROMELAS)

Presenter(s): Mason Laney

Environmental Science and Natural Resources

Mentor(s): Cheryl Murphy (College of Agriculture & Natural Resources), Rachel Leads (College of Agriculture & Natural Resources)

Per- and polyfluoroalkyl substances (PFAS) are a large group of man-made chemicals used in a variety of industrial and household products. Due to their water-, heat-, and oil-resistant nature, they are used in non-stick coating, water-repellent and stain-resistant fabric, cosmetics, food packaging, and firefighting foams. PFAS infiltrate environments through improper disposal of products that contaminate groundwater, bodies of water, and the atmosphere. Once in the environment, PFAS decompose very slowly. As a result, PFAS bioaccumulate in the food web and cause detrimental health effects. Consequently, mixtures of several distinct types of PFAS molecules exist in the environment concurrently; however, little is known about their toxicity. Military bases function as a primary contaminator of PFAS mixtures because of their substantial use of fire-fighting foams. Clark's Marsh in Oscoda, Michigan is a natural area that has been contaminated with PFAS due to it neighboring the former Wurtsmith Air Force Base. To better understand the effects of PFAS mixtures on fish populations, the current study coordinated in situ caging exposures at Clark's Marsh and a nearby clean reference site using adult and juvenile fathead minnows (*Pimephales promelas*). Prior to deployment, each minnow was photographed to determine initial total length. At 4 and 12 days of field exposure, minnows were removed from cages and their total lengths and wet weights were recorded to determine the impa

QUANTIFYING SUITABLE HABITAT FOR MICHIGAN STREAM FISHES AND ASIAN CARP: INSIGHTS FOR INVASIVE SPECIES MANAGEMENT

Presenter(s): Corinthian Martorana
Environmental Science and Natural Resources
Mentor(s): Dana Infante (College of Agriculture & Natural Resources)

There are many important fish species in Michigan waters. Among these are four species, Walleye, Brook Trout, Lake Sturgeon, and White Sucker, identified by the Great Lakes Fishery Commission as priority species for management. These fishes carry high importance as game species as well as being considered migratory, requiring movement between distinct habitats to complete their life cycles. Anthropogenic stressors and climatic changes in the region have led to changes in stream habitats and the fish species they support. For example, Lake Sturgeon, recently listed as endangered by the International Union for the Conservation of Nature (IUCN), were historically abundant in the Great Lakes region. However, overfishing, habitat fragmentation, loss of connectivity by dams and roads, and an ever-changing climate have all contributed to their vulnerable status. Non-native and invasive species additionally threaten the survival of high priority species in Michigan. For example, Bighead and Silver Carp are highly invasive in areas of the Mississippi River Basin and cause major problems for both humans and the ecosystems in areas where they have invaded. Although these Asian carp species have not yet invaded streams in the Great Lakes Basin, this work quantifies the potential spatial overlap in suitable stream habitats in Michigan for these carp and high priority species by evaluating predicted species distributions.

LONG-TERM INCUBATION STUDIES: UNCOVERING IDENTITIES OF DEEP SOIL MICROBES FROM IOWA AND CHINA

Presenter(s): Faith Nhkum

Environmental Science and Natural Resources

Mentor(s): James Tiedje (College of Agriculture and Natural Resources)

The Loess Hills in Iowa has caught scientists' attention due to the unique soil formed from wind deposits over the last 75,000 years. These undisturbed layers offer opportunities to sample depths spanning glacial periods. Vegetation returned 50,000 years ago during warmer periods, when soil, called paleosols, became covered by new deposits. DNA sequencing from previous extractions identified deep soils with high levels of novel phylum GAL15. Through genome bin analysis, GAL15 and other microbes exhibited extended doubling times, suggesting slow growth. Culturing these novel microbiomes aids in understanding their unique physiology that grants resilience to starvation. I hypothesize that simulating their natural environment will facilitate successful culturing of previously undiscovered microbial species. Characteristics replicated include: low nutrients, local temperature, oxygen, and extended incubation periods. Media were: R2A, CSE (cold soil extract), and 1/100 DNB (nutrient broth). These media were applied in growth environments of sterile soil, sand, and water with varying inoculum dilutions and incubated for one year. GAL15 was not detected via 16S sequencing and most incubations did not contain enough DNA. However, long-term incubations with cold soil extract enriched unclassified amplicon sequence variants (ASV). Another database indicated them to be members of SAR, a slow-growing marine oligophile. Long-term incubation yielded greater abundance of ASVs using CSE as t

ESTIMATION OF AGRICULTURAL RETURN FLOWS USING SOIL MOISTURE SENSOR TECHNOLOGY

Presenter(s): Joseph Pelkey

Environmental Science and Natural Resources

Mentor(s): Nawab Ali (College of Agriculture & Natural Resources), Younsuk Dong (College of Agriculture & Natural Resources)

Agricultural return flows are generally defined as the flows that are used for agricultural irrigation and are not being absorbed by plants or evaporated and enter groundwater or streams/rivers. There is growing interest in methods for estimating agricultural return flows from Michigan Water Use Advisory Council and Michigan Water Conservation and Efficiency Subcommittee. Quantifying the return flows is challenging because it depends on soil structure, soil texture, soil compaction, weather conditions, crop types, and root architecture. Previously, researchers have utilized computation models and soil moisture sensors to estimate agricultural return flows and groundwater recharge. These studies are limited to their specific locations and soil types and do not account for common Michigan soil types and structures. Therefore, demonstration of these methods in common Michigan soil types and structures is needed to evaluate their capability to measure return flows and groundwater recharge. A soil moisture sensor is a tool that has the ability to provide nondestructive continuous volumetric water content data at multiple soil depths. We will install soil moisture sensors at multiple soil depths in common Michigan soil types and structures, and monitor infiltration and leachates. The soil water balance equation will be used to calculate field capacity and soil water available content. We anticipate performing both laboratory and field experiments to evaluate the capability of soil

QUANTIFYING STREAM HABITAT CONNECTIVITY FOR PRIORITY FISH SPECIES IN MICHIGAN
Presenter(s): Jack Taylor
Environmental Science and Natural Resources
Mentor(s): Arthur Cooper (College of Agriculture & Natural Resources), Hao Yu (College of Agriculture & Natural Resources), Jared Ross (College of Agriculture & Natural Resources)

Several priority fish species inhabiting tributaries of the Great Lake Basin, including Walleye, Lake Sturgeon, White Sucker, and Brook Trout, have been identified by the Great Lakes Fishery Commission. These species, in addition to being migratory, are among some of the most important game fish in Michigan. The migratory behavior of these species stems from habitat requirements for their life histories such that they spend various life cycle phases in different freshwater ecosystems, including streams. However, a loss of connectivity along the stream networks that they are required to navigate in order reach vital spawning areas can prevent them from fully completing their life cycles. Additionally, species such as Lake Sturgeon are currently threatened due to a multitude of stressors, including the inability to access important stream habitats for spawning, increasing risks to populations of this long-lived species. We combined information on the role of dams in fragmenting stream networks with information on the distributions of these fishes in Michigan to understand the impact of dams in fluvial habitat connectivity losses. We provide spatially explicit maps showing species-specific river connectivity loss in a framework that could be applied in other regions and for additional migratory species. Ultimately, this data can assist managers and decision-makers in determining where efforts to increase stream connectivity might most effectively be focused.

PUBLIC HEALTH ADVOCACY AND CARBON PRICING AS BRIDGES TO BIPARTISAN CLIMATE ACTION
Presenter(s): Serena Westcott
Environmental Science and Natural Resources
Mentor(s): Maria Espinoza Paredes (College of Social Science)

The two-party system in the United States has caused much division and hindrance to progress, including on climate action. However, there is more hope for cooperation than how it appears at a surface level. This presentation will explore how activists and politicians on both sides of the American political spectrum can and should come together under frameworks such as carbon pricing and concern for public health. Despite the highly politicized state of our nation, I argue that U.S. citizens have more in common than they realize, and we must capitalize on our common ground to collectively achieve a sustainable future.

SEM IMAGING OF CURLED RIBBON
Presenter(s): Finn Wohltmann
Environmental Science and Natural Resources
Mentor(s): Carl Boehlert (College of Engineering)

Using the scanning electron microscope to compare the difference in the string before and after curling. Gift ribbon can be curled by using scissors or other sharp objects by running it over the top creating many small curls. In this project, I hope to look at the difference in the string by looking at the structure of the surface and seeing the slight altercations that lead to the curling of the string. I assume that the surface structure is changed as some fibers are displaced and slightly pulled along, this creates tension on one side leading the string to bend and thus curl into the said direction.

Epidemiology & Public Health

PRODUCE AS A VECTOR FOR VIRUS TRANSMISSION: USA-FRANCE COMPARATIVE STUDY
Presenter(s): Atef Choudhury
Epidemiology and Public Health
Mentor(s): Volodymyr Tarabara (College of Engineering), Xunhao Wang (College of Engineering)

This research was conducted in part on MSU campus in East Lansing and in part at the University of Montpellier, France as an extension of a previous study "Surface Transmission of Viruses in a Healthcare Facility", results of which were presented at UURAF 2023. By measuring contact angles of three probe liquids (MilliQ water, diiodomethane, and glycerol), surface energy of a pink lady apple and round cherry tomatoes were quantified. The apples and tomatoes were purchased from Monoprix, a major French retail chain similar to Meijer in the state of Michigan. The study addressed two main questions: 1) Does the washing of fruit affect its surface energy and 2) how does fruit preservation coatings impact virus adhesion to such surfaces? Calculations based on Younge-Dupré equation show a decrease in surface energy as fruit surfaces are washed, pointing to a decrease in surface hydrophobicity. The fundings have significant are also implications for produce cleaning practices. Beyond the examination of fruit surfaces, this research project scope was broadened to explore how irrigation by treated wastewater affects surface chemistry of irrigated produce. These efforts are currently underway in MSU laboratories with additional joint U.S-French research planned for Summer 2024.

DETERMINING THE INTENTION OF RECEIVING THE HUMAN PAPILLOMAVIRUS VACCINE: A CROSS-SECTIONAL SURVEY AMONG INTERNATIONAL AND DOMESTIC COLLEGE STUDENTS IN THE U.S.
Presenter(s): Loveleen Kaur
Epidemiology and Public Health
Mentor(s): ChengChing Liu (College of Nursing)

Human papillomavirus (HPV) vaccine uptake was significantly below the targeted 80% completion goal, especially among young adults such as college students. College students are important targets for the HPV vaccine given this population's low vaccination rates; however, limited research has focused on this population. This study examined the relationships between the Theory of Planned Behavior (TPB) and students' intention of receiving the HPV vaccine(s). Guided by the TPB, a questionnaire was applied to assess students' personal attitudes, intentions, perceived behavioral control (PBC), and subjective norms related to their intentions of obtaining the HPV vaccine(s). Two groups of college students were asked to complete the online survey, including domestic and international students.197 international and 222 domestic college students completed the Qualtrics survey. 69 (35%) international students reported and 24 (10.8%) domestic students never heard about HPV vaccines. 59 (30%) international students and 161 (72.5%) domestic students have received HPV vaccine(s). International students had lower scores on subjective norms ($p<.001$), PBC ($p<.001$), and intention to vaccinate ($p<.001$) compared with domestic students. According to the hierarchical linear regression, subjective norms was the only significant factor of the TPB that can be used to predict the intention of receiving the HPV vaccines of international students while subjective norms and the attitude toward re

MEASURING THE MULTIPLE DIMENSIONS OF NECESSITIES AMONG LATINA MOTHERS
Presenter(s): Elizabeth Castro-Pumay
Epidemiology and Public Health
Mentor(s): Dawn Misra (College of Human Medicine)

We sought to identify measures of what Latina mothers need for optimal maternal health and well-being by going beyond standard measures of socioeconomic status (SES) (e.g., income, education). Due to cultural influences and expected social roles as women, Latina mothers may have unique needs that are significantly different than mothers of other demographics. We conducted a literature search through multiple search engines including Google Scholar and PubMed to identify factors necessary for the well-being of Latina mothers. This literature search is essential to compare existing literature with areas requiring further investigation. Our findings suggest that factors like childcare, social support, leisure activities, and work-life balance are crucial to better understanding Latina mothers' maternal health and well-being. This literature review further emphasizes the gaps within existing scientific literature regarding the unique needs of this large demographic that is continuously growing in the US.

TAMPONS AS A SOURCE OF ENDOCRINE-DISRUPTING CHEMICAL EXPOSURE: A PATENT REVIEW

Presenter(s): Elizabeth Cordill
Epidemiology and Public Health
Mentor(s): Kristen Upson (College of Human Medicine)

Tampons are used by up to 86% of U.S. menstruators and absorb menstrual fluid in the vagina, a highly permeable and vascularized environment. As tampons are used for hours at a time, contaminant exposure from tampon use is plausible. Our research group previously observed higher concentrations of toxic metal mercury and endocrine-disrupting chemical triclosan with tampon use in U.S. menstruators. To understand how the manufacturing process could introduce mercury and triclosan into tampons, we conducted a review of US patents. We searched Google Patents and the US Patent and Trademark Office database using terms "A61F13/20" and "triclosan" (or "mercury"); "A61F13/202" and "triclosan" (or "mercury"); and "tampon" and "triclosan" (or "mercury"). We collected data on patent number, year, inventor, assignee, reasons for chemical use, tampon part it was used on, and patent status. We excluded patents in which mercury or triclosan were not used in tampon manufacturing but rather to measure tampon properties. Our search yielded 558 tampon patents from years 1970-2024, describing mercury use; of 20 patents reviewed thus far, mercury was used as a coating or in the absorbent core for antimicrobial or deodorant purposes. Our search also yielded 377 tampon patents from years 1979-2024 describing triclosan use; of 30 patents reviewed, triclosan was used as an antimicrobial and deodorant agent, in microcapsules, as a coating, or in an unspecified tampon part. Results from the patent

CHARACTERIZING THE NETWORKS OF INDIVIDUALS EXPERIENCING CHRONIC PELVIC PAIN: A MIXED METHODS STUDY

Presenter(s): Layla Ismail, Zainab Mehdi
Epidemiology and Public Health
Mentor(s): Jennifer Neal (College of Social Science), Kristen Upson (College of Human Medicine), Lucy Thompson (College of Social Science)

This poster presents data from a larger mixed methods research project, which took a feminist perspective to understand the dynamics underpinning the dismissal and minimization of gynecologic pelvic pain by centering patient voices. Specifically, the poster will examine how patients' egocentric networks influenced their gendered experiences of accessing pelvic pain care - by either helping or hindering access to care. Our analysis will present quantitative data on network characteristics, alongside qualitative data describing patient experiences related to individuals and organizations in their networks. As indicated by the quantitative data, while participants identified more sources of supports than barriers on average, the median number of supports and barriers was comparable at 1. However, there was greater variation in the number of sources of support (SD=1.43) than barriers (SD=1.00). In comparison, the qualitative data showed that participants tended to focus more on the barriers they had faced when discussing their experiences of seeking care. Here, the qualitative data provided insights into the lack of support, information, and specialists available to patients experiencing chronic gynecologic pelvic pain, which was not evident in the quantitative data alone. For example, these barriers were often characterized by - and led to - experiences of dismissal and a lack of care. In addition, even when discussing sources of "support", participants still reported that

THE DEVELOPMENT OF ALCOHOL DEPENDENCE AMONG INCIDENT DRINKERS: MALE AND FEMALE VARIATIONS
Presenter(s): Alexandra Beck
Epidemiology and Public Health
Mentor(s): James (Jim) Anthony (College of Human Medicine)

Recent research suggests that a traditional male excess of alcohol dependece among incident drinkers may now be a female excess. This project utilizes data from the National Survey on Drug Use and Health and analysis tools including bayesian posterior estimates and fischerian meta-analysis to examine this possibility.

CHARTING INEQUALITY: A STUDY ON THE SOCIAL DETERMINANTS OF EHR QUALITY IN US HOSPITALS
Presenter(s): Spencer Wozniak
Epidemiology and Public Health
Mentor(s): Stephen Gasteyer (College of Social Science)

Since the early 2000s, US federal health care legislation has encouraged electronic health record (EHR) adoption. While most US hospitals have now adopted EHRs, we know little about how the quality of these EHRs varies by community demographics such as race and socioeconomic status (SES). Considering that these factors are social determinants of health (SDH), and that recent research has been investigating the prospect of medical artificial intelligence (AI) tools based on data in the EHR, it is critical to examine whether the quality of EHRs varies on these demographic variables, as current healthcare disparities may be exacerbated by EHR and AI technology. Using 2019 American Hospital Association Information Technology Supplement survey data, we measured the adoption of "basic," "comprehensive," and "advanced" EHRs across US hospitals. We then assessed whether demographics of zip code tabulation areas (ZCTAs) and/or counties that hospitals are in are correlated with their EHR quality. Preliminary findings suggest that hospital EHR quality is directly correlated with median household income, percentage of population that is White, high school graduation rate, and health insurance coverage, while it is inversely correlated with poverty rate and Gini coefficient.

CONTAMINATION AND COMMUNITY HEALTH IN THE CROSSROADS OF AMERICA
Presenter(s): Karleigh Duffield
Epidemiology and Public Health
Mentor(s): Jennifer Lee Johnson (College of Agriculture & Natural Resources)

Indiana currently leads the nation in the release of toxic chemicals per square mile and its residents experience one of the highest rates of cancer incidence. In 2023, Dr. Jennifer Lee Johnson in the Michigan State University Department of Community Sustainability launched the

Toxic Action Lab, which utilizes the efforts of both faculty and students to aid in educating residents about local contamination and empowering residents when facing health concerns because of emerging contamination. Dr. Johnson was introduced to Kokomo, Indiana by our community partner Sherry Roe, author of Profits Over People: A Story of Tragedy and Corporate Malfeasance. Kokomo experiences historic and contemporary forms of industrial and agricultural pollution. Our community survey results indicated 88.5% of 160 respondents are concerned about the quality of the water they drink, 89.9% are concerned about the quality of the air they breathe, and 88.5% know someone who has died of cancer in Kokomo. Dr. Johnson's class CSUS 301: Community Engagement for Sustainability catalogued documents from the Indiana Department of Environmental Management (IDEM) archives and used ArcGIS to draft a continually updated Storymap of locations in Kokomo with past or present contamination issues. In February 2024, Dr. Johnson, Calisto Kohn, and myself visited Kokomo and conducted six lengthy interviews and tested water, soil, and air for various contaminants. Together we are successfully desig

PARTICIPANT CHARACTERISTICS ASSOCIATED WITH THE VAGINAL MICROBIOME DURING PREGNANT.
Presenter(s): Dana Nzerem
Epidemiology and Public Health
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

The vaginal microbiome acts uniquely in comparison to other host associated microbiomes as it is dominated by one genera of bacteria, *Lactobacilli*. While *Lactobacilli* dominates the vaginal microbiome, current literature has characterized specific strains of *Lactobacilli* to be associated with some adverse outcomes like increased prevalence for STDs and preterm birth. In addition, these less favorable bacteria are identified in mostly women of color but mechanistic underpinnings for these associations are unknown. Thus, the objective of the research was to analyze the vaginal microbiome of perinatal women alongside their demographics to further understand factors and exposures impacting the diversity and composition of the vaginal microbiome. While the results have not been determined yet, we anticipate identifying participant characteristics that may differ by race and explain the difference in vaginal microbiome composition.

IMPACTS OF EXPOSURE FROM PER- AND POLYFLUOROALKYL SUBSTANCES ON THE INFANT GUT MICROBIOTA
Presenter(s): Megha Pratapwar
Epidemiology and Public Health
Mentor(s): Courtney Carignan (College of Agriculture & Natural Resources), Sarah Comstock (College of Agriculture & Natural Resources)

Per- and polyfluoroalkyl substances (PFAS) are a group of chemicals widely used in consumer products which lead to adverse health effects in humans. PFAS levels in human milk have been negatively associated with diversity in the gut microbiome of 1 month old infants. To study the impact of PFAS contamination in Michigan, 79 mothers provided samples of infant (1-4 mos) stool. Questionnaire responses were analyzed to estimate PFAS exposure. DNA was extracted from stool samples, and sequencing of the V4 region of the 16S rRNA gene was performed to characterize the bacterial alpha and beta diversity. Regression was performed to determine associations between PFAS exposure and infant gut microbiota characteristics. Of 39 infants fed at least some formula mixed with water, 44% of mothers prepared it with bottled water and 38% prepared it with city water. Of the 59 infants at least partially breastfed, 52 mothers drank some tap water in the 3 months preceding stool collection. The primary source of tap water was reported as public water supply (69%) and private well (29%). Approximately 39% of participants live in counties with ≥ 9 groundwater/drinking water testing sites that detected PFAS levels above the standard. Since gut microbiota membership is established early in life, knowing which exposures alter the composition of this microbiota is crucial to ensure optimal child development. The results of this project will further our understanding of the impact of PFAS on the g

NEWLY INCIDENT ANXIOLYTIC-SEDATIVE-HYPNOTIC (ASH) MEDICINE USERS AND THE DEVELOPMENT OF CLINICALLY SIGNIFICANT DRUG DEPENDENCE SYNDROME
Presenter(s): Landon Stallmann
Epidemiology and Public Health
Mentor(s): James (Jim) Anthony (College of Human Medicine)

My project is part of a larger project to estimate how often newly incident drug users develop a clinically significant drug dependence syndrome, with a look at various drug subtypes. The data are from large nationally representative sample surveys of US community residents drawn via multi-stage area probability sampling each year and with standardized computer-assisted self-interviews. Other colleagues in this project are working on alcohol, heroin, and other drug sub-types. I am producing estimates for drug compounds that typically are prescribed to relieve anxiety, to help people calm down, and to improve sleep -- formerly called 'minor tranquilizers' and now called 'anxiolytic medicines' or sometimes anxiolytic-sedative-hypnotic (ASH) medicines. The following table shows my estimates to date based on analysis-weighted cross-tabulations. By the time of the URAAF presentation, I will produce summary estimates based on two approaches: (1) a frequentist meta-analysis, and (2) a Bayesian posterior inference approach. If time permits, I will be able to study female-male variations in these epidemiological parameters.

NOROVIRUS DOSE-RESPONSE MODEL SELECTION AND OUTCOMES
Presenter(s): Lillian Bieszke
Epidemiology and Public Health
Mentor(s): Jade Mitchell (College of Agriculture & Natural Resources)

Norovirus is a virus commonly transmitted by contaminated surfaces, food, and water. It is one of the most common food and waterborne illnesses worldwide. Researchers have been using Quantitative Microbial Risk Assessment (QMRA) to try and develop a better understanding of those various transmission routes. QMRA is a mathematical modeling framework that characterizes human health risks associated with pathogens in the environment. The dose-response assessment is a component of QMRA that involves the calculation of the relationship between the probability for infection and the number of pathogens an individual is exposed to. There are multiple norovirus dose-response models available in the peer-reviewed literature due to complexities associated with its pathogenicity such as immunity and aggregation. Immunity dose-response models consider how much of the population will be susceptible to a norovirus infection. Aggregation determines whether all the virus particles will be clumped together in a sample which will increase the exposure dose for an exposed population. Currently, the impact of dose-response model selection within norovirus QMRAs is not well understood. To help understand this impact, a literature review was conducted to identify norovirus outbreak data and previously published dose-response models. There were twenty models found, nine were aggregated and eleven were disaggregated. Three recent outbreaks were found with enough detail and reported attack rates

COMMUNICATION OF DATA ON MATERNAL MORBIDITY AND MORTALITY TO A COMMUNITY-BASED AUDIENCE
Presenter(s): Bria Campbell
Epidemiology and Public Health
Mentor(s): Claire Margerison (College of Human Medicine)

In the United States, maternal deaths are two times more likely compared to other high resource nations. Black women are more likely to die than white women from a range of pregnancy conditions relating to severe maternal morbidity. Community-engaged research seeks to draw on the expertise and lived experience of community members in addressing these issues. This project's objective is to develop an understanding of how to best communicate data on maternal mortality to a community-based audience. This was done through creating scientific graphs and infographics to communicate racial and ethnic disparities in maternal mortality and morbidity. Community members then provided feedback on what is most appropriate when communicating data to a non-scientific audience.

THE RELATIONSHIP BETWEEN CLINICAL CHARACTERISTICS AND COVID-19 INFECTION IN CHILDREN IN AN OUTPATIENT PEDIATRIC CENTER
Presenter(s): Hady Omar
Epidemiology and Public Health
Mentor(s): Said Omar (College of Human Medicine)

As per the American Academy of Pediatrics, State-Level Data Report, over 15.2 million children have tested positive for COVID-19, accounting for 18.1% of all cases as of December 29, 2022 (AAP 2022). The most common signs and symptoms suggestive of COVID-19 infection are shared with a wide variety of viral and bacterial infections, making diagnosis difficult without confirmed COVID-19 testing (CDC 2022). Though a common strategy to control the pandemic, school closures and virtual learning have proven to have deleterious effects on both education and lifestyles (Viner 2022). The purpose of this study is to compare the clinical characteristics and exposure history of children with COVID-19 to children testing negative for COVID-19 who presented with a history of symptoms concerning COVID-19 and/or recent exposure.

FIREFIGHTER EXPOSURE TO MIXTURES OF POLY- AND PERFLUOROALKYL SUBSTANCES (PFAS) IN LEGACY AND NEXT-GENERATION TURNOUT GEAR
Presenter(s): Krishna Kottai
Epidemiology and Public Health
Mentor(s): Courtney Carignan (College of Agriculture & Natural Resources), Rachel Bauer (College of Agriculture & Natural Resources)

Due to their unique properties, per- and polyfluoroalkyl substances (PFASs) are widely used in firefighting foams and gear. While studies have been conducted to better understand the exposure to PFAS in firefighting, there are currently no investigations on the transfer of PFAS from the gear to the skin or investigations of latest generation of turnout gear (PFZero®). Therefore we conducted a biomonitoring study of firefighters (n=18) who provided forearm wipes before and after a training event, a sample or wipe of their turnout gear, a blood sample, and completed a brief exposure questionnaire. PFOA was detected in the majority of gear samples and after-training forearm wipes from participants with legacy (pre-2010) or next generation (post-2010) gear but not those with PFZero. Next generation turnout gear contained primarily 6:2 FTMAC with concentrations in the outer layer an order of magnitude higher than total PFAS in the legacy gear. PFZero turnout gear was found to contain 6:2 and 8:2 FTMAC, primarily in the moisture barrier. These trends were reflected in the after-training forearm wipes. Overall, these findings reflect changes in PFAS mixtures used in firefighter turnout gear and indicate the potential for dermal exposure.

TYPE 1 DIABETES AND MAJOR DEPRESSION ASSOCIATION IN TEENS ACROSS MALE AND FEMALE ETHNIC SUBGROUPS
Presenter(s): Taarini Negi
Epidemiology and Public Health
Mentor(s): James (Jim) Anthony (College of Human Medicine)

In my research project so far, I have been able to find a suspected link between depression and type 1 diabetes in the teen population (12-17 years) of the United States when stratified into male and female subgroups. I used Bayesian posterior inference approach to generate estimates at a 95% confidence interval using R scripts. Prior to that I used Stata to stratify my data taken from NSDUH (National Survey of Drug Use and Health). It was concluded from the estimates that the occurrence of depression in teens who get diagnosed with type 1 diabetes at an early age was not significantly different than my expected values for the same. However, the further goal of this project is to use advanced generalized linear models to better estimate the diabetes-depression association with greater statistical control over my covariates that include self-identified ethnic subgroups and possibly other facets of diversity.

A LITERATURE REVIEW ON DOSE-RESPONSE RELATIONSHIPS IN DRINKING WATER BY-PRODUCTS
Presenter(s): Isabelle DeLaet
Epidemiology and Public Health
Mentor(s): Carly Gomez (College of Agriculture & Natural Resources), Jade Mitchell (College of Agriculture & Natural Resources)

Disinfection By-Products (DBPs) are compounds that can form in drinking water when chemical disinfectants used to reduce pathogens interact with organic material. When ingested, they can be toxic and/or carcinogenic. The EPA regulates 11 DBPs, more unregulated DBPs may pose hazards to human health. Dose-response relationships for all DBPs have never been compared, impeding comprehensive risk assessment efforts, appropriate disinfectant application, and jeopardizing public health. The objective of this study was to compile previously published DBP dose-response models, comparing health effect endpoints and the drivers of toxicity for each DBP. A citation mapping literature review was conducted using EPA's RFA G2022-ORD-H1 as an initial source. Articles cited here measuring health effects after varying DBP exposure doses were initially considered, with Google Scholar used to find subsequent articles citing these. Health effects with a significance level of $p < 0.05$ were reported. This study included 28 DBPs. Information about 8 regulated and 15 unregulated DBPs was found across 30 articles. In these sources, animal and cell types were used as models. Common endpoints in animal studies were tumors, change in hormone levels and organ weights, and offspring viability. In cell studies, common endpoints were death and genotoxicit

BAYESIAN ANALYSIS OF HEROIN USE BY GENDER
Presenter(s): Nolan Roberts
Epidemiology and Public Health
Mentor(s): James (Jim) Anthony (College of Human Medicine)

My main aim is to study how often people use heroin multiple times after using once, with regards to sex to see if there is a difference there. My materials and methods are from the United States National Surveys on Drug Use and Health, completed annually with new probability samples of non-institutionalized civilian US residents each year from 2002 until the recent years. Pre-pandemic (i.e., through 2019) the assessments were in-person computer assisted self-interviews, with standardized multi-item modules on the constructs under study. In my UURAF report, I will provide initial estimate on the raw % of people who use multiple times (# used multiple times/total # users) and then use Bayesian analysis in order to come up with a confidence interval for each sex.

YOUNG PEOPLE LIVING WITH HIV/AIDS: AN EPIDEMIOLOGICAL PERSPECTIVE
Presenter(s): Sophia Zuber
Epidemiology and Public Health
Mentor(s): James (Jim) Anthony (College of Human Medicine)

Starting in the early 1980s, the HIV/AIDS epidemic struck the United States, killing hundreds of thousands of Americans. I have always been deeply interested in studying both the scientific concepts and historical implications of this epidemic so when my mentor asked for me to derive my passion for science, it was a no-brainer. Because of my mentor's extensive experience in the field of epidemiology, he was able to guide me through the epidemiological approach to understanding a possible relationship between the diversity groups of gender and age regarding HIV/AIDS infection. Through this mentorship, I was able to learn how to analyze population data from the US National Surveys on Substance Use and Health (NSDUH). I gathered estimates and standard errors that could then be analyzed using both Year-Based Frequentist and Posterior Bayesian inference approaches.

Film Studies & Digital Media

VOICES OF ERADICATION: UNDERSTANDING THE SOCIOPOLITICAL DYNAMICS OF SMALLPOX ERADICATION IN BANGLADESH THROUGH PERSONAL NARRATIVES
Presenter(s): Kierra Jursch
Film Studies and Digital Media
Mentor(s): John Waller (College of Social Science)

The eradication of smallpox in Bangladesh presents an interesting case study to examine the relationship between socio-political factors and public health initiatives. Through interviews with key players involved in the eradication efforts, this research aims to examine the role of government policies, dedicated staff, community engagement, and international collaboration in the successful eradication campaign. Historically, Bangladesh faced significant challenges in combating smallpox, exacerbated by socioeconomic disparities and limited healthcare infrastructure. However, the eradication campaign implemented a range of strategies, including vaccination programs and surveillance efforts, with the support of dedicated and enthusiastic public health workers. By interviewing individuals directly involved in these efforts, this research seeks to examine the sociopolitical dynamics that influenced the eradication process. This includes government involvement which was essential in driving eradication efforts, although there were still challenges due to resource constraints and community engagement as cultural practices shaped the implementation of disease control measures. Despite the challenges faced, Bangladesh successfully eradicated smallpox, highlighting the resilience and adaptability of its public health system. By capturing the perspectives of those involved, this research contributes to a deeper understanding of the sociopolitical determinants that influenced the course

360 DEGREES OF NAMES
Presenter(s): Phuc Nguyen
Film Studies and Digital Media
Mentor(s): JeanaDee Allen (College of Communication Arts Sciences)

This project explores the intersection of dimensional thinking, creative legacy, and the influence of personal background on artistic expression. Through dance, the artist, Nguyen Minh Phuc, also known as Alva, transforms the abstract concepts of his names into dynamic performances. Each scene is symbolically linked to aspects of his name, using cultural symbols and personal attributes-such as an umbrella for the Vietnamese accent in "NGUYEN" and symmetrical movements to represent the balance in "MINH." The dance for "PHÚC" captures happiness and fortune with its flexibility and dynamism, while "ALVA" is depicted through tutting techniques, reflecting adaptability and independence inspired by the artist's relocation to the U.S. The color palette of blue and orange/yellow connects to the artist's personal and astrological preferences, adding a layer of personalization. Inspirations include the nostalgic melody of Trinh Cong Son's "Diem Xua" and the architectural philosophy of Zaha Hadid, particularly her view on exploring all 360 degrees of possibility. This project not only showcases a unique blend of dance, personal identity, and cultural homage but also embodies the artist's journey through creative self-expression, emphasizing the impact of one's background and inspirations on their creative legacy. This illustrates how dimensional thinking can expand the boundaries of artistic expression, merging personal history with broader cultural and creative influences.

FOOD WASTE AND SUSTAINABILITY: A LAS VEGAS FIELD STUDY
Presenter(s): Grace Distelrath, Joshua Kreiter, Nicole Jenosky
Film Studies and Digital Media
Mentor(s): Eddie Boucher (College of Social Science)

There are multiple societal, moral, and environmental issues that arise from food waste. It is estimated that Las Vegas produces 5 billion pounds of waste annually, but that number is speculated to be much higher. This study's focus is on the efforts exercised in Las Vegas establishments, specifically studied in an MGM Establishment, and the programs they practice to minimize food waste. The study also explores the problem of food insecurity in Nevada through Three Square Food Bank, a non-profit food bank that focuses on giving food back to the community. This documentary highlights the connection between these two establishments and how they work together to mitigate the problems of food waste and food insecurity in Las Vegas, and explains why these issues are so important to address.

Global & Area Studies

INVESTIGATING CRIME IN SYRIA VS. IN THE UNITED STATES
Presenter(s): Skylar Stone
Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

The IIIM stands for International, Impartial and Independent Mechanism. The IIIM doesn't make any arrest or prosecute. What they do is collect, preserve, and analyze evidence to prepare products so that it can share their conclusions and the information and evidence gathered to support competent jurisdictions to investigate and prosecute suspected criminals. It focuses on core international crimes committed in Syria since 2011. The Syrian IIIM was established in December of 2016 to divulge and help investigate and prosecute persons responsible for the core/most serious crimes in Syria under international law committed in 2011. the IIIM is that they focus primarily on war crimes and crimes against humanity or genocide. The IIIM does not focus on everyday crime or investigating things like daily murder which heavily differs from the United States. In Syria these crimes are considered substantially unimportant and do not deserve to be investigated. It's reported that in the last few the crime rates in Syria have been fluctuating and are currently at a very big high due to massive ongoing conflict. This conflict takes priority of the government so crimes like thefts, armed robberies, carjackings and house break-ins have seen drastic increases because national security have their focus shifted else where.

STRUGGLES OF SYRIAN REFUGEE WOMEN & GIRLS IN LEBANON
Presenter(s): Aarit Mitra
Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

The prime objective of this presentation is to provide insight into the key struggles encountered by Syrian refugee women and girls residing in Lebanon, a country where Syrian refugees constitute 25% of the total population. Since the onset of the Syrian Civil War in 2011, more than 13 million Syrians have faced displacement, with over 6 million living as refugees in over 131 countries worldwide. Despite the Syrian refugee crisis being the world's worst refugee crisis, very little is known about the detrimental effects of displacement on the Syrians. In particular, there exists very limited research on the struggles faced by Syrian women and girls residing in different host nations across Europe and Asia. This investigation focuses on the socio-economic and cultural obstacles confronted by the 750,000 female Syrian refugees who have currently taken refuge in Lebanon. Through a careful analysis of several credible resources, this presentation establishes that Syrian women in Lebanon confront multiple hardships including living in extreme poverty and unsafe conditions, being victims of sexual and gender-based violence, being compelled into child-marriage and early pregnancy, and risking frequent deportation. This presentation hopes to raise awareness about the precarious conditions of Syrian refugees, especially women and girls, living in Lebanon and strongly emphasizes the need of governmental or international humanitarian organizations to ensure that the refugees are not depr

JORDAN AND THE SYRIAN REFUGEE CRISIS
Presenter(s): Finn Weinstein
Global and Area Studies
Mentor(s): Ayman Mohamed (College of Arts & Letters)

The crisis in Syria persists, exerting massive effects on all neighboring countries. Among them, Jordan stands out, providing shelter for many of the refugees. However, the substantial influx of people into the country poses new challenges. Syrian refugees primarily concentrate on survival, grappling with fundamental needs such as shelter and food. Upon their arrival, refugees encounter numerous obstacles, including language barriers, medical requirements, mental health needs, and the overall economic burden of supporting the influx. In my research, I aim to examine how the arrival of refugees not only impacts the refugees themselves but also reverberates throughout local communities. Each individual maintains their distinct needs and identity while residing within the same community, making their situation complex to navigate. Understanding how intersectionality shapes the difficulties faced by refugees is paramount to addressing these challenges in host countries.

MIGRATION INTO EUROPE: THE HUMANITARIAN CRISIS OF LIBYA
Presenter(s): Kyla Zhao
Global and Area Studies
Mentor(s): Ayman Mohamed (College of Arts & Letters)

In December of 2010, a wave of anti-government protests and uprisings erupted across Arab countries. The movement termed as the "Arab Spring," that erupted against government control and corruption, swiftly spread across the region including nations like Libya. The struggle for a democratic government led to a significant power shift. With Libya serving as a gateway to Europe for many civilians from surrounding countries seeking a better life, it became a focal point for immigration. To deter immigrants, European countries provide funding and training to groups and gangs reminiscent of those involved in the Libyan rebellion during the Arab Spring. These groups then engage in activities such as kidnapping and detaining individuals, in exchange for European support in their power struggles. This presentation will delve into the humanitarian crisis faced by immigrants and the efforts undertaken by international powers to assist those held captive within Libya.

NAVIGATING SYRIA'S TECHNOLOGICAL TERRAIN: ELECTRONICS, ELECTRICITY, AND THE INTERNET
Presenter(s): Symaedchit Leo
Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

The displacement of Syria's citizens is currently grappling with a devastating civil war that has displaced millions. The conflict, coupled with natural disasters such as earthquakes and droughts, has crippled the economy, leading to widespread poverty and unemployment. The war has also disrupted basic services, including electricity. In 2021, Syrians identified access to electricity as a major humanitarian concern. The lack of electricity affects all sectors, from food security to health, education, and livelihoods. The situation has led to widespread poverty and unemployment, with many people struggling to make ends meet. Despite these hardships, Syrians have shown admiring resilience. They continue to use electronics, such as smartphones and laptops, to stay connected, as its their only resource. However, the Syrian government's strict censorship laws limit freedom of speech and expression. The internet plays a crucial role in this context. It allows Syrians to bypass censorship, stay informed, and maintain contact with the outside world. However, access to the internet is often limited due to electricity shortages and government restrictions. There are ways to support Syrians in these challenging times. Donating to organizations that uphold free speech and human rights, supporting independent media outlets, raising awareness on social media, and contacting elected representatives can make a difference. In conclusion, Syria is facing a complex

VIEW OF HOLOCAUST SURVIVOR POPULATIONS ABROAD
Presenter(s): Stephen Goodwin
Global and Area Studies
Mentor(s): Lynn Wolff (College of Arts & Letters)

This oral presentation will encompass months of research pertaining to the movement of Jewish populations after the holocaust. This project will includes visual aids created by the researcher to the help guide audiences along the presentation. This project seeks to help audiences understand how Jewish populations were affected as a result of the holocaust and how populations spread out afterwards and during the events of the holocaust.

CHINESE CHILIS: ECONOMICS AND IDENTITY
Presenter(s): Jackson Murphy
Global and Area Studies
Mentor(s): Xuefei Hao (College of Arts & Letters)

Despite what many people (including locals) may believe, chili peppers are not native to China. Although we are unsure of the exact dates and locations in which the chili arrived, experts can agree that the chili came to China via a variety of methods around the 16th century. Upon its arrival, the chili's use was split between classes for its aesthetic and culinary value. Due to the chilis versatile abilities in the culinary world, and how inexpensive and easy it was to grow/acquire, people in lower economic classes began substituting chilis in for pricier spices/preservatives (i.e. salt, ginger, black pepper). This practice was primarily based in more southern provinces (Sichuan, Hunan, Guizhou, etc), beginning throughout the 17th century and is still used similarly today. However, due to the origin of its popularity, the chili became a classifier of socio economic groupings, derogatorily deemed as, "the spice of the poor". This presentation explores the connections between food and culture through chilis in China: how even a non-native plant was able to highlight and eventually bridge the gap between classes, become a national symbol of revolution, grow international awareness of the Chinese culinary scene, and truly connect itself with the identity of a region.

ACCESS TO FAMILY MEDICINE IN SYRIA
Presenter(s): Faith Goodman
Global and Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

Due to the humanitarian crisis in Syria, access to crucial medical care has become scarce. People have struggled to obtain the medicine they need, hospitals rarely have substantial amounts of food, water, and energy to run at full capacity, and restrictions have been made about what supplies are allowed to be let into the country to provide help. Through this presentation, I show a timeline of how healthcare and medicine access has been influenced throughout the years and show the declination of its quality, plus provide ways in which we can help by including nonprofit foundations and their missions. Beginning before the war at the usage of traditional medicines, which was a very popular treatment form in early times, this was a method that people of lower wealth could treat illnesses due to it being less costly and more common than chemical medicines. Just before the Arab Spring began, the healthcare system had improved and was seemingly sufficient. Then during the war, access to medicine and healthcare was difficult due to the dangers and restrictions put into place. Now the aftermath of the war has left the healthcare system in shambles and is working slowly to rebuild itself with many restrictions put into place and little awareness. The purpose of this presentation is to spread awareness that reform needs to be done, and sending help if at all possible is necessary in order to give people the medical attention they need within Syria.

SPIRITUAL STYLE ACROSS ISRAEL
Presenter(s): Maya Weisberger
Global and Area Studies
Mentor(s): Yore Kedem (College of Arts & Letters)

This research explores the relationship between style, spirituality, and personal identity in Israel. Through interviews with individuals from diverse backgrounds, this presentation investigates how people use style to express their spiritual beliefs and how it intersects with their identity. The study finds that while some individuals use clothing and accessories to represent their religious beliefs explicitly, others opt for a more subtle approach and prioritize comfort and personal expression. Overall, the presentation highlights the complexity of this relationship and how it varies from person to person.

Health Sciences

USE OF SCANNING ELECTRON MICROSCOPY TO FIND EFFECTS OF BOX BLEACH AND DYE ON HAIR SHAFT
Presenter(s): Samantha Bennett
Health Sciences
Mentor(s): Carl Boehlert (College of Engineering)

A common use to get the perfect color for hair for cheap is box bleach and dye. Scanning electron microscopy was used to assess the damage down to the hair shaft when exposed to box bleaching and dyeing. Three female volunteers' hair strands were bleached and dyed to examine the change in diameter and characteristics of the shaft and cuticle when treatments were applied separately and together. Analysis was performed to provide recommendations to those wishing to alter hair color.

ARE TOOTHBRUSHES REALLY CLEAN?
Presenter(s): Ranjot Brar
Health Sciences
Mentor(s): Carl Boehlert (College of Engineering)

I will be researching the cleanliness of a tooth brush after brushing your teeth for a week without cleaning your brush properly after, compared with a toothbrush that is cleaned right away after brushing for a week. Another idea I had was researching cleanliness of your retainer which is a similar idea, comparing a dirty one that is not washed after a week and one that is cleaned after every use after a week. For my project I will need 2 toothbrushes along with 2 sets of retainers, and an electron scanning microscope. Prior to scanning both objects I will need to coat them with a sputter- coating as these objects are not conductive.

MOLECULAR IMAGING META-ANALYSIS
Presenter(s): Dora Lei, John Scott
Health Sciences
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

Born in the 1990s, the field of molecular imaging has been used to improve health outcomes for patients around the world through diagnostic avenues. This meta-analysis examines the effectiveness and advancements in medical imaging modalities, specifically MRI, Ultrasound, CT, PET, SPECT, and fMRI in the context of the developing subfield of molecular imaging. These techniques allow physicians to study molecular processes and structural components of the body in high detail. Advancements in this field have the potential to improve precise diagnostics and treatments in conditions where the speed of intervention is critical to better outcomes. The objective is to synthesize existing literature to evaluate the overall impact of these methods on the detection and treatment of tumors. Simply put, a brain tumor describes aberrant cell growth and division that impedes human function because of the skull's limited volume.

Tumors can be divided into several categories depending on the kind, place of origin, pace of development, and stage of progression, therefore, clinicians use a variety of tools that allow for greater specificity in diagnosis. Computer aided diagnostics (CAD) is a developing software that assists radiologists in interpreting images. It is expected that CAD will be highly valuable to the accurate and accessible assessment of tumors in patients. This technology and other future directions will dictate how this field will change medicine in years to come.

ENHANCING PREOPERATIVE PATIENT EDUCATION: A LITERATURE REVIEW ON THE ROLE OF VIRTUAL REALITY AND 3-D PRINTING
Presenter(s): Lisa Phan
Health Sciences
Mentor(s): Ann Annis (College of Nursing)

Despite increasing recognition of using Virtual Reality (VR) and 3-D printing technologies in healthcare, there is a gap in understanding the full potential of these tools for patient education. Exploring innovative methods can offer new opportunities to empower patients, improve health literacy, and enhance the overall quality of care across different healthcare settings. Our aim was to evaluate the effectiveness of incorporating VR or 3-D printing as supplementary teaching tools in contrast to conventional methods in enhancing preoperative patients' understanding of their procedure. A literature review was conducted using PubMed to explore providers' use of tech-based educational tools with adult preoperative patients. The search strategy included '(VR OR "virtual reality" OR 3-D) AND "patient education" AND surgery', which yielded 127 results that were individually filtered to the first 9 most relevant studies. Articles published within the last 5 years, with adult patient (≥18 years of age) samples, written in English, and that examined VR and/or 3-D print as supplemental teaching modalities during the patient's surgical consultation were included. Others performed in a non-surgical setting were excluded. Some studies revealed enhanced test scores related to anatomical and procedural information, while others observed an increase in patient self-reported ratings of acquired knowledge. However, all studies consistently found improvements in patient knowledge about pr

MITIGATING THE NEGATIVE IMPACT OF UNIVERSITY ENVIRONMENTS OF CYSTIC FIBROSIS STUDENT-PATIENTS AGED 17-24; A CALL FOR INSTITUTIONAL AWARENESS
Presenter(s): Destiny Kanning
Health Sciences
Mentor(s): Ashlee Price (MSU HCI Clinical Services)

The dramatic improvement in the quality and longevity of life for individuals with Cystic Fibrosis (CF) has led to a significant increase in life expectancy, prompting many patients to pursue undergraduate education. As an active clinical advocate for the CF community within Big Ten Universities, this presentation addresses the critical need for institutional reeducation to ensure the safety and well-being of CF patients. Over the past two years, I have conducted voluntary research, nationally recognized by the Cystic Fibrosis Foundation, shedding light on the misinformation prevalent in post-secondary institutions. Notably, at Michigan State University, only 4.88% of faculty and staff can correctly identify life-saving measures for CF students. The presentation emphasizes the urgency of providing adequate care in undergraduate environments, which were previously inaccessible to these patients. The research initiates a crucial conversation between CF patients and post-secondary institutions, giving a voice to nearly 80 student-patients in the greater Midwest area, aged 17-24. My outreach efforts include visits to five surrounding Big Ten Universities, where I have presented my research and educated leadership on the unique needs of CF students. Additionally, brochures developed in collaboration with the CF Foundation serve as a valuable resource for faculty in direct contact with CF students in lecture halls. The presentation outlines the impact of the research on creating aw

A MULTIVARIATE META-ANALYSIS FOR OPTIMIZING CELL COUNTS WHEN USING THE MECHANICAL PROCESSING OF LIPOASPIRATE FOR REGENERATIVE APPLICATIONS
Presenter(s): Nia Kepes
Health Sciences
Mentor(s): Gershon Zinger (Shaare Zedek Medical Center)

Lipoaspirate has become the preferred source for regenerative cells. The mechanical processing of lipoaspirate has advantages over enzymatic processing but has a lower yield of regenerative cells. A review of the literature shows different techniques of extraction, but the ideal method or combination has not been determined. Methods: A comprehensive literature search was focused on the mechanical processing of lipoaspirate, without the use of enzymes. Data from the articles were integrated by utilizing a multivariate meta-analysis approach and used to create a statistical-based predictive model for a combination of multiple variables. Results: Starting with 10,000 titles, 159 articles were reviewed, and 6 met the criteria for inclusion and exclusion. The six studies included data on 117 patients. Sixteen factors were analyzed and six were identified as significant. The predictive profilers indicated that the optimal combination to maximize the cell yield was: a centrifuge force of 2000x g, a centrifuge time of 10 min, a cannula diameter of 2 mm, and an intra-syringe number of passes of 30. The optimal patient factors were a higher BMI and younger age. Conclusions: The novelty of the method used here was in combining data across different studies to understand the effect of the individual factors and in the optimization of their combination for mechanical lipoaspirate processing.

A CHILD-TARGETED HEALTHY LIFESTYLE INTERVENTION IMPROVED PARENTS' BEHAVIOR AND HEALTH
Presenter(s): Dalton Goodwin, Julia Kause
Health Sciences
Mentor(s): Jiying Ling (College of Nursing)

Childhood obesity is becoming a major problem throughout the country. Physical activity and dietary choices of the parents may have an impact on the increase in childhood obesity. The aim of this study was to evaluate the effects of a healthy lifestyle intervention "FirstStep2health" on improving parents' behaviors (physical activity and diet quality) and health outcomes (body mass index [BMI], % body fat, blood pressure [BP]). The intervention, aimed to improve children's healthy lifestyle behavior and health outcomes, includes a child physical activity and healthy eating program, a parent program (group meetings, social media-based component), and a child learning and parent practice connection component. This cluster RCT was conducted with parents from 10 Head Start centers in Michigan. In the study, there were 53 parents in the intervention group and 42 in the control. Out of all 95 participants, 91.6% were female, and the mean age was 30.42 years old. Additionally, 36.8% were Black and 8.4% were Hispanic. Almost half of the participants were unemployed, and 64.3% were single. The intervention had medium to large effects on decreasing parents' systolic (d=-1.11; 95%CI=-1.54, -.67) and diastolic BP (d=-.58; 95%CI=-.99, -.17). The effects on decreasing parental % body fat (d=-.32; 95%CI=-.73, .09) and BMI (d=-.34; 95%CI=-.74, .07) were small. There were also small effects on increasing light physical activity (d=.23; 95%CI=-.18, .63), fruit/vegetable (d=.25, 95%CI=-.15, .66

A HEALTHY LIFESTYLE INTERVENTION DECREASED ANTHROPOMETRICS IN PRESCHOOLERS
Presenter(s): Naina Cheeti
Health Sciences
Mentor(s): Jiying Ling (College of Nursing)

It is critical to assist young children in establishing a healthy lifestyle (healthy diets, sufficient exercise, etc.) that can persist into adult life. These habits can help reduce the risk of developing health problems, such as diabetes, cardiovascular disease, and obesity, later on. The FirstStep2Health Intervention is a healthy eating and physical activity intervention aimed to help preschoolers from low-income backgrounds to develop healthy habits. The purpose of this study was to evaluate its effects on improving preschoolers' lifestyle behaviors (diet quality and physical activity) and anthropometrics (body mass index [BMI] z-score and % body fat). This cluster randomized controlled trial was conducted with 95 preschoolers (53 intervention, 42 control) from 10 Head Start centers. There was a higher proportion of male and Black preschoolers in the intervention group. The mean age of the participants was 49.27 months, with 57.9% being female. About ? of the families earned an annual income of less than $20,000 and almost half of the parents (49.5%) were unemployed. The intervention had a moderate effect on decreasing BMI z-score (d=-0.44) and % body fat (-0.45). Although there were no effects on improving proxy-report diet quality, fruit/vegetable intake indicated by skin carotenoids increased in the intervention group when comparing to the control group (d=0.58). No effect was observed on increasing physical activity. A future study with a larger sample size is neede

NON-PHARMACOLOGICAL INTERVENTIONS TO PREVENT INTENSIVE CARE UNIT (ICU) DELIRIUM
Presenter(s): Clarke Campbell, Grace Waldron
Health Sciences
Mentor(s): Hesam Varpaei (College of Nursing), Lorraine Robbins (College of Nursing)

Delirium is an acute impairment of cognitive function leading to an increased risk of mortality and extended stays in intensive care units (ICUs). This study is aimed to determine the effectiveness of non-pharmacological interventions (NPIs) in preventing delirium in ICUs. A systematic review guided by the PRISMA checklist and meta-analysis using random effects were performed. The heterogeneity was evaluated using Q and I2 tests. Subgroup analysis was performed to find the source of substantial heterogeneity (I2 > 75%). A total of 67 articles were included in this study, of which 23.88% were from the USA. In the study, 86.56% were RCTs, and 13.44% were quasi-experimental studies. The most used tools to assess the outcome were CAM/ICU (65.67%) and NEECHAM (11.94%). Meta-analysis using the random-effects model showed that NPIs were associated with a lower incidence of delirium compared with controls (pooled OR =0.57, p<001). Although heterogeneity was not significantly different based on subgroup analysis of patients' admitted wards, study design, and risk of bias, we found that all world continents had a significant effect excluding studies pooled within European countries (OR = 0.76), which had the greatest amount of statistical heterogeneity (I2 = 65%). Studies conducted in Asia had the greatest effect on decreasing delirium during hospitalization (OR = 0.39), followed by South America (OR = 0.46), and then North America (OR = 0.72). Our findings show a signific

COMPARING SEX AND SPORT TYPE ON SCAT6 BASELINE METRICS IN NCAA DIVISION I ATHLETES

Presenter(s): Carly Ortwine, Jayden Conklin, Julia Harrison, Morgan Schmidt

Health Sciences

Mentor(s): Megan Loftin (College of Education)

The Sport Concussion Assessment Tool 6 (SCAT6) is the most recent edition of an assessment tool that can be used as an individualized reference for baseline assessment prior to concussion. The purpose of this research study was to investigate differences in sex and sport type baseline values from the SCAT6 in NCAA Division I collegiate athletes. These athletes were tested prior to the start of the 2023-2024 season during their yearly physical checkups. The SCAT6 includes elements such as symptom evaluation, cognitive assessments (i.e., orientation, immediate memory, concentration and delayed recall), and balancing testing. Mann-Whitney U tests were conducted to identify sex and sport type (contact, non-contact) differences for all SCAT6 components. A total of 339 healthy collegiate student-athletes [157 females (19.94+1.44 years old); 182 males (20.58+1.56 years old)] completed the SCAT6. Our results found significant sex differences in most SCAT6 components (p<0.001). More specifically, females reported more concussion symptom scores than males, but performed better on cognition and balance assessments. Additionally, student-athletes were categorized based on their sport type with 170 (50.1%) participating in a contact sport and 169 (49.9%) participating in a non-contact sport. Significant differences were found between contact and noncontact sports (p<0.005). Contact sport athletes reported less concussion symptom scores than non-contact athletes, but performed worse

DEVELOPMENT AND IMPLEMENTATION OF A DATA EXTRACTION TOOL FOR AN INTEGRATIVE REVIEW EXAMINING WEARABLE TECHNOLOGY AND NURSES
Presenter(s): Emma Johnson
Health Sciences
Mentor(s): Susan Buchholz (College of Nursing)

The nursing workforce forms the largest body of regulated healthcare providers globally. High patient volumes and increased medical complexity have increased the workload and stress of nurses. Nurses' health is now assessed using wearable technology. An integrative review is being conducted to synthesize available data concerning wearable technology used to assess nurses' health. Using a librarian-informed search strategy, titles were retrieved from six databases (Pubmed, Embase, CINAHL, Web of Science, IEE Explore, AS&T), and references were imported into Covidence, a literature review software. After screening 8603 titles and abstracts and then reviewing 270 full-texts, we are now at the data extraction phase for 123 studies. The purpose of this presentation is to present how we have developed and implemented a data extraction tool specific to this review. For the data extraction process, an existing Covidence Data Extraction Template was modified to contain the following criteria: Citation Information, Study Design and Location, Recruitment Data, Sample Size Information, Gender and Age Data, Wearable Device Data, Outcome Data, Key Findings, Biometric Cross-Reporting, and Economic Data. Six reviewers are involved in the data extraction process. Once two reviewers have extracted study data, the reviewers come to a final study data decision by consensus. Upon completing this work, the integrative review will inform nurses and other stakeholders about the extent of we

ESTROUS CYCLE ABNORMALITIES AND DEPRESSIVE-LIKE BEHAVIORS IN MICE EXPOSED TO SHIFT-WORK LIGHTING
Presenter(s): Kierra Jursch
Health Sciences
Mentor(s): Alexandra Yaw (College of Agriculture & Natural Resources), Brooke Devries (College of Natural Science), Hanne Hoffmann (College of Agriculture & Natural Resources)

Shiftwork is characterized by exposure to irregular light patterns and is linked to mood disturbances in humans and disruptions in circadian rhythms, which are biological processes that follow a roughly 24-hour clock. Circadian rhythm disruption is associated with reproductive issues such as irregular menstrual cycles, menstrual disorders, and pregnancy complications. Similarly, in mice, changes in light exposure can dysregulate estrous cycles, similar to human menstrual cycles, resulting in reproductive and behavioral issues. Previously, we found that when female mice were exposed to alternating light advances and delays, referred to as RL, approximately 50% became acyclic, meaning they did not complete a full estrous cycle within two weeks. To explore the relationship between circadian rhythm disruption, reproductive dysfunction, and depressive-like symptoms, a group of female mice was exposed to RL, while a control group was exposed to standard lighting conditions where lighting remained consistent day to day. Vaginal lavage was performed after 6 weeks of RL to identify acyclic mice in the RL group. These mice were compared to the control group using the sucrose preference test to assess anhedonia, a depression-like behavior, and a social preference test to measure social behavior. Data analysis is ongoing, but we hypothesize that acyclic mice exposed to RL will exhibit a reduced preference for sucrose and decreased interest in social interaction compared to control mice.

DIFFERENCES IN LEVEL OF EDUCATION AMONG PARENTS/GUARDIANS AND THE QUALITY OF LIFE PERCEIVED BY THEIR ADOLESCENT CHILDREN

Presenter(s): Aaron Price, Ryan Chackunkal

Health Sciences

Mentor(s): Hesam Varpaei (College of Nursing), Lorraine Robbins (College of Nursing)

Parental education is a critical factor that can impact aspects of an adolescent child's life. However, this connection has not been adequately examined in underrepresented adolescents. Therefore, the purpose of this study was to investigate the relationship between parental education levels and perceived quality of life (QOL) among adolescents living in disadvantaged communities. Using baseline data from a randomized controlled trial, 163 adolescents in grades ranging from 5th to 8th from urban areas in Michigan participated. Adolescents completed a demographic survey and responded to the Pediatric QOL (PQL) Inventory, comprising 23 items across four domains. No differences were found in age, race, weight status, or biological sex between adolescents with parents of varying education levels. None of the parents having an annual income ≤30,000/year had a graduate or professional degree. No group differences based on parental/guardian education were noted for the PQL emotional, physical, or social function domain scores. However, adolescents having a parent with a graduate/professional degree had a significantly higher PQL school function domain score and PQL Total Score, compared to adolescents who had parents with some college/bachelor's degree or a high school diploma or less. This study highlights how important parental education is for adolescents' QOL and indicates that interventions to increase QOL may be needed for adolescents whose parents have low levels of ed

FINE-TUNING PRE-TRAINED IMAGE CLASSIFIERS FOR IMPROVED PEDIATRIC RIB FRACTURE CLASSIFICATION

Presenter(s): Noah Austad

Health Sciences

Mentor(s): Adam Alessio (College of Engineering)

Accurate detection of rib fractures in pediatric patients from radiographic images presents a challenging classification task due to the subtlety of fracture appearances. Pre-trained image classifiers fine-tuned on domain-specific data have shown promise in improving performance over models trained from scratch. This research leveraged the ResNet50 architecture for binary classification of rib fracture patches. The ResNet50 model is trained on over one million images from the ImageNet database, sorted between one thousand classes. We compared the performance of this network when its weights were initialized as either random or pre-trained. We trained the ResNet50 model on XX patches of fracture-absent and fracture-present regions from pediatric chest radiographs. The results yielded a 4.27% increase in validation accuracy when using pre-trained weights, and fine tuning from that state. Despite the difficulty of classifying rib fracture patches and disparity between the training data and target domain, fine-tuning the pre-trained ResNet50 model demonstrated notable success, achieving an accuracy of 63.03%. This demonstrates the potential and adaptability of deep learning models in addressing nuanced medical imaging tasks.

WEIGHT STATUS DIFFERENCES IN QUALITY OF LIFE AMONG UNDERREPRESENTED ADOLESCENTS IN 5TH-8TH GRADE
Presenter(s): Anna Toebe, Kanon Nishijima
Health Sciences
Mentor(s): Hesam Varpaei (College of Nursing), Lorraine Robbins (College of Nursing)

Negative body image is known to adversely affect adolescents' quality of life (QOL), consisting of 4 domains (physical, emotional, social, and school). Little is known about adolescent weight status differences in these domains, particularly among underrepresented adolescents who may be at most risk for decreased QOL. This study's purpose was to identify weight status differences in QOL among adolescents via secondary analysis of baseline data from a NIH-funded R61/R33 study (HL144896). Fifth to 8th graders in four urban schools in Michigan were recruited to complete a brief demographic survey and Pediatric QOL Inventory. Scores ranged from 0= never to 4= almost always. Weight status based on body mass index (BMI; underweight/healthy weight [UW/HW] and overweight/obese [OW/OB]) was determined from height measured using a portable stadiometer and weight assessed with a Tanita scale. Mann-Whitney U test and Chi-squared test via SPSS28 were used to analyze data with p<05 being considered as statistically significant. No age, biological sex, or racial differences were noted between BMI groups. No weight status differences occurred for the emotional, school, or social function scores. However, between-group differences occurred in the physical function mean score with OW/OB having a lower score than UW/HW. OW/OB had a lower total QOL score than UW/HW. The data indicated OW/OB adolescents had a significantly lower QOL, which suggests that this group may have a negative body ima

THE INFLUENCE OF PRIOR COVID-19 DIAGNOSIS ON CONCUSSION RECOVERY OUTCOMES
Presenter(s): Haley Helm, Matias Jimenez, Myra Chahal
Health Sciences
Mentor(s): Allie Tracey (College of Education)

Several symptoms of COVID-19 overlap with those of a concussion, but there has been little research done on the impact of previous COVID-19 exposure on concussion outcomes. The purpose of this study was to determine if prior diagnosis of COVID-19 influences concussion outcomes, including concussion assessment scores and recovery time, in college-aged individuals. A prospective cohort study of college-aged individuals diagnosed with concussion was conducted. Participants completed demographics, injury and medical history information, the Sport Concussion Assessment Tool-6 (SCAT6), and Vestibular Oculomotor Screening (VOMS) tool within 5 days of injury and within 2 days after full medical clearance (FMC). Participants were put into one of two groups: those with a prior COVID-19 diagnosis and those without.

Mann Whitney U Tests determined differences in concussion outcomes between groups. Ninety-four participants were included in this study (COVID-19: n = 43, age = 21.3 years SD=2.5; no COVID-19: n = 51, age = 21.0 years SD= 2.5). No significant differences were found between groups for SCAT5 and VOMS composite and total scores. Significant differences were found between COVID-19 and no COVID-19 groups in days to symptom resolution (11.5 days vs. 8 days; p=0.021), but not in days to FMC (14 days vs. 12 days; p=0.099). No differences between groups on the SCAT6 and VOMS may stem from test limitations in discerning overlapping COVID-19 and concussion neurological deficits. The sig

PARENT EVALUATION OF THE GUYS/GIRLS OPT FOR ACTIVITIES FOR LIFE (GOAL) INTERVENTION: A QUALITATIVE STUDY
Presenter(s): Grace Waldron
Health Sciences
Mentor(s): Hesam Varpaei (College of Nursing), Lorraine Robbins (College of Nursing)

To address the high obesity prevalence among adolescents, a NIH/NHLBI-funded randomized controlled trial called GOAL is currently being conducted in schools in underserved urban Michigan communities. GOAL includes a 16-week intervention to increase healthy eating and physical activity (PA) in adolescents. The intervention consists of an after-school program two days/week for 5th-8th graders, three educational meetings for the parents, and a website for parents to communicate about their child's health habits. The purpose of this qualitative study was to determine satisfaction with the intervention. Online semi-structured interviews were conducted with parents of adolescents participating in the GOAL intervention. Parents responded to questions about benefits, barriers, and enablers of PA and healthy eating while providing recommendations to increase participation. Eleven parents (72% Black, 100% female) were interviewed. All liked the duration and content. All parents indicated that their child was making smarter health-related choices after the intervention. Instead of in-person meetings, parents preferred online meetings due to conflicting scheduling (n=6). The main barriers to parent attendance were time (n=6) and technological issues (n=4). For adolescents, the barrier was a time conflict with another after-school program. Recommendations included involving the parents more (n=8) and providing hands-on skills for healthy eating and outdoor PA (n=5).

SLEEP IMPROVEMENTS THROUGH PEER EDUCATION
Presenter(s): Georgia Bernwanger, Kim Le, Megan Grove
Health Sciences
Mentor(s): Robin Tucker (College of Agriculture & Natural Resources)

Previous studies of the Sleep Education for Everyone Program (SLEEP) illustrated sustained improvement in sleep outcomes in older adults. This study focuses on the effectiveness of MSU certified peer-led education on enhancing sleep outcomes in university students. Participants for SLEEP were recruited by survey who often experience poor sleep quality and quantity. The program consisted of 6 weekly 30-minute sessions. Throughout the program, participants were educated on topics including sleep hygiene and Stimulus Control Therapy. Sleep duration was recorded using Fitbit® devices; sleep quality was evaluated using the Pittsburgh Sleep Quality

Index. The data was analyzed using descriptive statistics and paired t-tests. Findings from the first cohort of 24 participants indicates that peer-facilitated SLEEP led to improved self-reported sleep duration on weekdays and weekends (6.6 ± 1.2 h vs. 7.3 ± 0.8 h, $p = 0.001$; and 7.5 ± 1.5 vs. 8.5 ± 1.5, $p = 0.008$, respectively), but not according to the objective Fitbit data (6.7 ± 0.8 h vs. 6.9 ± 0.7 h, $p = 0.229$). Sleep quality improved (9.3 ± 2.9 vs. 6.3 ± 2.1, $p < 0.001$) as did unhelpful sleep hygiene behaviors (5.9 ± 6.3 vs. 21.8 ± 6.1, $p = 0.001$). The second cohort is currently being studied with a sample size goal of 45 students in the intervention and control groups, which could provide additional power to detect differences in objectively-measured sleep duration.

EVALUATING THE UTILITY OF VIRTUAL REALITY AND EXERGAMING FOR PATIENTS WITH HEART FAILURE

Presenter(s): Darby Pickford, Gabbi Allman

Health Sciences

Mentor(s): Fabrice Mowbray (College of Nursing), Pallav Deka (College of Nursing)

The benefits of regular exercise in patients with heart failure have been well established. However, exercise adherence is often difficult to achieve. Developing intrinsic motivation (i.e., enjoyment) for exercise is an essential component for achieving long-term adherence. Virtual reality and 'exergaming' may improve enjoyment and mitigate barriers to physical activity for exercise. We aim to synthesize data related to virtual reality and 'exergaming' (immersive and non-immersive) to evaluate their utility and effectiveness on the physical activity levels of patients with heart failure. We are conducting a systematic review and meta-analysis of peer-reviewed literature, searching data from CINAHL, PubMed, Scopus, Web of Science, and clinicaltrials.gov. After an extensive literature search, we retrieved 4,568 articles for title and abstract screening. Title, abstract, and full-text screening will be conducted in duplicate and independently. Data will be pooled based on the modality of exercise and outcomes of interest (e.g., heart rate, minutes of exercise, etc.) We will report descriptive statistics regarding study characteristics and eligibility criteria (i.e., experimental and quasi-experimental studies). We will also report pooled risk differences along with corresponding confidence intervals to inform our risk of bias assessments and grading of the evidence. This study will highlight gaps in the literature and recommendations for future research surrounding virtual reali

INVESTIGATING BIOLOGICALLY RELEVANT METALS IN CAENORHABDITIS ELEGANS

Presenter(s): Kyleen Hall

Health Sciences

Mentor(s): Aaron Sue (College of Human Medicine), Thomas O'Halloran (College of Human Medicine)

The metallome, or the concentrations and distributions of metal ions, plays important roles in key cellular decisions. Understanding how the metallome of an organism changes during various biological processes, and in response to certain environmental cues, contributes to our understanding of biological processes such as reproduction, disease, toxicity, aging, and more. To study the metallome, we employ the use of two instruments capable of sensitive elemental analysis: an inductively coupled plasma triple quadrupole mass spectrometer (ICP-QQQ-MS) and a laser ablation inductively coupled plasma time of flight mass spectrometer (LA-ICP-TOF-MS). The nematode Caenorhabditis elegans presents as an ideal model system to study the metallome using these instruments due to its ease of maintenance, small size, genetic tractability, and many human orthologs. Here, we used C. elegansto investigate how the metallome changes in response to overexposure to manganese and iron, two necessary elements that can be toxic at high concentrations. Two C. elegans strains were examined: the N2 (wild-type) and IG6 (smf-1 metal transporter deletion) strains. Using the ICP-QQQ-MS and LA-ICP-TOF-MS, we observed how the abundance and distribution of biologically relevant metals changed within the worms to gain a better understanding of the mechanism of toxicity of iron and manganese. By more clearly elucidating the mechanism of toxicity of these elements, we hope to shed light

PARENT-ADOLESCENT DISCREPANCIES IN REPORTS OF BEHAVIORAL HEALTH SYMPTOMS DURING A PEDIATRIC WELL-CHILD VISIT: RELATIONSHIP TO FUNCTIONAL IMPAIRMENT AT ONE TO TWO YEAR FOLLOW-UP.

Presenter(s): Matthew Spaulding, Natalia Khoshnam, Sanjanasri Pothuraju
Health Sciences
Mentor(s): Melissa Benbow (College of Osteopathic Medicine), Rachel Christensen (College of Osteopathic Medicine), Susan Frank (College of Osteopathic Medicine)

Pediatricians often are faced with discrepant reports from parents and adolescents as to whether or not the adolescent is presenting with clinically significant symptoms of emotional or behavioral problems. This study used behavioral health screens collected from 1107 adolescent/parent pairs at 3 MSU Pediatrics outpatient clinics to assess and compare the utility of congruent and discrepant reports of clinically significant symptoms in predicting impairment in adolescents' day-to-day functioning. The PSC-17 (Gardner et al., 2007) measured symptoms and a 6-item scale (based on Blucker et al., 2014) measured impairment. Dummy variables coded as 0 or 1indicated whether the parent only, the adolescent only, or both reported significant symptoms (control = both denied any clinically significant symptoms). Regression analyses assessed whether discrepant as well as congruent reports would predict impairment at T1 and T2 (12 to 18 months later). At T1, 163 informant pairs (14.7% of the sample) agreed that the adolescent was presenting with clinically significant symptoms whereas 104 parents (9.4%) and 110 (9.9%) adolescents reported clinically significant symptoms denied by the other informant. Results showed that congruent reports of positive symptoms explained more variance in both parent and adolescent reports of functional impairment at both T1 (R2s respectively were 26.3% and 27.9%, ps <.001) and T2 (after controlling for T1 impairment, R2s were 1.5%

MSU STRIDE CENTER: WORK-BASED LEARNING LITERATURE REVIEW
Presenter(s): Saara Ashtiani
Health Sciences
Mentor(s): Aliza Lambert (College of Education)

This summer the MSU STRIDE Center is introducing the Spartan Work program to create precollege pathways for underrepresented and economically disadvantaged students with disabilities. STRIDE is partnering with the MSU Athletic Department to place youth ages 16-18 with intellectual and/or developmental disabilities in paid employment opportunities. My research was based in doing a literature review to help structure research questions following this program.

DOES TAKING A COURSE IN NUTRITION HELP STUDENTS BETTER PREDICT SODIUM CONTENT IN FOOD?
Presenter(s): Darby Pickford
Health Sciences
Mentor(s): Pallav Deka (College of Nursing)

Hypertension is the primary starting point of many cardiovascular diseases. Prevention and management of hypertension include monitoring and restricting sodium intake. This study aimed to evaluate if students who have taken, versus not taken, a course in nutrition are better able to estimate sodium contents in regularly consumed foods. This cross-sectional study asked students at MSU to indicate their best estimate of sodium present in 30 commonly consumed food items, confidence in their estimates and rate their surprise over learning of the actual sodium amount in the food items. An independent t-test was done to compare the sodium estimates of the two groups of students. Of the 200 students who participated in the study, 63 had taken a course in nutrition and 134 had not. The mean age was 20±1.4 years, 148 females, 44 males, and 4 others. On average, students ate out 2.21 times per week. 27.4% of students who had taken a course in nutrition felt confident in their responses compared to 25.9% of students who had not. There were no significant differences ($p=0.772$) in sodium estimates or surprise in knowing the actual sodium amount in food ($p=0.342$) between the two groups. Students who had taken a course in nutrition were not able to estimate sodium content in food better than students who had not taken a course in nutrition. Better ways of teaching nutritional awareness for sodium content in commonly consumed food need to be investigated.

SHARED DECISION-MAKING IN HEALTHCARE: UNDERSTANDING CAPACITY VS. COMPETENCY
Presenter(s): Leah Alfred
Health Sciences
Mentor(s): Linda Keilman (College of Nursing)

A key concept of person/patient-centered health care is the process of shared decision-making (SDM) that happens when healthcare professionals, a person/patient, and their invited family/friends meet to discuss care options and choices, benefits, risks for wellness/health promotion/prevention, or in treating acute, chronic, or terminal conditions. Optimum SDM occurs when the evidence-based interventions are discussed with respect to the person/patient's wishes, goals, values, and preferences. It is through honoring the individual's autonomy and unique individuality that mutually agreed upon goals of care are established and correlated to expected outcomes. In caring for older adults, individuals working with this population must understand the power of mutual SDM and be able to recognize an individual's capacity and/or competency cognitive and functional status. Capacity and competency are two different cognitive (brain) functions utilized in understanding information and making appropriate and safe decisions based on individual values and preferences. Capacity is the ability to learn and understand health care information and the benefits and risks of potential interventions. Competency is a legal determination made by the court system. The two terms are often used interchangeably, but they are very different. A literature review was conducted regarding the difference between capacity and competency. To develop a strong research question, the literature was searched to find

A NATURE-BASED BEREAVEMENT MEDITATION PROTOCOL FOR INFORMAL CANCER CAREGIVERS

Presenter(s): Grace Caldwell, Sophie Delahaye
Health Sciences
Mentor(s): Arienne Patano (College of Nursing), Gwen Wyatt (College of Nursing), Rebecca Lehto (College of Nursing)

Limited research addresses cancer caregivers (CG) bereavement needs following the death of the patient. Bereavement is an intense period of mourning during the first six months following death, that includes an unfolding of the grief process and is characterized by strong emotions and demands on cognitive resources. Both nature and meditation are recognized as supportive practices during difficult life events. The purpose of this research is to develop an intervention of accessible nature-based meditations for home-based cancer CGs during the early bereavement period. Guided by the Bereavement Framework, the intervention draws on our team's past research that has developed supportive resources for both patients and their CGs. In the present study, we are developing a 6-module intervention. Specifically, one of the modules focuses on an ocean beach meditation by integrating nature scenes with a guided synchronized breath and body scan activity. Next, we will produce a 10-15-minute audio recording to accompany the nature scene. Once all six modules of the intervention are completed, adjustments will be made to the protocol followed by acceptability and feasibility testing. The pilot testing will be conducted with 20 bereaved cancer CGs over a two-week period. Demographic and bereavement data will be collected pre-intervention. Post-intervention bereavement and acceptability/feasibility data will be recorded. Descriptive statistics and t-tests will be used to analyze the data. T

INTERVENTION FIDELITY ASSESSMENT OF MINDFUL HEALTHY FAMILY PROJECT
Presenter(s): Allison DeLuna
Health Sciences
Mentor(s): Tsui-Sui Kao (College of Nursing)

Evaluating treatment fidelity is an essential step to maximize internal and external validity and can facilitate the replicability of intervention programs. The purpose of this study was to appraise 5 aspects of treatment fidelity of Mindfulness-based motivational interviewing (MM-based-MI) program. MM-based-MI was designed to provide resources and accountability for rural and Native American parents and their children to promote healthy lifestyles in their homes. Twenty-seven caregivers received 9 virtual MM-based-MI health sessions every other week and 3 motivational texts per week (design/dose). Research assistants who completed 9 hours training (provider training) introduced and encouraged the practices of mindful eating, movement, and interactions at home via Zoom or phone calls (delivery) with audio-recorded (receipt). Participants' perceived importance, readiness, and confidence in leading a healthier lifestyle were evaluated each session on a scale of 1-10. Our results showed that over 70% of participants' lifestyle trajectories had either increased or maintained over the course of the program (4-6 months). For those who received all sessions (55.55%), the improvement and maintenance of healthy lifestyles were much higher than those who only completed few sessions (enactment). The reasons for the fluctuating ratings in their perceived importance, readiness, and confidence were mostly due to extenuating circumstances such as illnesses, busy holidays or conflicting dema

THE EFFECTS OF DRINKING WATER SOURCES ON THE GUT MICROBIOMES OF PREGNANT WOMEN IN MICHIGAN
Presenter(s): Anish Gogineni
Health Sciences
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

The gut microbiome is a diverse ecosystem that varies widely between individuals and can be affected by several factors. There is a great potential for drinking water to be one of those factors because its composition [CS1] differs by source - city, well, bottled, etc. Minerals, PFAS, and/or other contaminants vary by source. This study aims to understand if there the pregnancy gut microbiome is associated with the source of drinking water. Stool samples were collected from a cohort of 67 pregnant women enrolled in the Michigan Archive for Child Health (MARCH) to obtain gut microbiome data. The different responses for water sources were categorized as city, well, bottled, or filtered water. Alpha diversity will be assessed using the Choa 1 index (presence/absence) and the Shannon index (abundance) to quantify the diversity of each individual's microbiome. Beta diversity will be assessed using the Sorensen index (presence/absence) and the Bray-Curtis index (abundance) to quantify the diversity between the individuals' microbiomes. The beta diversity indexes will then be visualized using a Principal Coordinate Analysis (PCoA) plot. Finally, a Permutational Analysis of Variance (PERMANOVA) analysis will be used to test if drinking water source is associated with beta diversity of the gut microbiota during pregnancy. The proposed study design and methods will achieve the aim of understanding how water sources can affect the gut microbiome during pregnancy.

TEACHING STRATEGIES FOR SEXUAL EDUCATION IN K-12 AMERICAN SCHOOL SYSTEMS
Presenter(s): Katie Griffin
Health Sciences
Mentor(s): Rebecca Lehto (College of Nursing)

Despite documented evidence regarding the importance of sexual education for young people, as of 2020 only 28 states in the United States had mandatory sex and HIV education in K-12 public schools. Thirty-six states allow parents to opt-out on behalf of their children, whereas only 22 states require that information taught about sex and/or HIV must be medically, factually, or technically accurate. Knowledge about sexual health is essential towards pregnancy and sexually transmitted disease prevention among teenagers, to understand knowledge of consent, to de-stigmatize communication about sexual health with health professionals, and to enhance understanding of gender and sexual identities. Evidence also demonstrates that teenagers who received contraceptive education as opposed to abstinence have lower pregnancy risk. The purpose of the project was to create an educational video for an adult audience (parents of K-12 children) regarding the important basics of sexual education in American K-12 schools. To create this video, peer-reviewed research from both articles and government websites were compiled, and a script containing factual and objective medical information was developed. Audio-visual display of information depicting public health consequences derived from lack of sexual education in K-12 schools is both an engaging and a persuasive strategy for health promotion. Although sexual education may be an awkward and controversial topic in schools for children

EDIBLE RFID TAGS: NON-TOXIC SUBSTRATE AND ANTENNAS FOR PILL TRACKING IN ELDERLY CARE
Presenter(s): Aarav Contractor
Health Sciences
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

This study investigates the development of ingestible and edible RFID tags tailored for pill tracking in elderly care. The primary objective is to create RFID tags utilizing safe and non-toxic substrates along with antennas to ensure biocompatibility upon ingestion. Through a literature review, biocompatible substrates and antennas are identified for potential application in ingestible RFID tags. The research aims to offer a solution for efficient pill management in elderly care facilities, revolutionizing medication administration with a non-invasive and automated method for monitoring pill intake. The utilization of non-toxic substrates and environmentally friendly materials aligns with sustainable healthcare practices, minimizing adverse effects on human health and the environment. This work promises to enhance the quality of care for the elderly population by ensuring accurate and reliable medication tracking while prioritizing safety and sustainability.

MANIPULATIVE THERAPY AND PHYSICAL ACTIVITY ON GAIT PATTERNS IN PATIENTS WITH CHRONIC LOW BACK PAIN: A REVIEW

Presenter(s): Ryan Hertz
Health Sciences
Mentor(s): Clarence Nicodemus (College of Osteopathic Medicine), Jessica Epstein (College of Osteopathic Medicine)

Chronic low back pain (cLBP) is frequently observed in aging populations and its prevalence is set to increase as the average age of the population increases; by 2050 it is estimated that 843 million people will be affected. cLBP is often characterized by abnormalities in gait characteristics, so it becomes pertinent to analyze the effects of different treatments on gait parameters, often through 3D kinematic analysis. Osteopathic Manipulative therapy (OMT) and physical activity (PA) therapies have demonstrated their effectiveness on pain, but their effects on gait characteristics remain somewhat unknown. Cochrane Library, Google Scholar, PubMed, Web of Science, and EMBASE were searched until December 2023 for randomized-controlled trials which analyzed the effects of PA or OMT on gait parameters. Studies were summarized using Excel Sheets. 5 studies were included. All five studies reported significant improvements in pain as measured through visual analogue scale. In the OMT+PA articles, disability scores improved in both groups, but only one article found significant differences between treatment groups. Similarly one PA article that analyzed disability found that disability decreased in experimental groups. All studies reported varying degrees of impact on kinematic variables. The goal of this study was to inform the delivery of a prospective study evaluating the effects of osteopathic manipulative therapy and physical activity on cLBP patients' gait characterist

TIME OF DAY EFFECTS ON EXERCISE HEART RATES IN POSTMENOPAUSAL FEMALES WITH HYPERTENSION

Presenter(s): Allison O'Donnell, Juliana Varanelli
Health Sciences
Mentor(s): Jill McMahon (College of Osteopathic Medicine), Katharine Currie (College of Education)

Exercise can be used to lower blood pressure, but prescribing exercise using heart rate reserve (HRR) may be challenging due to heart rate (HR) changing throughout the day. This study sought to determine the effect of time of day on resting and exercise HR. We also sought to determine if exercise intensity (%HRR) differed depending on whether it was calculated using resting HR from the stress test or exercise visit. Twenty-two post-menopausal (55-80 years) hypertensive females had their resting and maximum HR measured during an exercise stress test. Participants then completed a moderate-intensity exercise bout on a treadmill in the AM and PM on separate days and resting and exercise HR were collected. Data were analyzed using repeated measures ANOVA, paired t-test, and Wilcoxon tests. Resting HR was similar across the visits ($P=0.093$). Average treadmill HR was lower in the AM (110±12 bpm) vs. PM (114±11 bpm; $P=0.041$). There was no difference in the exercise intensity (%HRR) using resting HR from the stress test vs. the AM resting value ($P=0.457$) or PM resting value ($P=0.097$). The resting HR and %HRR were not influenced by time of day supporting the use of resting HR collected on the day

of exercise or from previous testing days including those obtained during a stress protocol. The elevated HR during PM submaximal exercise requires further analysis to determine if this might be explained by exercise stimulus (treadmill speed or incline) or medication timing

INTERPROFESSIONAL EDUCATION: VALUES AND ETHICS FOR OSTEOPATHIC MEDICAL STUDENTS
Presenter(s): Clayton Beard
Health Sciences
Mentor(s): Fabrice Mowbray (College of Nursing)

Guidance from the Interprofessional Education Collaborative was utilized by Michigan State University (MSU) to advance interprofessional learning experiences, with the first session focused on the Values and Ethics of healthcare providers. The primary aim of our study was to evaluate the effect of this educational session on the knowledge and confidence of osteopathic medical students regarding interprofessional practice competencies. We performed a prospective cohort study of all osteopathic medical students who completed the first educational session in September 2022. We obtained Institutional Review Board approval from MSU. Before (1 week) and after (2 weeks) each regularly scheduled virtual IPE event, participating students completed electronic, de-identified, and validated questionnaires generated through Qualtrics ©. Students were eligible if they were over 18 years of age. We evaluated pre- and post-session scores across all 16 domains using a series of Wilcoxon Ranked Sign Tests. Our primary outcome was an increase in each competency, defined as an increase of any magnitude on a five-item Likert scale (strongly disagree [0] to strongly agree [5]). 322 students completed the educational session, of which we could only link 96 student surveys (30%). Characteristics were almost identical between those who did and did not complete the post-session survey. We saw a significant increase in 14/16 (88%) competencies from pre- to post-survey, except for topics on cultural sen

ASSESSMENT OF LOCATION AND SIZE DEPENDENT BONE MICROARCHITECTURE DIFFERENCES IN EQUINE TUBER COXAE
Presenter(s): Nicholas Bray
Health Sciences
Mentor(s): John Popovich (College of Osteopathic Medicine)

Bone microarchitecture is important to the structure and function of the skeletal system in health and disease. It is often assessed using micro-computed tomography (micro-CT); however, the analysis and data interpretation may not yet be optimized and understood with respect to the location and size of the bone being sampled. This study aims to assess location and size dependent changes in bone microarchitecture to improve identification and diagnosis of bone disease. This study examined 28 equine tuber coxae bone biopsy samples. All samples were harvested and imaged from both the contralateral (CL) and ipsilateral (IP) tuber coxae using a Quantum GX micro-CT imaging system (PerkinElmer). Two regions of interest (ROIs) were created for each sample: 1) whole bone sample and 2) cubed subregion of the whole bone. Data were analyzed using Dragonfly imaging software (Comet Technologies) to calculate three common microarchitecture metrics: bone volume fraction (BVF), average trabecular separation (ATS), and average trabecular thickness (ATT). To determine the effects of location and size dependencies on bone microarchitecture, comparisons were made between CL and IP sides and between the whole bone and cubed subregion ROIs. Statistical analyses were conducted using Microsoft Excel. Whole bone and cubed ROIs ($P<0.05$) were significantly different for all metrics. However, there were no significant differences when comparing the same ROIs between sides, except for ATT when

TRAINING AND EDUCATION OF NURSES IN CARING FOR INDIVIDUALS WITH INTELLECTUAL AND DEVELOPMENTAL DISABILITIES: LITERATURE REVIEW

Presenter(s): Sarah Erickson
Health Sciences
Mentor(s): Patricia West (College of Nursing)

Approximately 6.5 million people in the United States have an intellectual and developmental disability (IDD) which generally requires support services. Individuals with IDD experience health disparities which leads to higher rates of morbidity, mortality, and risk factors for poorer health than the general population. Nurses will encounter patients with IDD throughout the lifespan and across any healthcare setting. Nurses contribute to the quality of care for people with IDD impacting health outcomes for this population. Nurses need to have the knowledge and skills, as well as compassion to support this vulnerable population. However, there is a limited understanding of the training and education of nurses in caring for people with IDD. The purpose of this review is to examine and synthesize the literature surrounding the training and education of nurses in the care of individuals with IDD. Web-based searches were conducted in CINAHL to identify relevant literature published in English utilizing key words and will be reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA). Covidence© was utilized to organize and review the literature. We excluded literature conducted in countries besides the U.S., as well as limiting it to the last five years. Search results yielded 260 records which we are currently screening for inclusion criteria. Findings from this review will inform the benefits of the educational and training gaps currently

AMONG NURSES WORKING IN IN-PATIENT SETTINGS IN DEVELOPING COUNTRIES, WHAT IS THE KNOWLEDGE AND AWARENESS OF WOUND CARE FROM SURGICAL AND NONSURGICAL WOUNDS

Presenter(s): Umme Hoque
Health Sciences
Mentor(s): Ann Annis (College of Nursing)

Healthcare associated infection (HAI) is a major public health concern that impacts individuals internationally. Adequate knowledge and practice of wound care is essential in preventing these HAIs. The aim of this study is to determine the knowledge and awareness of surgical and non-surgical wound care among nurses in developing countries. A literature review was conducted using the Cumulative Index to Nursing and Allied Health Literature (CINAHL) database. Inclusion criteria contained: Nurse, wound management OR knowledge, and developing countries (Bangladesh Or Pakistan OR Ethiopia OR Palestine OR Nigeria). Studies focused on physicians or developed countries or surface wounds were excluded. A total of eight studies met criteria. Results revealed that on average, less than 50% of nurses in developing countries have adequate knowledge and awareness of surgical and non-surgical wound care. Deficiency in the knowledge of essential wound care can jeopardize the well-being of patients. The knowledge gap for nurses in these developing countries may be attributed to low resources and funding for hospitals, high nurse to patient ratio, and insufficient performance monitoring systems. This means that nurses in developing countries are less likely to prevent HAIs when compared to their counterparts in developed countries. This could significantly affect the overall health and wellbeing of patients with wounds, potentially leading to HAI and rehospitalization. These adverse health out

IDENTIFYING CONCUSSION IN COLLEGE-AGED INDIVIDUALS USING A MULTIMODAL ASSESSMENT OF VESTIBULAR AND OCULOMOTOR FUNCTION
Presenter(s): Lili Klein
Health Sciences
Mentor(s): Megan Loftin (College of Education)

Vestibular and oculomotor assessments are fundamental tools to identify concussions. However, research is unclear on which vestibular and oculomotor assessment or combination of assessments best detect concussions. The purpose of this study was to assess the discriminant ability of the Vestibular/Ocular Motor Screening (VOMS), Balance Error Scoring System (BESS), modified BESS (mBESS), and High-Level Mobility Assessment Tool (HiMAT) to identify college-aged individuals with concussion from controls. A prospective study of college-aged individuals (18-30 years) diagnosed with concussion within 5 days of enrollment was conducted. Demographics, injury information, VOMS, BESS/mBESS, and HiMAT were completed at the initial visit. Logistic regressions (LR) and receiver operating characteristic (ROC) analyses of the area-under-the-curve (AUC) determined the ability of the VOMS, BESS/mBESS, and HiMAT to identify concussion from control. A total of 214 participants (mean age=20.4±2.5 years, 52.8% female) were enrolled, with 137 (64.0%) concussions and 77 (36.0%) controls. The VOMS total (AUC=0.93, 95%CI=0.90-0.97, p<0.001) and HiMAT total (AUC=0.79, 95%CI=0.65-0.93, p<0.001) significantly identified concussion from control, while the BESS (AUC=0.58, 95%CI=0.50-0.67, p=0.05) and mBESS (AUC=0.55, 95%CI=0.47-0.64, p= 0.23) did not. A 2-factor model with combined VOMS and HiMAT totals did not improve identification (AUC=0.92, 95%CI=0.85-1.00,

TREATMENT FIDELITY IN NATURE-BASED VIRTUAL REALITY INTERVENTION AMONG HOSPICE CAREGIVERS
Presenter(s): Lily McGowan
Health Sciences
Mentor(s): Rebecca Lehto (College of Nursing)

Treatment fidelity is a 5-step standard recommended by the National Institute of Health in behavior change research, including design (dose), provider training, intervention delivery, participant receipt, and enactment. Fidelity steps are taken to enhance the quality control to assure rigor and reproducibility of the study. The abstract purpose was to describe treatment fidelity in an exemplar home-based study using a nature-based virtual reality (VR) intervention evaluating mental health symptoms of hospice caregivers. First, the study design (dose) was developed: daily sessions of nature VR for at least 10 minutes, over the course of 5 consecutive days. Second, provider training was done according to the manualized protocol to ensure consistent and appropriate delivery of the intervention as prescribed. Third, participants received standardized training on VR usage and safety measures. Fourth, participant receipt was measured by the number of times and duration of VR use. Fifth, enactment and assimilation of the study behavior into participant lifestyle was not possible to assess due to the nature of the study. VR equipment was borrowed by the participants and returned to the researchers at the study completion. Ideally, enactment would be assessed 4-6 weeks after the intervention. In summary, 4 of the 5 steps of treatment fidelity were included in this study. Therefore, because of the careful attention to treatment fidelity, we can trust our protocol and replicate the stud

APPLICATIONS OF STREAK CAMERA TECHNOLOGY IN CANCER TREATMENT
Presenter(s): Curtis Moore
Health Sciences
Mentor(s): Paul Gueye (Facility for Rare Isotope Beams)

Cancers are notoriously difficult to treat, and current applications like radiation therapy cannot be used on all cancers. Lung cancer and blood cancer, for example, have cancerous cells constantly moving due to respiration and blood flow, so radiation therapy risks damaging healthy cells and hurting the patient. Streak cameras are a relatively recent technology that find use in optics, chemistry and biology. They measure the light emitted by a source, be it a subatomic particle, large polymer, or anything in between, and organize it so the temporal and spatial changes of the light intensity can be measured over time. These data can be analyzed to study the state and structure of the source over time. Experiments often use a spectrometer, which separates and measures electromagnetic emissions from the target molecule, to organize the light emitted by the target molecule. In this study, target molecules consist of organic materials such as nucleotides and proteins. Literature review has shown that individual nucleotides and each sequence have unique spectral emissions, allowing for identification. One of the primary goals is to be able to identify cancerous DNA, RNA, and associated proteins by contrasting them with the spectral signatures of healthy cell DNA and RNA. These data can then be relayed in real time to a therapy or imaging device, allowing it to track cancerous cells and perform more specialized and targeted treatments.

PHONE-BASED NON-CLINICAL WELL-BEING AND EMOTIONAL SUPPORT FOR NURSES AND NURSING STUDENTS: A REVIEW OF EFFECTIVENESS
Presenter(s): Kendall Perry
Health Sciences
Mentor(s): Jackeline Iseler (College of Nursing), Jacquie Albarez (College of Nursing)

Background: The COVID-19 pandemic exacerbated the nursing shortage and burnout crisis in the US, with about 100,000 RNs leaving the profession in 2021 and over 600,000 planning to leave by 2027. Nearly one in five new nurses quit within the first year, and one in three within two years. Nursing students also experience high levels of burnout, anxiety, and depression. Aims: This review aims to answer the question: How effective is phone-based non-clinical emotional support for improving the mental health and well-being of nurses and nursing students? Methods: A literature search used keywords such as Nurse* OR Nursing Students AND (wellness OR well-being OR mindful* OR "mental health" OR burnout OR resilience*) AND (smartphone OR app* OR "cell phone" OR mobile OR online support). CINHAL and PubMed databases were used, with articles on bedside nurses and students, mobile mindfulness and mental health interventions, nurse burnout reduction strategies, and self-care for mindfulness and resilience. Results: Out of 149,373 studies, eight were included in the review. They highlighted the benefits of teaching mindfulness skills and using mobile interventions to reduce stress and improve mindfulness. However, the literature on the well-being of bedside nurses and students is scarce and inconsistent. Conclusion: The reviewed studies showed positive results, but more research is needed to address the gap in the literature and urgent need for on

NEURODEVELOPMENTAL OUTCOMES IN UGANDAN PERINATALLY-INFECTED CHILDREN WITH HIV AT PRESCHOOL AGE WHO ARE NOT IMMUNE-COMPROMISED
Presenter(s): Jenus Shrestha
Health Sciences
Mentor(s): Itziar Familiar-Lopez (College of Osteopathic Medicine), Michael Boivin (College of Osteopathic Medicine)

Background: Neurodevelopmental delay and disabilities have been well documented in children living with HIV, especially living in more impoverished settings host to many risk factors. The present study compares a cohort of immunologically stable Ugandan preschool-age children living with HIV, to a comparable cohort of non-exposed or infected children matched for age and living situation. Method: Perinatally infected Ugandan children living with HIV (CLHIV) (12 boys, 12 girls; mean age 4.6 yrs, SD 0.77) were compared to demographically similar non-exposed/non-infected children (14 boys, 17 girls; mean age 4.8 yrs, SD 0.78) using the Mullen Scales of Early Learning (MSEL) and the Color Object Association Test (COAT), an experimental measure for object placement immediate recall and learning. CLHIV children were immunologically stable in that all but one child was at WHO stage 0 or 1 and children included in this study had CD4% levels above 20 (mean 29.0 (SD-7.4). Results: After adjusting for socio-economic status (SES), gender, age, and quality of caregiving and developmental milieu (HOME scale), the HIV cohort was significantly lower than their non-infected counterparts on overall MSEL cognitive performance ($p<0.05$). MSEL differences were especially apparent on receptive language and expressive language. The two groups also differed on overall learning outcomes with the COAT assessment ($p<0.05$). Overall MSEL and COAT performance were not related to immunology sta

"SHE'S GOING TO WRITE HER OWN STORY": A MIXED-METHODS STUDY EXPLORING CAREGIVERS' EXPERIENCES WITH THEIR CHILDREN WITH MEDICAL COMPLEXITIES
Presenter(s): Joseph Kesto, Justin Strong, Latrell Massey
Health Sciences
Mentor(s): Emily Jensen (College of Social Science)

Children with medical complexities (CMC) have chronic health conditions that impact multiple organ systems, resulting in major limitations, and require significant healthcare services and resource use (Cohen et al., 2011). This population is estimated to be <1% of all US children. However, they account for 56% of hospitalized patients, 82% of hospital days, and 86% of hospital charges in children's hospitals (Berry et al., 2013). Their developmental differences, along with their high utilization rates of medical care, can bring unique challenges for children with medical complexities and their caregivers when obtaining medical care. Research is only beginning to emerge to understand the experiences of caregivers when seeking medical care and educational services for their CMC. This study is the first of its kind to aim to understand caregivers' experiences with their CMC in medical and educational settings. Our study also investigated the unique impact of COVID-19 on this population. We will present results of a mixed-method study exploring the experiences of caregivers of children with medical complexities in medical settings, as well as the impact of COVID-19 on their lives. The presentation will include unique recommendations to improve quality-of-care for children with medical complexities and their families.

A QUALITATIVE DESCRIPTIVE STUDY OF CISGENDER FEMALE-BODIED EMERGING ADULTS PRECONCEPTION HEALTH DEFINITIONS
Presenter(s): Jaime Parker
Health Sciences
Mentor(s): Emma Schlegel (College of Nursing)

Emerging ages for women is a critical and sensitive period for preconception health. Before potential pregnancy, the knowledge and inventions are diminutive. This study sought to gain an understanding of how emerging adults define their preconception health which illuminates critical gaps in our knowledge and offers a foundational step towards effective health interventions during a pivotal developmental stage.The findings presented are part of a larger, mixed methods study examining the relationships between emerging adults' sexual and reproductive health information source and their preconception health knowledge and health literacy. Emerging adults (18-25 years; n = 245) assigned female at birth were recruited October-November 2022 via ResearchMatch and social media advertisements to complete a cross-sectional survey. A subset of survey respondents (n = 24) were randomly recruited between April and July 2023 to complete follow-up interviews focused on preconception health promotion preferences. Interviews were analyzed using a qualitative descriptive approach and inductive and deductive coding strategies. In this presentation, we present the analysis of participants' definitions of preconception health. Results: Data analysis is ongoing. The findings of this study can be used to create effective interventions tailored to the needs and preferences of emerging adults, including sexual minorities. At crucial ages in cis-gender females' lifetimes, understanding their idea

ADDRESSING FALLS IN NURSING HOMES
Presenter(s): Chaitanya Vadlamudi
Health Sciences
Mentor(s): Murthy Gokula (Concierge Connected Care)

This study aims to implement person-centered, non-pharmacological interventions in the Cognitive Spa, a dementia care unit at Orchard Villa Skilled Nursing Facility, with the objective of reducing behavioral disturbances, falls, and readmissions among patients. The current schedule will be improved by incorporating stimulating activities for a select group of patients, while a control group will be used for comparison. Patients admitted to the facility will be assessed using various scales, including the global deterioration scale, social service assessment, CAA Review, and FAST scale. The study will begin by providing training to State Tested Nurse Aides (STNAs) on dementia care, addressing the gaps in their knowledge. Certified trainers will create presentations to educate and prepare the STNAs in caring for patients with dementia or Alzheimer's disease. Additionally, recreational therapy and other trained specialists will train the STNAs involved in the dementia care unit to enhance their involvement in providing quality care. A revised schedule will be created, allowing three nurse aides to be available to the patients, with two focused on safety and hygiene and one involved in recreational therapy during daily activities. By improving STNAs' knowledge and involving them in recreational therapy, it is anticipated that patient care quality will be enhanced, potentially reducing falls.The second part of the study will involve implementing aromatherapy and light therapy

RELATIONSHIPS BETWEEN PHYSICAL ACTIVITY (PA) SELF-EFFICACY AND QUALITY OF LIFE AMONG UNDERREPRESENTED ADOLESCENTS
Presenter(s): Emily Creedon, Kiran Patel
Health Sciences
Mentor(s): Hesam Varpaei (College of Nursing), Lorraine Robbins (College of Nursing)

Self-efficacy correlates with increased physical activity (PA) in adolescents, which relates to an increase in well-being and quality of life (QOL). Research is lacking on how adolescents' PA-specific self-efficacy correlates with QOL. The purpose of this study was to examine relationships between PA-specific self-efficacy and QOL among underrepresented adolescents in underserved urban areas. The Pediatric QOL Inventory assessed physical, emotional, social, and school QOL on a 0-4 scale (0 = never to 4 = almost always). Body mass index (BMI) was measured with a portable stadiometer for height and Tanita scale for weight. Spearman correlation coefficients were used to examine relationships between PA self-efficacy and QOL. A secondary analysis was conducted, including 163 adolescents (mean age = 12.6 years) with half being male (50.9%) and the largest percentage in 7th grade (36.2%). The majority were Black (60.7%), 17.2% White, and 22.1% were mixed or other races. About 41.1 % were overweight or obese. Statistically significant relationships occurred between PA self-efficacy and physical function (ρ=.250, p=.001), social function (ρ=.264, p<.001), and the total QOL score (ρ=.177, p=.025). This research shows that increased PA-specific self-efficacy may lead to an increase in physical function, social function, and QOL for adolescents. PA has a positive impact on both physical health and social well-being. Interventions teaching PA skills may improve PA self-

INTERPLAY OF ESR1 AND RAC1 IN ENDOMETRIAL GLAND DEVELOPMENT
Presenter(s): Laasya Koduri
Health Sciences
Mentor(s): Ripla Arora (College of Human Medicine)

Endometrial glands play crucial roles in embryo development and survival in mammalian pregnancies. In this study, using genetic mouse mutants in Estrogen Receptor 1 (Esr1) and Ras-related C3 botulinum toxin substrate 1 (Rac1), we aim to shed light on the mechanisms governing endometrial gland structure. Uterine glands are branched tubular exocrine glands that generate secretions for the embryo at the time of embryo attachment and during post-implantation stages. Previously, we have used two different models to generate tissue-specific deletions in the uterus: Pax2Cre and PgrCre mouse lines. Pax2Cre deletes in the embryonic uterine epithelium, and PgrCre deletes in the neonatal uterine epithelium, muscle, and mesenchyme. Using these deleter lines, we found that PgrCre deletion of Rac1 increases the number of branches on endometrial glands and the length of those branches. Using the Pax2Cre deletion of Esr1, we found a reduction in the number of gland branches. This suggests that Esr1 and Rac1 may play opposite roles in regulating uterine gland branching. When we used Pax2Cre to make an epithelial specific deletion of RAC1, these embryos died in utero and could not be analyzed. To generate a mouse that can delete RAC1 nonlethally specifically in the adult epithelium, we used the LtfCre mouse line. With the LtfCre deletion of Esr1 and Rac1, we will examine endometrial glands specifically associated with the implantation chamber. Through our investigations, we aim to provide furt

THE EFFECTS OF COVID-19 ON SYRIANS
Presenter(s): Mario Leyva
Health Sciences
Mentor(s): Camelia Suleiman (College of Arts & Letters)

The 2020 COVID pandemic stopped the world in its tracks with devastating impacts across the globe. This presentation delves through the effects the pandemic has on the Syrian population including refugees who have fled the country and many who still reside in Syria. A multitude of factors contributed to the harmful conditions Syrians find themselves in today including an ongoing conflict, poor infrastructure, a terrible economy, and a staggered response to the virus. This conflict has led to severe shortcomings when it comes to medical availability for patients, a low supply of protective equipment for civilians and medical officials, and very few opportunities for people to pursue a career in medicine. Due to these suboptimal conditions, the healthcare system in Syria has undergone many changes as officials try their best to provide for the people. On top of it all, the Syrian people are hesitant to the COVID vaccine, which coupled with an overcrowding and sanitation issue made the situation far worse. All of these traumatic experiences combined have affected the mental health of Syrians and caused issues with executive function, or a person's ability to function efficiently. Despite all this, there are still ways to help Syrians and revert the damaging effects this situation has had on their mental health.

MHEALTH DELIVERY PLATFORMS FOR HNC PATIENTS: A SYSTEMATIC REVIEW
Presenter(s): Maeve Dunckel
Health Sciences
Mentor(s): Veronica Bernacchi (College of Nursing)

Head and neck cancer (HNC) patients often experience disfigurement and disability to the face and neck that limits their ability to speak. As telehealth interventions are increasingly utilized to manage cancer symptoms, there is an urgent need to investigate if virtual platforms can be used by HNC patients who are unable to verbally communicate. This systematic review aims to characterize telehealth delivery platforms for interventions targeting cancer distress symptoms in HNC patients. We searched 4 electronic research databases from September 2023 - December 2023 for studies testing telehealth interventions to manage cancer distress symptoms in HNC patients. Of the 875 initial articles, 89 publications met eligibility criteria. Predetermined data, including the study sample, measures, telehealth platform, and symptoms managed, were extracted and analyzed. The delivery platforms of telehealth interventions were telephone call (n= 32) videoconference call (n=34), or mHealth app software (n=23). Telephone and video conferencing interventions required participants to be able to speak, while mHealth interventions did not require verbal participation. Our findings suggest that most existing telehealth interventions for HNC patients require the ability to speak. This limits the ability of many HNC patients, who may have pain while speaking, a tracheostomy, or vocal fatigue, from participating in telehealth interventions to manage cancer symptoms. Future studies need

DOES GENETIC DELETION OF AUTOIMMUNE REGULATOR INFLUENCE MOUSE MATING BEHAVIOR
Presenter(s): Katrina Halgren
Health Sciences
Mentor(s): Margaret Petroff (College of Veterinary Medicine)

Autoimmune regulator (Aire) is a transcription factor expressed in the thymus responsible for generating immune self-tolerance. Deletion of Aire causes autoimmune disease and can result in infertility. The vomeronasal organ (VNO) is necessary for pheromone sensing in rodents, which drives mouse mating behavior. We showed that VNO and its surrounding glands are targeted by autoreactive immune cells in Aire-deficient (Aire-/-) mice. Further, Aire-/- males are severely sub-fertile compared to their wild-type counter parts. Based on these results, we hypothesized that Aire-/- males may be infertile due to their inability to sense female pheromones, resulting in lack of copulatory behavior. To determine if the mating behavior of male Aire-/- mice was significantly different to Aire-wildtype (Aire+/+) mice, we used the Behavioral Observation Research Interactive Software (BORIS) program to code the behavior of Aire-/- and Aire+/+ mice when introduced to female mice in estrus. The male and female mice were recorded for one hour, and then BORIS was used to observe and code sexual behaviors such as anogenital investigation, mounting, intromission, and ejaculation, and non-sexual behaviors such as contact, non-contact, and aggression. The preliminary results of this experiment are not significant due to a small sample size (n=3), but there do appear to be qualitative differences between the behavior of Aire-/- and Aire+/+ male mice. In future experiments, we

IMPACTS OF GUT MICROBIOTA ON CHILD DEVELOPMENT: A DIETARY ANALYSIS
Presenter(s): Anushree Ravi
Health Sciences
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

A child's neurodevelopment is critical during the early and middle years of childhood. About 16% of children in the United States suffer from a mental health disorder. Interest in this connection of the gut-brain axis to the physical and mental development of children is growing. Many of these issues stem from problems in neurodevelopmental processes that rely on external cues during development. These cues are strongly influenced by the signals gut microbes send to the central nervous system. The bi-directional communication between gut microbes and the nervous system has been shown to influence both metabolic and psychiatric disorders.The ARCH Gut-Brain project is part of an NIH-funded longitudinal cohort study. This sub-study aims to describe the connection between the gut microbiome and cognition during early and middle childhood. For this project, we will analyze the gut bacterial composition of stool samples from children undergoing study visits between 4-5 years of age and 10-11 years of age, alongside their diet. We have currently recruited 45 participants for this study, who have sent in a stool sample of the child. I will describe the dietary patterns of the participants, alongside their gut microbial analysis results. I will specifically be examining the dairy, fruits/vegetables, and cereals, whole grains, and sweets. This knowledge will enable dietary recommendations to support optimal child neurodevelopment.

History, Political Science, & Economics

EMOTIONS OF MOZARTIAN MUSIC & OPERA IN 1780-90S VIENNA AND PRAGUE
Presenter(s): Brandon Loy
History Political Science and Economics
Mentor(s): Ronen Steinberg (College of Social Science)

In the last decade of his life, Mozart moved from his home city of Salzburg to the Habsburg imperial capital of Vienna. Mozart made a name for himself in the city almost overnight due to his exceptional piano-playing skills and the hosting of several public concerts during his first years of living in Vienna. Throughout 1781 and into 1782, Mozart composed one of his first mature operas, Die Entführung aus dem Serail (The Abduction From the Serial), which made him not only in the eyes of the public of Vienna but also with the Holy Roman Empire Joseph II. Using these connections and the emperors love for the arts and music Mozart became a household name in Vienna by the mid-1780s. After partnering with Venetian Court poet Lorenzo de Ponte for his opera Le Nozze di Firago (The Marriage of Figaro), he traveled to the Bohemian capital of Prague in late 1786, where the opera saw great success, and the city adopted him as one of their own-leading the way for more mature masterpieces. The Music of Mozart had a profound impact on the citizens of both Vienna and Prague during the last decade of Mozart's life.

ZIONISM AND KURDISH NATIONALISM: CAN COMPARISON BE A CATALYST TO CHANGE?
Presenter(s): Isabelle Borr
History Political Science and Economics
Mentor(s): Russell Lucas (James Madison College)

In Middle East research, Zionism has been oversaturated with research contributions in religion, identity, security, and peace studies. While there is a significant gap in overall Kurdish studies. Before 1948, these two nations were non-state actors pursuing self-determination. Despite similar ideology and experiences at the hands of other international actors, the Zionist movement succeeded in attaining a state. By evaluating mainly the late Ottoman period of 1880-1918, a pattern emerges of how each movement positions itself on the global stage to receive future recognition. This research will explain how movements with similar ideologies and strategies obtained different results.

DESTRUCTION OF RELIGION AND CULTURE IN GAZA
Presenter(s): Hady Omar
History Political Science and Economics
Mentor(s): Shreena Gandhi (College of Arts & Letters)

Gaza and Palestine in general has been subject to occupation and apartheid by the Israeli government for over 75 years. They have suffered under the rule of an authoritative government with little to no control over water resources, transportation, international travel, etc. Since the October 7th attack on Israel, the IDF has unleashed constant bombardment on Palestinian civilians with no regard or adherence to international law. To date over 30,000 Palestinians have been murdered with the number rising by the day. To understand the violence in Palestine it is necessary to conduct a deep dive into the history of the land. The destruction of religion and culture is transpiring destroying religious monuments, such as mosques, churches, safe havens, etc. The Palestinian population is facing a crisis of not only their lives but the eradication of centuries-old history, culture, and religious significance.

THE ANNULMENT OF ROE V. WADE: AN ANALYSIS OF STATE POLICY CHANGES ENSUING FROM DOBBS V. JACKSON

Presenter(s): Lola Browne
History Political Science and Economics
Mentor(s): Matthew Grossmann (College of Social Science)

The Supreme Court's Dobbs v. Jackson decision and subsequent overturning of Roe v. Wade has led to an increase in states introducing and implementing policies restricting abortion access nationwide. Now that this issue lies within state jurisdiction, sixteen have introduced bans between the time of conception and six weeks. 2014 research from Guttmacher Institute revealed that three out of four abortion patients were considered low income, meaning individuals in states with restrictive legislation are now at an elevated risk of carrying an unwanted pregnancy compared to before the Dobbs ruling. The Hyde Amendment of 1977 prohibits the federal funding of abortions for any reason other than rape, incest, or life endangerment, which further exacerbates this inaccessibility. In this project, state policy bans introduced post-Dobbs were examined in order to determine which states implemented restrictions. Eight types were identified, falling under pre-roe, trigger, gestational, viability, method, reason, Texas SB8 copycat, and total bans. Further analysis of these bans revealed three of them to pose the most restrictions to abortion access, those being total, trigger, and Texas SB8 copycat bans. These policies contribute to the increasing criminalization and inaccessibility for abortion care.

ELITE ADVANTAGE: EXAMINING THE CONCENTRATION TRENDS IN ACADEMIC INNOVATION

Presenter(s): Jiayi Gu
History Political Science and Economics
Mentor(s): Hanzhe Zhang (College of Social Science)

The increasing alignment of science and innovation production with the prestige economy highlights reputation's critical role in the spread and impact of research findings, raising concerns about the equity and diversity of academic contributions. The prevalence of authors from elite institutions in top-tier journals underscores a potential academic oligopoly, with these universities significantly influencing innovation's direction and visibility. This concentration of academic output among a select group raises questions about the monopolization of intellectual discourse. Innovators, central to the innovation process, are notably concentrated in certain circles, driving innovation production. This focus on the concentration of innovators, varying across scientific fields, can be understood through innovation's production functions or market matching mechanisms. Our research aims to illuminate how this concentration affects economic growth through human capital and innovation generation, offering insights into its implications for diversity, equity, and the scientific community's health.

ANALYZING PRESIDENTIAL-CONGRESSIONAL COMMUNICATIONS UNDER TRUMP
Presenter(s): Josh Taft, Rebekah Batu
History Political Science and Economics
Mentor(s): Ian Ostrander (College of Social Science), Joshua Koss (College of Social Science)

While the President of the United States of America has long been at the apex of political attention in American politics, the eccentricities of Donald Trump's administration heightened this privileged position. Trump's always-online status, particularly his heavy usage of Twitter, placed virtually all of his political whims in the public spotlight. What may have remained behind closed doors in meetings with select cabinet officials and members of Congress, was thus frequently thrust into the public by way of Trump tweeting. We code all of President Trump's tweets to examine the political content of his messages. Of particular interest for this research project is the way Trump utilized this social media tool to communicate with Congress by discussing its members or pending legislation.

MATCHING ACADEMIC ECONOMISTS
Presenter(s): Knick Laux
History Political Science and Economics
Mentor(s): Hanzhe Zhang (College of Social Science)

I have developed a process in Python to take data on the names and affiliations of award economists and implement fuzzy-matching and other filters to assign each unique name and affiliation with its closest match in the Microsoft Academic Graph (MAG) database. The code involves removing words in affiliation titles which are analogous to stop words such as "at", "of", "college", "university" and so on. There is also a process for checking the abbreviated version of each affiliation in MAG if an input affiliation is a series of capitalized letters. Each input name and affiliation is output with its closest match in MAG, the MAG id of the match, and the similarity score obtained through the fuzzy matching steps. While improvements to the code are continuous, the current accuracy of the matching is around 80% or higher. Although economists have been the primary focus of the code up until now, the process is generalizable and may contribute to data collection on academics from other disciplines in the future.

THE GRAND ETHIOPIAN RENAISSANCE DAM: THE FAILURE OF INTERNATIONAL WATER LAW AND FRAMEWORKS TO ACHIEVE SUSTAINABLE REGIONAL COOPERATION
Presenter(s): Maren Nicolaysen
History Political Science and Economics
Mentor(s): Norman Graham (James Madison College)

Since the 20th century, international and regional frameworks have been established to achieve hydrological cooperation between the Nile River Basin (NRB) states. The Grand Ethiopian Renaissance Dam (GERD), built on the Blue Nile in Ethiopia has the potential to expand access to electricity to millions and provide Egypt, Ethiopia, and Sudan with more measured water security in times of drought. While past research focuses on the lack of effective international law on transboundary freshwater bodies and resources or the history of water conflict and cooperation between NRB states, my research combines these areas to highlight the challenges to collaboration on the Nile and what should be done to mitigate future disagreements through more robust regional frameworks. I use literature on Nile Basin cooperation, bilateral and multilateral treaties, contemporary commentary on GERD developments, as well as hydrological and ecological data collected by the UN and regional organizations to exhibit the limitations of international law in directing solutions, and how the lack of specificity in frameworks concerning the Nile will continue to affect development around the Basin adversely. From 1999 to 2020, multiple framework meetings and expert working committees were held by the three stakeholder states and international third parties to address Sudanese and Egyptian concerns with the GERD. Due to narratives around the dam transforming from largely technical and logistical to political,

GENDER'S ROLE IN CONSTITUENT EVALUATIONS OF GOVERNOR'S ECONOMIC PERFORMANCE
Presenter(s): Ryan Meister
History Political Science and Economics
Mentor(s): Ana Bodea (College of Social Science), Jennifer Wolak (College of Social Science)

With the increasing number of female governors of both major political parties elected to office over the last two decades, questions arise as to how female politicians are treated and assessed as compared to their male counterparts. Based on the literature, there is reason to expect that voters could rate differently male and female governors - an executive position - for a similar state of economic affairs. Ours provides an opportunity to explore gender's role in constituent assessment of economic performance, comparing male and female governors. Are male and female governors held to different standards when it comes to economic performance? By using Census data on economic trends and approval ratings and surveys for governors, this would allow for the possibility of analyzing the role of gender stereotypes in American elections and economic performance.

EFFECTS OF PPP LOANS ON UNEMPLOYMENT DURING COVID-19 PANDEMIC
Presenter(s): Ethan Fick
History Political Science and Economics
Mentor(s): Brad Crowe (College of Social Science), Leslie Papke (College of Social Science)

I use county-level data to estimate a linear regression model of the responsiveness of weekly Unemployment Claims to PPP Loans previously approved in that county.

ASIA IN THE US WORLD HISTORY TEXTBOOK
Presenter(s): Kara Hwang
History Political Science and Economics
Mentor(s): Aisel Akhmedova (College of Education), Alexandra Allweiss (College of Education), Ethan Segal (College of Social Science)

I am interested in the portrayal of Asian history in US high school world history textbooks. A disparity between Korean and US history textbooks in their contents and narrative, for example, may reveal that each country chooses to deliver the same historical event from different perspectives that serve their motives. Through the research, I am taking a look at the extent of Asian presence in the US high school world history textbook and how it has changed over time if it did. I will also be focusing closely on three countries, Korea, Vietnam, and Japan. Published literature confirms that throughout history, governments played active roles in dictating the publication process of history textbooks. It also acknowledges that distortions and neglect in history textbooks are happening all around the world despite the fact that they could plant a narrow-minded perspective for a generation of students. World history textbooks students consume throughout their compulsory education are subject to biased misrepresentation of the world based on the political interests of the state behind them. Not only in the display of bigotry in their narratives but also in their selectiveness in contents as well as neglect of certain sources the government may manipulate what its students would be taught and encouraged to think. With the United States being one of the most influential countries in the world as well as a country with great demographic diversity, addressing the issues in US h

HOW PRESIDENT HANNAH TURNED A UNIVERSITY INTO AN AGENT OF U.S. FOREIGN POLICY
Presenter(s): Denver Rayl
History Political Science and Economics
Mentor(s): Charles Keith (College of Social Science)

My research paper and accompanying presentation will focus on President John Hannah and his role in MSU's involvement in Vietnam. While America's dive into the Vietnam War was the fault of many, the direction that the university took to support Ngo Dinh Diem's government in the south ultimately was the responsibility of Hannah. Between his expansion of the university, strong anti-communist stance, and ties to Washington D.C., Hannah was a poster child for higher education's support of U.S. foreign policy during the Cold War. There were specific circumstances that tied MSU to Vietnam that will be addressed, but this relationship was part of a broader expansion of the university's engagement and partnerships abroad. Comparing the support that South Vietnam received under Hannah's leadership to similar cases will demonstrate his commitment to expanding the influence of the university and the U.S. The outcome of this research will demonstrate the driving factors, including the power and ambition of John Hannah, behind MSU's involvement in U.S. international relations during the early Cold War.

FOR THE SAKE OF (HER) PLEASURE: THE SEXUAL INFLUENCES IN WITCHCRAFT CONVICTIONS FROM 1630-1650'S NEW ENGLAND
Presenter(s): Kaya Wilske
History Political Science and Economics
Mentor(s): Emily Conroy Krutz (College of Social Science)

This project explores what the category of "woman" means in Early America through the lens of witchcraft. The project visits New England colonies, prior to 1692, with the intent to stay away from the Salem outlier of Early American witchcraft. Further, a goal of this work is to contribute to developing gender and sexual frameworks, building upon prior methodologies and testing their limits. Additionally, this project in its current stage is exploring how useful treating witchcraft as a separate gender could be for Early American occult studies. Other questions explored are: What is being presented in the stories about women and witchcraft? How is their "gender expression" revealed? Is there a relationship between crime and witch accusations? If so, what are the correlations, how are these crimes viewed compared to women who did not receive written accusations?

AN ANALYSIS OF THE ENSLAVED POPULATION OF AMITY HALL PLANTATION, JAMAICA, 1820
Presenter(s): Jaida Gouldbourne
History Political Science and Economics
Mentor(s): Walter Hawthorne III (College of Social Science)

My presentation will focus on an analysis of the enslaved population of Amity Hall Plantation, Jamaica, in 1820. The paper is based on a dataset that I assembled with Dr. Walter Hawthorne of the MSU Department of History for a project titled Enslaved.org. I transcribed information from an inventory of the plantation that was assembled by British colonial officials upon the death of the planation's owner. The inventory lists the names of all of the enslaved people on the plantation along with other information such as gender, race, and origin. For the poster, I will present background information about the plantation and run quantitative analysis of the dataset. I will then compare my findings with data about other Caribbean plantations in the period. The data is a rare look at a plantation population. It is important because it lists the names of enslaved individuals and allows us to reconstruct at least some aspects of their life histories. Ultimately, the data will be uploaded at Enslaved.org, where it will be searchable. Users of the platform will be able to combine data from my dataset with information from other datasets from Jamaica, allowing for broad studies of the colony's enslaved population to be undertaken.

UNDERSTANDING CLIMATE CHANGE THROUGH A HISTORICAL APPROACH TO LABOR AND THE ENVIRONMENT
Presenter(s): Robin Border
History Political Science and Economics
Mentor(s): Stephen Gasteyer (College of Social Science)

Conventional wisdom often pits labor interests in opposition to environmental concerns. These conventions are then projected as part of conservative political rhetoric: prioritizing the environment will come at the cost of jobs; climate change mitigation is too expensive; increased labor power requires growth in industries and therefore we can't regulate the environmental harm those industries cause without harming labor. Labor scholars, however, have argued that labor interests and environmental interests are not as contentious as they may seem. Productive capacity is contingent on the environmental conditions experienced by workers and their communities. This relationship is facilitated by the dynamics of a system that relies on the continual expansion of productive capacity, meaning movements to improve labor or environmental conditions should find common cause against the structural incentives creating their concerns. We analyze convention proceedings of several major unions over the past century, including those of United Auto Workers (UAW), American Federation of Labor and Congress of Industrial Organizations (AFL-CIO), and the International Union Allied Industrial Workers of America (AIW). Our findings indicate that while labor interests have not been entirely aligned with conventional environmental concerns, labor has historically played a key role in supporting major environmental action and legislation. The results show that contrary to the conventional discourse,

EXPLORING FEMALE POLITICAL REPRESENTATION IN ZAMBIA
Presenter(s): Nel Robinson
History Political Science and Economics
Mentor(s): John Waller (College of Social Science), Michael Wahman (College of Social Science)

This research investigates female political representation in Zambia, focusing on three areas: influence of sub-national factors, barriers faced by women in politics, and gender disparities in campaign spending. It combines a thorough literature review with original data analysis and interviews. The literature review highlights the complex interplay between societal norms, political structures, and financial dynamics shaping women's political landscape in Zambia, including the impact of geographic location, urban-rural divide, and regional demographics on female representation, the societal scrutiny and opaque selection processes hindering women's political engagement, and the financial disparities affecting their electoral outcomes.The primary research involves interviewing female candidates and analyzing political science data using R, aiming to deepen understanding of the challenges and dynamics in female political participation. Key questions address the extent to which sub-national factors influence female representation, the specific barriers and challenges women face compared to men, and how campaign spending differences between genders affect election outcomes for women. Methodologically, the project integrates data preparation and analysis, comprehensive interviews, and a synthesis of findings in discussion and conclusion sections. The study aims to provide insights for advocacy, structural reforms, and policy interventions, promoting gender equality in Zambia's poli

Humanities

THE IRAQI CHRISTIAN IDENTITY: COMMUNAL CHALLENGES, CULTURAL SHIFTS, CURRENT REALITIES, AND PROGRESS TOWARDS THE FUTURE
Presenter(s): Isabelle Zablock
Humanities
Mentor(s): Ayman Mohamed (College of Arts & Letters)

Contrary to their presence in Iraq since the 1st century A.D., Iraqi Christians have endured extensive religious and social persecution throughout history. Over time, this has created one of the largest refugee migrations to date. For a myriad of political, socioeconomic, and safety reasons, Iraqi Christians fled their homeland in search of greater stability for their families and futures. The diaspora of Iraqi Christians is often overlooked, and remains largely unaddressed by global powers, societies, and historical accounts, leaving the estimated 1.5 million refugees to reestablish their identity in silence. From living in relative civility to being forced to seek immigrant and refugee status across the world, the Iraqi Christian identity has been disrupted in countless ways. While families and Eastern Rite Churches attempt to maintain the community's traditions, the barriers that immigrants and refugees face in the West have undermined the community's ability in carrying out their religious and cultural legacies. Drawing from existing qualitative studies, as well as primary and secondary accounts from the Iraqi Christian population, I will discuss how the historical genocide of Iraqi Christians has forced cultural shifts and altered the community's collective identity. Additionally, the current status of Iraqi Christians will be further elucidated to better explore the reality of 'home', and whether that definition continues to resonate today. By bringing awareness to the

ART AS A TOOL FOR PROCESSING TRAUMA: GLOBAL SIMILARITIES IN COMMEMORATING THE COVID-19 PANDEMIC

Presenter(s): Carina Abbasov, Marine Avequin
Humanities
Mentor(s): Natalie Phillips (College of Arts & Letters)

Our Mellon-funded project, Creativity in the Time of COVID-19: Art as a Tool for Combating Inequity and Injustice, explores how populations use creative outlets to push back against the systemic inequities exacerbated by the COVID-19 pandemic. This project, which also gathers the stories associated with each pandemic art piece, has culminated in a digital and physical exhibition that explores how collective artworks pave a path toward envisioning a more just future. Creativity allowed people across cultures and identities to memorialize their experience of the pandemic and honor the loved ones they have lost. We have collected hundreds of survey responses in which most respondents indicated grief and stress but also expressed hope for the future and pride in their identities. It was noticed through global responses that people often processed the pandemic in similar ways, despite their wide-ranging geographical locations. Through our survey submissions, we aim to better understand the thematic similarities across the various art mediums utilized during the pandemic. While analyzing patterns in pandemic-era artwork from different cultures, we found that common themes emerged such as self-portraits, data processing, and commemoration of loved ones. Self-portraits reflected common feelings of isolation and confusion despite the wide range of people creating them. The loss of loved ones became more common in the wake of the pandemic and is thus shown across many art pieces. Despi

WHERE THE BOUNDARY HAS BROKEN: THE INTERSECTION OF THE SOCIAL AND THE ECOLOGICAL IN RENEE GLADMAN'S HOUSES OF RAVICKA

Presenter(s): Sydney Logsdon

Humanities

Mentor(s): Ellen McCallum (College of Arts & Letters)

This project explores the environment as it is portrayed in Renee Gladman's *Houses of Ravicka*. Borrowing from the field of queer ecocriticism, I analyze how the functioning of the landscape in *Houses of Ravicka* relates to themes of gender, sexuality, urbanism, language, and social customs. I then use these topics to interpret the existing binaries within the novel, with the aim of better understanding how they reflect the ecological attitudes of Gladman's individual characters and their whole community. The novel's unique and ever-shifting social and architectural structures suggests that strict adherence to binaries creates multiple levels of interpersonal and ecological miscommunication, preventing characters from fully responding to community-wide crises. This analysis relies on Martin Schauss's reading of Ravicka as a society facing an ecological crisis, as well as Nicole Seymour's interpretation of the infrequent intersections of queer studies and ecocriticism as a problem of false dichotomies. Through these lenses, this essay aims to use the experimental novel as a platform to challenge existing real-world understandings of the environment and promote a level of fluidity that may encourage greater action in response to climate change.

HEALING INSECURITY THROUGH MAGIC

Presenter(s): Andrew Denney, J.C. McCasling, Ryan Byrne, Sydney Gossage, Tiana Gentry

Humanities

Mentor(s): David Watson (College of Arts & Letters)

The focus of our research was the practice of magic as it was studied in western culture with a main focus on the viewpoints of Aleister Crowley, Henry Cornelius Agrippa, and Edred Thorsson. Using western occult practices, we created a spell with the intent to heal insecurity stemming from daily stresses in the lives of young people. This working strives to create stability and calm within the mind. The spell centers around the planet Saturn and its connection to the classical elements of water and earth, as well as materials such as onyx, birch, and pine. These physical materials help to channel the spiritual and elemental powers involved to produce the metaphysical effects desired. We also incorporated runes from the German mystic tradition.

ALLEVIATING HOMESICKNESS THROUGH MAGICAL PRACTICES INVOLVING CULTURE, HERITAGE, AND FAMILY

Presenter(s): Alyssa Seville, Brooklynn Bell, Giovanni Antonio Ramos Loureiro Kizem Rodrigues, Liam Comrie, Lin Cabada

Humanities

Mentor(s): David Watson (College of Arts & Letters)

This project looked at remedies for homesickness through the lenses of varying cultural beliefs, practices, and superstitions with a focus on magical practices. By examining our personal practices, we explored various remedies that people have used for homesickness throughout different regions and historical periods. With this in mind, we researched indigenous literature, religious practices, and the origins of our own practices and beliefs. Using what we found, we executed a piece of original spell work that encompasses the specific historical, magical practices we researched pertaining to homesickness. This was composed through various representations, such as culturally significant deities, symbols and sigils, religious artifacts, and family heirlooms. Our composition is separated into seven categories that represent the movement of the emotional body through the process of remedying homesickness starting with themes of denial, grief, isolation, and ending with acknowledgment, adaptation, and acceptance. Structured as an offering, the final category represents how in order to fully embrace your new life, you must be willing to leave something behind. These components intentionally span across our intersecting identities as students living away from home, relating to our personal experiences with homesickness.

HEALING ANXIETY AND ISOLATION THROUGH MAGIC

Presenter(s): Annalena Mecagni, Ava Veltri, Tyler Pohl, Zoey Crossley

Humanities

Mentor(s): David Watson (College of Arts & Letters)

In our presentation, we aim to address the pressing concern of mental health among students by exploring how magic can serve as a coping mechanism. We will focus on a specific magical working designed to heal mental ailments such as isolation, anxiety, and insecurity, using herbal and earth-focused magic. Our presentation will encompass three main components. Firstly, we will delve into the creation process, discussing how the group developed the magical working. We will highlight the importance of intention-setting and each component's symbolic significance in addressing mental health challenges. Next, we will detail the performance of the magical working, outlining the rituals and actions involved. This will include explanations of specific magical symbols and elements incorporated into the ceremony, as well as their intended effects on mental well-being. By drawing connections between symbology and mental health practices, we aim to demystify magic and emphasize its potential as a therapeutic tool. Finally, we will analyze insights gained from the experience and reflect on the efficacy of magical practices in addressing mental health concerns. Throughout the presentation, we will ensure that our content is accessible and comprehensible to a general audience. By shedding light on ancient practices and their relevance to contemporary mental health issues, we hope to provide visitors with a holistic understanding and practical insights to enhance their own well-being. U

HEALTHCARE ACCESSIBILITY FOR SYRIAN REFUGEES
Presenter(s): Jacqueline Sarafa
Humanities
Mentor(s): Camelia Suleiman (College of Arts & Letters)

The Syrian refugee crisis has led to scarcity in medical resources and affordability in Syria and neighboring countries. This project draws upon sources that illuminate the limitations and difficulties the refugees face. Through non-profit organizations and government assistance, refugees can navigate through language barriers, insurance policies, and accessibility to medical care. Unfortunately, there is an abundant amount of Syrians who are unable to afford healthcare, which exacerbates their conditions as the price of aid is too high. Often non-government organizations, either medical or other, attempt to relieve the financial burden, however the cost of medical procedures can be extremely high. Unregistered and undocumented refugees are no longer afforded the grace of minimal to no cost, making them unable to receive the help needed. The sources studied include research surveys on refugees within different countries including Lebanon and Turkey, as well as academic research on policy and cost. Another aspect of this project is to raise concern for safety hazards and risks that pertain to children living in refugee camps. Children suffer the consequences of negligence in the home as well as tragic injuries caused during conflict. Many medical conditions that are commonplace become more severe as medical personnel and infrastructure has dwindled due to the Syrian civil war. With the lack of support from the Syrian government, medical facilities have not been rebuilt or impr

WOMEN'S RIGHTS IN MOROCCO: EXPLORING THE RAMIFICATIONS OF RELIGIOUS AND CULTURAL PATRIARCHY ON LEGAL AND SOCIETAL STANDARDS FOR WOMEN IN MODERN MOROCCO
Presenter(s): Eva Fiander
Humanities
Mentor(s): Ayman Mohamed (College of Arts & Letters)

This research explores how cultural and religious patriarchy within post-colonial Morocco has shaped a societal environment where the legal rights of Moroccan women have been severely diminished. The study primarily relies on firsthand legal documents, academic journals, and accounts from women living under the independent regime. Firstly, it establishes historical precedent by examining the anthropological ties to tribal hierarchy within the Maghreb region of Northern Africa. Subsequently, it tracks the legal evolution, including the adoption of family law known as Mudawwana in 1957, family law reforms in 2004, and civil rights reforms in 2014 following the Arab Spring. These developments indicate a modernization of laws without a corresponding modernization in implementation. Additionally, the study examines excerpts of the Qur'an alongside academic interpretations to understand the religious justification for patriarchal laws and expectations within Moroccan society. In conclusion, the research highlights the polarized state of women's rights in Morocco, shaped by patriarchal standards grounded in religion, culture, and law.

LEBANON AND DRAG
Presenter(s): Jackson Murphy
Humanities
Mentor(s): Camelia Suleiman (College of Arts & Letters)

Drag in Lebanon, it exists. The art of drag is founded in artistic and preformative gender expression, typically via cross-dressing. Performers present themselves as exaggerated feminine or masculine characters and are called Drag Queens or Kings respectively. In Lebanon, drag has recently experienced a growth in visibility due to 'Anya Kneez.' Anya is a Lebanese drag performer who grew up in New York City but returned to Lebanon for family and work. Upon reentry to Lebanese society Anya was determined to foster and protect the queer community. They mainly do this by proudly performing in drag; being a role model and trailblazer in Lebanon's queer community. Due to their dedication, many consider Anya the mother of Lebanon's ever growing drag scene. That being said, this is no easy role, not only are same-sex relations and transgenderism illegal in Lebanon, but being queer is actively criminalized. On and offline, queer people in Lebanon face discrimination and violence daily. On August 23, 2023, an LGBTQ+ friendly bar in Beirut was hosting a drag show. However, this show was quickly interrupted by a group called, "Soldiers of God'' who threatened violence and assaulted many of the performers and attendees. Not only do the actions of this night display the atmosphere of hate and fear that is forced on queer Lebanese people, but the response from law enforcement and officials echoes the true injustices that queer people are facing in Lebanon. My primary sources were Human Righ

ECHOES OF PAIN: HUMAN SUFFERING IN SUDAN
Presenter(s): Lewi Anamo
Humanities
Mentor(s): Ayman Mohamed (College of Arts & Letters)

In this research, I will discuss Sudan's humanitarian crisis, characterized by severe human rights violations, persistent ethnic and religious conflicts, and challenging economic conditions. This study explores the complexity of Sudan's humanitarian crisis, illuminating the roles played by both offenders and victims, as well as the historical context and the interaction between governmental and military forces that have exacerbated the issue. In discussing ethnic and religious conflicts, I will emphasize the dominance that the Arab minority had during British colonization, their control over the country post-colonization, and the subsequent rift between Arabs and Africans. While examining the roles of the army and the government in the crisis, I will illustrate examples of coups d'état and military massacres, as well as instances of human rights violations against the population. Economic elements are analyzed to shed light on the socio-economic aspects of the crisis, including skyrocketing living costs and economic factors driving individuals to flee the nation. Through these discussions, I aim to shed light on horrific human rights abuses, such as forced relocation, sexual assault, and mass murders. Additionally, the study assesses how the world has responded to the Sudanese situation, with a focus on humanitarian operations and the UN's participation.

THE INTERSECTION OF RACE AND DISABILITY IN EDUCATIONAL ACCOMMODATIONS
Presenter(s): Eryn Greuel
Humanities
Mentor(s): Nilufer Akalin (Lyman Briggs College)

Many university students with a diagnosable disability never utilize the disability accommodations they are eligible for under ADA policy, especially students with psychiatric or "invisible" disabilities. Considering the advantages of accommodations for improving academic outcomes, it is possible that previous negative experiences students of color have had may convince them to never request accommodations. The literature has paid little attention to examine the intersection between race and disability. For this reason, it is worth asking whether accommodation offices are equitable between students of different races. This project revolves around the following questions: (1) I ask whether students of a racial minority gain fewer benefits from disability diagnoses and accommodations than white students? (2) How and in what way? Drawing on the literature review about disability accommodation in education and the intersection of race and disability, I examine each stage of a person's educational path. Primary research on how K-12 accommodations offices support students of different races, and how these students perceive accommodations offices, are an important basis to improve academic outcomes for disabled students of color. This paper is significant as it explores the experiences of students of color with disabilities at schools and colleges and it points at the importance of positive efforts to improve academic outcomes for these students. I argue that (1) the combination of

POSTNATAL CARE IN SYRIA
Presenter(s): Hope Ehause
Humanities
Mentor(s): Camelia Suleiman (College of Arts & Letters)

The objective of this presentation is to provide insight into postnatal care in Syria. The postnatal period is often quite ignored especially in Syria where there is a humanitarian crisis occurring. Prior to the war, Syria was performing better in regards to public health. Until the eruption of violence in 2011, Syria made good progress in improving maternal health indicators including reducing the maternal mortality ratio and increasing the level of skilled birth attendance. But as we know, the ongoing war have desecrated public health systems in Syria, with pregnancy already being traumatic, especially in war torn areas. This has lead to the maternal mortality ratio and the under-five mortality rate to increase. But, to eliminate the single story regarding Syria it is important to focus on how the country is improving. Recently, Syria has been the first in the region to adopt a World Health Organization(WHO) program in which WHO-trained community health workers make individual home visits to support mothers during pregnancy and after childbirth, providing them withT important information such as the importance of breastfeeding if possible, ways to reduce the risk of SIDS, warning signs in the mother?s and baby?s health, and much more. Because of this initiative, women have reported feeling well supported and better educated.

A RIGHT TO WELCOME
Presenter(s): Amber McAddley
Humanities
Mentor(s): Meagan Driver (College of Arts & Letters)

This project is a creative exploration that spearheads an initiative through The Multilingual Lab. It increases support and visibility of multilingualism on campus, spreads awareness on multilingual and multicultural groups on and off campus, and connects members of different languages, cultural identities, and interests with each other. My aim is to support intercultural communication and a more inclusive campus environment. To meet project objectives, I interviewed and recorded messages that welcomed others to MSU campus in 17 different languages. These messages inform on language groups on and near campus and provide sustainable resources that can be readily accessible to students, such as familiar and safe places for cultures to connect and engage with one another. These interviews yielded 17 voice memos, which were then linked to a QR code for posting around campus through unified and individual language posters. This initiative also shares over 30 language-related links, clubs, and organizations with the public, which are continuously being organized and marketed for dissemination. My extensive interactions with students and members of the local community have emphasized and dissected the depths and the unique components of multilingual communication as a whole. We all have a right to feel welcome in our environment. My work and ongoing discoveries will continue to promote and aid in the development of communities with groups that are underrepresented.

DISSIDENCE OF RECONCILIATION WITH THE PATRIARCHY: A COMPARISON OF EASTERN FEMINIST PHILOSOPHIES IN THE CONTEXT OF ARAB-ISLAMIC CULTURE
Presenter(s): Sky Young
Humanities
Mentor(s): Camelia Suleiman (College of Arts & Letters)

One of the most relevant talking points of modern global feminist theory is the concept of intersectionality[12]. With an emphasis on diversity, intersectionality plays a major role in understanding the differences of patriarchal and hierarchical systems across cultures and the unique ways it affects groups within them. Using an intersectional lens of critical thinking can help to bring awareness and dialogue to the needs of various feminist movements across the globe. This research looks to highlight two different approaches of Arab-Islamic feminism (dissidence and reconciliation) within the frameworks of cultural, historical, and political influences. To demonstrate modern relevancy, these frameworks were applied to the lives and teachings of Dr. Nawal El Saadawi from Egypt and Dr. Fatima Mernissi from Morocco-- two prominent advocators of dissidence and reconciliation theory respectively. The goal of this paper is not to declare a better feminist tactic, but rather to understand the significant historical and culture frameworks which forged them and how they are being implemented today.

DISPLACED LIVES: CHALLENGES OF SUDANESE AND PALESTINIAN REFUGEES IN EGYPT
Presenter(s): Manas Kartik
Humanities
Mentor(s): Ayman Mohamed (College of Arts & Letters)

In many parts of the world, refugees encounter substantial challenges concerning their status in host countries, including food insecurity, poverty, limited access to education or employment, and loss of cultural heritage. This can also pose issues for the host nation, as the lack of opportunities can drive certain segments of the population to resort to crime for survival. Focusing on Egypt, this paper sheds lights on the situation of Sudanese and Palestinian refugees, along with displaced persons who encounter significant obstacles in integrating into the country due to laws restricting their rights and freedoms. Despite previous political assurances of support and a shared heritage affording benefits in decades past, these barriers persist. Egyptian citizens also contend with challenges stemming from the large influx of refugees, including cultural clashes and strain on resources in a nation with a relatively weak economy. Notably, policies limiting land ownership, the absence of free education, and diminished employment prospects present formidable hurdles to the well-being of refugees and displaced individuals in Egypt. Moreover, displaced persons or their descendants face difficulties accessing healthcare and managing expenses due to their ambiguous status within Egypt's legal framework, making it harder for them to afford these necessities compared to citizens. Additionally, they grapple with c

HOLOCAUST SURVIVOR STORIES
Presenter(s): Alexis Curtis, Kira Saroken, Laylah Anderson, Ryan Lewis
Humanities
Mentor(s): Amy Simon (James Madison College)

The personal accounts and narratives of Holocaust survivors provide invaluable insights into the profound and often traumatic experiences they endured during one of the darkest periods in human history. Our presentation looks at several different issues that appear regularly in the Holocaust survivor oral testimonies found in the USC Shoah Foundation's Visual History Archive to better understand this historical event and its lasting effects on the people who experienced it. Each survivor's story is unique, but common themes include loss, resilience, and the long-term impact of the trauma. Our presentation will investigate survivors' stories of mental health struggles, attitudes toward Israel and the concept of a Jewish homeland, war crimes trials against Nazi perpetrators, especially those that featured Holocaust survivor witnesses, and memories of resistance methods used against Nazi German control inside ghettos and concentration camps during the war. Together, these topics demonstrate the myriad of Holocaust experiences at the time and since. Taking on questions of trauma, memory, identity, and justice, our presentation highlights often overlooked aspects of the Holocaust. The testimonies aren't just eyewitness accounts of what happened. They are also the stories of the victims.

SILENT SUFFERING: THE HIDDEN CRISIS OF SYRIA'S CHILDREN IN WAR
Presenter(s): Muang Muang
Humanities
Mentor(s): Ayman Mohamed (College of Arts & Letters)

What started as a nonviolent protest in 2011 escalated into a full on Civil War in Syria. The Arab Springs inspired the whole uprising of the citizens in Syria. This Civil War turned the country that was full of life, vibrant colors, art, cuisine, and culture into a country that's in shambles with almost no hospitals and schools available for the citizens. This ends up really damaging the citizens of the country, especially the children. It affects the children's physical health, nutritional health, and it really takes a hit on their mental health. This research will elaborate and give insights on how much children in Syria are impacted and suffering because of the Civil War that's going on. Global efforts of inclusion and accomodation are discussed from a social justice perspective.

NELLIE BLY: THE DEVELOPMENT OF FEMININE PERSPECTIVE, REFORM, AND THE CHALLENGING OF TRADITIONAL GENDER AND CLASS IDEALS
Presenter(s): Rebecca Yeomans-Stephenson
Humanities
Mentor(s): Thomas Summerhill (College of Social Science)

Muckraking journalist Nellie Bly is among the most well known of the Progressive era, remembered for her acts of stunt reporting and her continuous reform efforts. Through her writing, Nellie Bly introduced a feminine perspective to a traditionally masculine industry, presenting her own thoughts and observations regarding the role of women within society. Nellie Bly provided women with a critical voice in challenging traditional ideas surrounding gender and class, and the need for large-scale reform in order to better serve the broader public. By engaging in muckraking reporting, such as her time at the Blackwell's Island insane asylum, or covering the Suffragists, Nellie Bly established the development of feminine perspective within the front pages and headlines of newspapers across the country, challenging restrictive ideologies surrounding gender and class, and developing a new sphere for female involvement within society.

EFFICIENT QUALITATIVE ANALYSIS IN EDUCATION: LEVERAGING CHATGPT FOR RAPID EVALUATION OF STUDENT FEEDBACK DATA
Presenter(s): Marochelle Moreno
Humanities
Mentor(s): Hala Sun (College of Natural Science)

ChatGPT and other large language models have many applications. One potential use for ChatGPT is in evaluating qualitative data. Coding of qualitative data by humans offers more depth of analysis, sensitivity to nuances, and interpretive flexibility. However, coding done by ChatGPT offers quick and efficient data processing, which allows researchers to analyze large volumes of textual data quickly. A comparative analysis between ChatGPT and human coding with nVivo was done on a pair of short 30 minute interview transcripts, which revealed more nuanced insights. While this method does offer more engagement and understanding of the data, it's a lengthy process and brings up concerns about potentially missing codes due to human error. Conversely, ChatGPT enabled faster coding, yet it was less engaging and brought up doubts over code quality, despite its ability to identify overlooked codes and effectively categorize codes. These findings have implications for analyzing other types of smaller qualitative data sets, such as student feedback data. Integrating ChatGPT into the process could expedite analysis, allowing educators to gain insights rapidly. However, concerns persist regarding the depth and accuracy of analysis compared to human coding. So, a hybrid approach, combining ChatGPT's speed with human oversight for accuracy and interpretive depth, could be more beneficial. Understanding student feedback nuances is crucial for improving educational practices. B

HOW THE HUMANITARIAN CRISIS IN SYRIA HAS AFFECTED RATES OF HEART DISEASE
Presenter(s): Neal Sanghvi
Humanities
Mentor(s): Camelia Suleiman (College of Arts & Letters)

This presentation delves into the far-reaching consequences of rising heart diseases among Syrians. I study the cultural health care aspects in the aftermath of the Arab Spring and the descent of Syria into a civil war. It illustrates how the prevalence of heart disease has affected traditional lifestyles and imposed stress on familial and communal structures by studying the cultural and healthcare aspects. Over the course of many years and conflict, people in Syria have suffered in many ways and how they suffered from a health perspective is focused on in this presentation.This presentation emphasizes the urgent need for comprehensive appropriate treatments that acknowledge various factors to reduce the detrimental impacts and enhance holistic well-being in Syrian communities via a study of the interconnected factors leading to the rise in heart disease. I focus on many research papers that conduct studies on people in Syria as well as people who have fled Syria and how they have handled dealing with heart disease and how that has affected other aspects of their life as well. It is very important to raise awareness for this issue as Syria has had one of the worst humanitarian crises in the past few years and millions of people have suffered through no fault of their own. Additionally, raising awareness about inaction of the local government and dramatic gender disparities that still persist even in a very modern and progressive world is something that brings a lot of im

SYRIAS ECONOMIC COLLAPSE
Presenter(s): Maheen Raza
Humanities
Mentor(s): Camelia Suleiman (College of Arts & Letters)

Syria's economic collapse has been a complex issue with roots in armed conflict, political unrest, and international sanctions. This presentation looks at the intricate interactions between the factors that led to the collapse and analyzes how they affected the environment, industry, and agricultural sectors, among other areas. The collapse has exhausted poverty and social unrest by causing hyperinflation, widespread unemployment, and a large drop in GDP. Furthermore, the devastation of infrastructure and the millions of displaced people have severely harmed future economic opportunities. I have first hand experiences listed in my presentation to show what the real life effects were. Beyond its boundaries, the fallout from Syria's economic collapse affects regional stability. The result of this presentation is to draw attention to the geopolitical state of Syria and bring upon personalized solutions to help aid the current difficulties the country is facing.

Integrative & Organismal Biology

EXAMINING GENETIC EFFECTS OF SPLAKE (SALVELINUS FONTINALIS X SALVELINUS NAMAYCUSH) INTROGRESSION INTO WILD LAKE TROUT POPULATIONS
Presenter(s): Grant Bruninga
Integrative and Organismal Biology
Mentor(s): Ben Kline (College of Natural Science), Mariah Meek (College of Natural Science)

Over recent decades, many native fish species have experienced significant declines in population abundance in response to degradation of habitat quality, increasing environmental instability via climate change, and the introduction of non-native species. Of the native fish species impacted by these factors, brook trout (Salvelinus fontinalis) and lake trout (Salvelinus namaycush) represent two of the most culturally, ecologically, and economically important species to the Great Lakes region. Despite the innate value of these fish to the region, both species face a common threat: splake. Since the 1970s, an anthropogenic hybrid of brook trout and lake trout, the splake (Salvelinus fontinalis x Salvelinus namaycush), has been stocked into Lake Superior to provide recreational fishing opportunities amidst declining brook trout and lake trout populations. However, through interbreeding, splake can dilute genetic advantages that wild trout possess to help them survive such as traits that improve the ability to acquire food and adapt to changes in water quality. Therefore, introgression of splake alleles into wild trout populations could drastically reduce the resilience of lake trout populations, especially in an era of rapid environmental change. Using known hatchery crosses of brook trout, lake trout, and splake, we will characterize the phenotypic effects of splake introgression into wild trout populations using restriction-site associated DNA sequencing and establish referenc

SEASONAL VARIATION IN WHITE-TAILED DEER SPACE USE IN A MID-MICHIGAN WILDLIFE RESEARCH AREA
Presenter(s): Ethan Wallace
Integrative and Organismal Biology
Mentor(s): Louise Mead (College of Natural Science)

White-tailed deer (*Odocoileus virginianus*) population numbers have steadily increased across the United States, inversely, the space that deer inhabit has continued to dwindle. Urbanization and modification to natural areas have forced deer into fragmented natural areas often encircled by roads and residential areas. Shrinking habitat size coupled with overpopulation has led to increased vehicle collisions involving deer and may be impacting disease dynamics in some populations. To investigate the role that human disturbance plays in deer space use, we installed a system of camera traps, for three weeks, across all four seasons. The study took place within Rose Lake State Wildlife Research Area, a natural area located in mid-Michigan (Bath Township, Clinton County). The study area is surrounded by four roads and contains walking trails, a shooting range, and some residential homes. We investigated the occurrence of deer as indicated on camera traps across a gradient allowing us to examine space use relative to roads, trails, and the shooting range. We hypothesized that deer may show differential use of these areas, especially if human activity and sound from the shooting range deterred deer from this area. Preliminary analysis suggests the shooting range did not influence deer space use as indicated by our camera traps, but that they may avoid the more traveled areas in the forest with trails. Understanding how and why deer tend to occupy specific spaces will h

USING SPOTTED GAR AS THE OUTGROUP TO UNDERSTAND NERVOUS SYSTEM EVOLUTION AFTER WHOLE GENOME DUPLICATION IN TELEOST FISHES
Presenter(s): Grace Urban
Integrative and Organismal Biology
Mentor(s): Ingo Braasch (College of Natural Science)

A whole-genome duplication (WGD) event leads to a full duplication or polyploidization of an organism's genome. Throughout evolution, the bony vertebrate lineage has undergone two WGDs. Additionally, lineage-specific WGDs are also observed such as in the ancestor of the teleost fishes (Teleost Genome Duplication, TGD), the most species-rich group of vertebrates. WGD-derived extra copies of genetic elements have been proposed to provide the raw material that can seed evolutionary and developmental innovations, adaptation, and speciation, for example in the vertebrate nervous and sensory systems. Genome-wide, around 80% of the extra gene copies from the TGD have been lost (non-functionalization) in teleosts during their rediploidization process. However, for those genes that have been retained as duplicates, regulatory changes or coding mutations may generate complementary expression patterns and/or protein functions among duplicates (sub-functionalization); and/or gene duplicates may acquire new expression patterns and/or protein functions (neo-functionalization). Yet, the extent of sub- and neofunctionalization following the TGD remains poorly understood. Therefore, my research training aims to use the closest living outgroup of the teleosts, the non-teleost fish spotted gar (Lepisosteus oculatus) as an outgroup for comparative analysis of gene expression to the teleost model organism zebrafish (Danio rerio). By characterizing brain morphology through developing gar brains an

MEASURING THE PREVALENCE OF ARTIFICIAL FEED IN THE DIET OF BLACK BEARS USING LASER ABLATION ISOTOPE RATIO MASS SPECTROMETERY
Presenter(s): Collin Sauter
Integrative and Organismal Biology
Mentor(s): Hasand Gandhi (College of Natural Science), James Moran (College of Natural Science)

This experiment uses laser ablation isotope ratio mass spectrometry (LA-IRMS) to measure stable carbon isotope ratios ($\delta^{13}C$) of hairs and teeth collected from captive black bears (*Ursus americanus*). The LA-IRMS system performed a multitude of $\delta^{13}C$ measurements roughly ~1mm apart along the length of the hairs. The bears were fed a controlled diet which alternated between periods of exclusive consumption of either trail mix, corn, or deer meat. The $\delta^{13}C$ for these food sources was measured on an elemental analyzer IRMS and the values were used to determine if the change in food sources correlates to changes in $\delta^{13}C$ along the length of the hair. Preliminary results show clear periods of alternating between different food sources. However, further research is needed to accurately match spatial changes in $\delta^{13}C$ values of hair to the temporal changes in a bear's diet and to calibrate any associated delay between a shift in food source and its correlating appearance in the hair record. Additionally, this study tested tooth cross-sections as a potential alternative to hair which possibly offers a longer temporal scale, but results are still preliminary. We are using samples collected from captive bears fed a controlled diet to validate the effectiveness of our technique. Once this is demonstrated, we will apply LA-IRMS to hair samples from wild bears to help evaluate the ecological implications of

XENOPUS OPTIMAL HEALTH AND MODEL WELFARE PROJECT
Presenter(s): Isabella Harrison, Nivedhya Sanju
Integrative and Organismal Biology
Mentor(s): John Zubek (College of Natural Science)

The robust frog Xenopus laevis is a valuable model organism used in biomedical research worldwide. Though somewhat underutilized, it is at the forefront of cell biological, biochemical, and developmental studies and has been used for over 60 years. Xenopus are aquatic frogs relatively easily housed, however, there is little understanding of, nor citeable evidence of the thresholds of care, environmental limits, or symptoms when system ecological parameters are unstable over time. This lack of understanding has limited the model's use, become costly for animal care teams, and created confusion and misunderstandings, ultimately putting a costly unmanageable burden on researchers, oversight, and the model itself. While these amphibians have been shown to tolerate various living conditions including extremes (e.g. temperature or pH), evidence based thresholds for basic living conditions such as pH, feeding, stocking density, water temperature, food and feeding behavior, activity levels, water chemistry and preferred housing types (e.g. static vs recirculating) have not been answered to date. Therefore, care for the Xenopus model has been hampered by these compounding issues when utilized in research environments. Most guidance has been "borrowed" from research on other organisms (e.g. mouse model). Previous research lacks generalizeable standards outside of individual laboratories (Wu and Gerhart, 1991) and may be outdated for current laboratory systems. However, McNamara et al.,

NICHE PARTITIONING IN BOCAS DEL TOTO, PANAMA, BETWEEN DENTROBATID AURATUS AND OOPHAGA PUMILIO
Presenter(s): Lilja Plumert
Integrative and Organismal Biology
Mentor(s): Justin Lawrence (Lyman Briggs College)

Sharing of food sources will result in competition between species, often resulting in the competitive exclusion of weaker competitors. To avoid competition, species will often subdivide resources, minimize competition and allow for coexistence, also known as niche partitioning. Niche partitioning can increase the biodiversity in the area and explain the diversity in the tropics. In Panama, Dendrobates auratus and Oophaga pumilio coexist in the same habitat in multiple locations, which have access to the same resources. The dietary invertebrates provide their defensive alkaloid toxins. We investigated how these diets varied among species and among populations, which could explain how these two species can coexist. We syntopically sampled stomachs from 20 Dendrobates auratus and 20 Oophaga pumilio from five different locations of Bocas del Toro, Panama. Syntopic sampling allows us to control for invertebrate communities that could change over geographical space and see whether these species are specializing on different invertebrates. We dissected stomachs, photographed and measured contents using ImageJ. We identified species to broad categories such as termites (infraorder Isoptera), ants (Formicidae), and mites (Acari), then compared composition within and among frog species.We found that, while there are similarities between species, there are some distinct differences supporting the idea of niche partitioning. This research is the first of its kind in examining diet

STRAWBERRY POISON FROG'S DIET ACROSS COLOR MORPHS AND ITS IMPLICATIONS FOR COMMUNICATING TOXICITY
Presenter(s): A. Proudfoot
Integrative and Organismal Biology
Mentor(s): Justin Lawrence (Lyman Briggs College)

Poison frogs in the family Dendrobatidae are known for their bright coloration that signals their toxicity to predators in a process known as aposematism. The Strawberry Poison Frog (*Oophaga pumilio*) is one species of poison frog that has multiple color morphs throughout its range, with the most extreme variation being found in Bocas del Toro, Panama. Poison frogs get their toxins from their diet of invertebrates. This project investigates the possible linkage between poison frog coloration and diet with the opportunity to explore the implications of the relationship between coloration and toxicity. We used *O. pumilio* as a model species to investigate whether diet and color morph are connected. We collected data from and analyzed 13 different populations of *O. pumilio* each with their unique color morph (5 per population, N = 65). We dissected 65 *O. pumilio* stomachs and took pictures of their contents. We categorized invertebrate types, and measured length and width of invertebrates to estimate volume of prey consumed. We focused, in particular, on mites as they are known sources of defensive toxins. There are significant population-level differences in mite size. *Oophaga pumilio* populations that have similar color morphs were less likely to consume different mite sizes while those with dissimilar color morphs were more likely to consume diffe

CHARACTERIZATION OF ENTERIC NERVOUS SYSTEM DEVELOPMENT IN SPOTTED GAR (LEPISOSTEUS OCULATUS)
Presenter(s): Isabella Rinaldi
Integrative and Organismal Biology
Mentor(s): Brooke Jeffery (College of Natural Science), Ingo Braasch (College of Natural Science), Julia Ganz (College of Natural Science)

The enteric nervous system (ENS) provides the intrinsic innervation to the gastrointestinal tract. Because of its central role in controlling gut function, identifying the genetic basis of ENS development is important for understanding its role in gastrointestinal diseases. The zebrafish (*Danio rerio*) model system has been crucial in understanding the genetic basis underlying ENS development, as gene regulatory networks governing developmental processes are often shared across the vertebrate lineage. Recent work has identified the spotted gar (*Lepisosteus oculatus*), a non-teleost fish, as a bridge between the teleost zebrafish and humans if genetic elements cannot be linked between zebrafish and humans. To use gar as a bridge species, we aimed to characterize ENS development in spotted gar. I first performed immunohistochemistry between stages 25 and 34 of gar development using the pan-neuronal markers Elavl and acetylated-α-Tubulin (α-Tub) to determine when ENS neurons differentiate. Elavl and α-Tub were detected in enteric neuronal cell bodies and nerve fibers respectively at stages 32-33 and 33-34 but not at stages 25-30. This suggests that ENS neurons differentiate at the beginning of stage stages 31-32. We are currently testing gut function using an intestinal transit assay to establish at what stage the ENS is functional. To identify neuronal subtypes, I am currently performing immunohistochemistry with subtype markers Nitric oxide synth

FUNGAL BIOELECTRONICS
Presenter(s): Caleb Ronders, Iha Singh
Integrative and Organismal Biology
Mentor(s): Jinxing Li (College of Engineering), Yulu Cai (College of Engineering)

The increasing necessity for sustainability and versatile environment sensing technology arises from escalating demands for monitoring in a wide range of applications, from harsh environmental conditions to biomedical usage. This research delves into the innovative application of diverse fungi as a bioelectronic sensor. We embarked on a comprehensive series of experiments, ranging from the use of single and multichannel laser graphene electrodes, this approach utilized a stimulus method that applied both voltage and heat. Our goal, to assess the potential of various fungi species as living material, aimed not only to enhance clinical and environmental monitoring but also to advance wireless and remote sensing technologies. Our experimental method involved subjecting these fungi to diverse conditions, specifically emphasizing their response to temperature and voltage changes. Key findings from this study highlight the resilience and adaptability of certain fungi species, positioning them as a prime candidate for the creation of sustainable and efficient bioelectronic sensors. This Innovative research embarked on the linkage between the diverse adaptability of fungi characteristics to their application in bioelectronic, concentrating on environmental sustainability, with efforts seeking to advance technological innovations in biomedical and environmental sensing solutions.

PHEROMONE ANTAGONISTS AS A MEANS OF SEA LAMPREY CONTROL IN THE GREAT LAKES REGION

Presenter(s): Ashley Strong
Integrative and Organismal Biology
Mentor(s): Jacob Kimmel (College of Agriculture & Natural Resources)

I spent my summer working with MSU's Li Lab to develop a new control method for invasive sea lamprey in the Great Lakes. Sea lamprey (*Petromyzon marinus*) are parasitic fish that are thought to have been invasive in the Great Lakes since the creation of canals to circumvent Niagara Falls in the early 1900s, decimating local fisheries (Hubbs 1937). There are several pre-existing methods of population control being used in the Great Lakes, but the project I worked on focused on the creation of a method that wouldn't harm native species in the process. During mating season, male lamprey emit a pheromone that is attractive to females, allowing them to find each other and mate. We conducted behavioral assays in artificial and field settings with the goal of identifying an antagonist compound that would inhibit this process. Adult sea lamprey die immediately after breeding season, so a successful application of this research would prevent the creation of a new generation before the death of the old generation, effectively eliminating a local population.

Kinesiology

DIFFERENCES IN GENERAL RISK PROPENSITY BETWEEN CONCUSSION AND HEALTHY COLLEGE-AGED INDIVIDUALS

Presenter(s): Gio Polsinelli, Shayna Menzer, Sophia Holdwick, Wayne Jannette
Kinesiology
Mentor(s): Megan Loftin (College of Education), Reid Davis (College of Education)

Concussion can have many adverse effects on affected individuals, one such effect is a higher likelihood for risk-taking behaviors. The purpose of our study was to explore the propensity for risk-taking between college-aged individuals with concussion and healthy controls. Participants in this study were administered the General Risk Propensity Scale (GRiPS) within five days of a concussion, and the healthy controls were age and sex matched. The GRiPS questionnaire includes 8 self-report questions about an individual's propensity for risk-taking behavior and provides a total score out of 35. Furthermore, a score above 20 suggests a higher propensity for risk-taking behavior, whereas a score below 20 implies a lower propensity for risk-taking behavior. An Independent samples t-test was run to identify if there was a difference in GRiPS total score between concussion and control groups. We observed 111 college-aged individuals with a concussion (n=58, 26 males, μ age=21.4 $\pm$ 2.4 years) and healthy controls (n=53, 27 males, μ age=21.2 $\pm$ 2.4 years). There were no differences found in GRiPS total score for individuals with a concussion (23.28 $\pm$ 6.8), compared to healthy controls (24.17 $\pm$ 5.8), $t(109) = 0.743$, $p = 0.459$, $d = 0.141$. These results suggest that an individual's propensity for risk-taking is not influenced by concussion so clinicians may not need to be concerned about risk-taking behaviors following injury. However, these f

NUMBER OF ESTIMATED CONCUSSIONS NEEDED TO RETIRE FROM SPORT PARTICIPATION IN COLLEGIATE ATHLETES

Presenter(s): Ian Kelly, Katie Koch, Kosette Bartels
Kinesiology
Mentor(s): Allie Tracey (College of Education), Haley Clark (INTERCOLLEGIATE ATHLETICS)

Multiple concussions may lead to cognitive slowing, persistent headaches, and memory issues; thus, retirement from sport because of recurrent concussion has become more common. This study's purpose was to determine if there is a difference between collegiate and healthy athletes in the total number of concussions they would need to sustain before retiring from their current sport participation. A prospective cohort study of college-aged concussed (n=60, female=34, μ age=21.12, SD=1.98) athletes (e.g., recreational, intramural, club, varsity) and healthy matched controls (n=57, female=31, μ age=21.62, SD=2.3) was conducted. Concussed athletes were enrolled within 5 days of sustaining their injury and provided demographics and injury information. Controls were matched in age, gender, and sport. All participants were asked "how many concussions would you have to sustain for you to retire from your current sport participation?" Independent samples t-tests determined differences in concussion retirement number between groups. Univariate linear regressions determined if known covariates (i.e., gender, sport, level of play, history of concussion, and concussion education) confounded results. Concussed athletes reported that they would have to sustain significantly more concussions (μ=8.88, SD=17.42) than healthy controls (μ=4.23, SD=1.78) before deciding to retire from their current sport participation (t(115)=2.01, p=0.04, Cohen's d= 0.37). Previous history of c

TRACKING HAND MOTIONS DURING THE REMOVAL OF WRINKLES FROM A CLOTH

Presenter(s): Ethan Newman, Ian Doherty
Kinesiology
Mentor(s): Nilay Kant (College of Engineering), Rajiv Ranganathan (College of Education)

Handling deformable materials like cloth is an easy task for most people but remains a challenge for artificial agents like robots. The human brain can identify patterns to determine where an action is necessary to produce a desired result for the cloth, but robots cannot do so easily. If the motions produced by a human during handling of a cloth can be successfully tracked and interpreted, it would provide a pathway to allow a robot to do so, including those used for therapeutics. To assess the development of motion by humans while handling deformable materials, the authors attempted to measure how individuals learn to remove wrinkles from a cloth. This task requires both the perceptual process of identifying relevant features in the cloth (e.g., identifying the length and orientation of the wrinkle) and the motor process of determining where to place the hand to remove the wrinkle. To understand these processes, the authors provided participants with different wrinkle patterns, and tracked their finger motions during wrinkle removal using a camera and a small marker. Each participant was asked to complete one trial session, in which twenty-five wrinkles were removed. Findings from this study are expected to allow a better understanding of the human strategy development in this task, which in turn can be implemented in robotic aids to help individuals with disabilities participate in sewing-related activities.

FROM TENDON TO TORQUE: A YEAR-LONG INVESTIGATION OF PATELLAR TENDON THICKNESS AND ITS ASSOCIATION WITH QUADRICEPS STRENGTH IN FEMALE D1 ATHLETES

Presenter(s): Ali Farooqui
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

The patellar tendon is a key component for producing force and movement within the lower extremity. During a calendar year, athletes experience excessive joint loads that may negatively affect the tendon. One of these effects may be changes in quadricep strength; however, the correlation between patellar tendon structure changes over a calendar year and its effect on quadricep strength remains unclear. Therefore, the purpose of this study was to determine how differences in patellar tendon thickness over a year affects changes in quadricep strength in female Division I female athletes. Female Division I soccer and field hockey athletes were recruited. With the participant supine in 30° of knee flexion, bilateral sagittal infrapatellar ultrasound scans were used to image the patellar tendon at two successive pre-season assessments. ImageJ was used to measure patellar tendon thickness on both knees at each visit. Quadriceps strength was measured as peak knee extension torque with an isokinetic dynamometer. A Pearson product moment correlation was used to determine the association between change in patellar tendon thickness and quadriceps strength. We included 14 female athletes (Age=20.0±1.3 yrs, Height=168±4.75 cm, Weight=67.6±8.61 kg) that had longitudinal data for both patellar tendon ultrasound and quadriceps strength. Quadriceps strength change was not associated with patellar tendon thickness change in the right ($r = -0.24$, $p=0.409$), and left limb (r

ACCESSIBLE MEASUREMENTS OF GROUND REACTION FORCES RELATED TO OSTEOARTHRITIS SYMPTOMS IN AN ACLR POPULATION
Presenter(s): Blake Garrison
Kinesiology
Mentor(s): Arjun Parmar (College of Education), Matthew Harkey (College of Education)

Anterior cruciate ligament injuries and subsequent reconstruction (ACLR) are frequent, and often accelerate the development of osteoarthritis. After ACLR, aberrant gait kinetics are prevalent and associated with poor patient reported outcomes. However, the measurement of kinetics is limited to specialized research settings. This study aims to determine if gait kinetics assessed via single sensor wireless insoles are associated with early osteoarthritis (EOA) symptoms following ACLR. 67 ACLR patients (39 females, age: 23.1±10.6 years, height: 169.3±8.7 cm, mass: 72.4±14.4 kg, time since surgery: 5.88±1.64 months) performed thirty second treadmill walking trials. Limb symmetry indices (LSI) of peak impact force, impulse, and both instantaneous and average loading rate were assessed. Participants completed the Knee injury and Osteoarthritis Outcome Score (KOOS) to classify EOA status. Logistic regression analysis was used to determine if gait kinetics were associated with EOA symptoms after controlling for age. The logistic regression analysis showed that age (OR = 1.22, CI: 1.1-1.6) and peak impact force (PIF) LSI (OR = 1.23, CI: 1.0 - 1.6) increased probability of reporting EOA symptoms. Conversely, greater impulse LSI (OR=0.77, CI: 0.6 - 0.9) reduced the probability of reporting EOA symptoms. The relationship between PIF and IMP indicates that load attenuation over greater duration is imperative to reducing EOA symptoms. The use of clinically accessible devices to measure gai

SEASONAL CHANGES IN PATELLAR TENDON STRUCTURE: ULTRASOUND INSIGHTS FROM FEMALE FIELD HOCKEY VS. SOCCER PLAYERS
Presenter(s): Saif Juma
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Athletes engaging in dynamic sports, such as field hockey and soccer, experience substantial patellar tendon strain. Ultrasonography offers a non-invasive method to evaluate patellar tendon integrity, yet the impact of a competitive season on these tendons remains unclear. Therefore, the purpose of this study was to determine the change in patellar tendon thickness and composition of both limbs from pre- to post-season in female Division I NCAA athletes. Methods: 37 female athletes(age = 20.4 ± 1.5 yr) were recruited, comprising 17 field hockey players and 20 soccer players. Ultrasound imaging was employed to assess the change in patellar tendon composition and thickness from pre- to post-season. Participants were supine with their knees flexed at 20°. Longitudinal ultrasound images of the patellar tendon were acquired in both limbs and the tendon was manually outlined in ImageJ. Patellar tendon thickness was quantified as the cross-sectional area divided by the length of the tendon. Patellar tendon composition was quantified as the average echo-intensity (i.e., brightness, 0 [i.e., dark] - 255 [i.e., white]) of the pixels within the outlined tendon. Two by two ANOVAs were used to compare the patellar tendon thickness and composition between limbs and from pre- to post-season. Results: For patellar tendon composition, there was a significant main effect for limb (F=10.24, p=0.003), but not for time (F=0.98, p=0.33) or the time*limb interaction (F=0.93, 0.34). For patellar ten

ASSOCIATION BETWEEN JUMP LANDING BIOMECHANICS AND ECHO INTENSITY IN THE RECTUS FEMORIS IN DIVISION I FEMALE ATHLETES

Presenter(s): Kate Mumford
Kinesiology
Mentor(s): Jessica Tolzman (College of Education), Matthew Harkey (College of Education)

Echo intensity (EI) captured from ultrasound (US) indicates muscle quality with higher EI representing non-contractile tissues while darker EI represents contractile fibers. Vertical ground reaction force (vGRF) measures the extent of load force on the lower extremity during a drop vertical jump. This could shed light on muscle composition and functional performance in athletes throughout the season. This study aimed to evaluate the association of quadriceps muscle quality using ultrasound (US) assessed EI and vGRF during a drop vertical jump in Division I female athletes. We enrolled 102 athletes (age: 20.2±1.4 years, height: 170.9±8.9 cm, mass: 69.0±11.2 kg). Participants laid supine with their knee slightly flexed at 20-30 degrees. Bilaterally, an experienced technician captured three panoramic ultrasound images of the quadriceps rectus femoris muscle halfway up the length of the leg. All images were processed within ImageJ, where the entire rectus femoris was outlined and EI was measured. To assess vGRF, the patient stands on a 30 cm box and performs a drop vertical jump three times. All jumps were processed within Vicon, with peak vGRF used within the statistical analysis using a Pearson correlation coefficient test. There was no association between echo intensity and vGRF values on the left (59.8±6.8 au,1.9±0.4 N, r =-0.03, p=0.74) or right limbs (59.7±7.1 au, 2.0±0.5 N, r =-0.04, p =0.68). Ultrasound-assessed echo intensity is not associated with vGRF patterns in

DIFFERENCES IN KINESIOPHOBIA BETWEEN INDIVIDUALS WITH AND WITHOUT HISTORY OF ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Presenter(s): Charlotte Pohl, Emiko Oku
Kinesiology
Mentor(s): Francesca Genoese (College of Law), Matthew Harkey (College of Education)

Background: Anterior cruciate ligament (ACL) tears are a sport-related injury that result in knee instability. Post-ACL reconstruction (ACLR), individuals commonly exhibit psychological impairments, such as kinesiophobia (i.e., fear of movement/[re]injury) which is associated with poor health-related outcomes. However, it is currently unknown whether the levels of kinesiophobia experienced by individuals with ACLR differ from those of individuals who have not sustained this injury. Exploring differences in kinesiophobia between individuals with and without ACLR will allow for identification of psychological factors that may be more likely to affect individuals with ACLR and may highlight a need to address kinesiophobia throughout ACLR rehabilitation. The objective of this project was to explore differences in kinesiophobia between individuals with and without a history of ACLR. METHODS: 27 individuals with ACLR (time since ACLR= 22.72±13.66 months; age= 21.26±3.45 years; 6 males) and 27 age and sex-matched controls without a history of lower extremity surgery (age= 21.15±2.94 years; 6 males) were included. The 11-item Tampa Scale of Kinesiophobia (TSK-11) was used to measure kinesiophobia. TSK-11 scores range from 11-44, where higher scores indicate greater fear of movement/(re)injury. Descriptive statistics (median [IQ]) were calculated for TSK-11 scores and Mann Whitney U Tests were used to compare TSK-11 scores between groups

SEASONAL FEMORAL ARTICULAR CARTILAGE CHANGES IN DIVISION 1 FEMALE ATHLETES
Presenter(s): Jagger Wraalstad
Kinesiology
Mentor(s): Arjun Parmar (College of Education), Matthew Harkey (College of Education)

Knee cartilage is vital for joint articulation and load attenuation. Cartilage degeneration is often unnoticed until damage is catastrophic. Due to the demands of sport, cartilage health is vital to sustaining a high level of performance and joint health. The purpose of this study was to determine the association between peak vertical ground reaction force (vGRF) during a drop vertical jump (DVJ) task and changes in ultrasound-assessed knee cartilage in Division 1 female athletes over a sporting season. Twenty female soccer athlete participants completed five DVJ trials onto external force transducers during pre-season testing to assess peak vGRF. Knee cartilage images were acquired via ultrasound at pre- and post-season. Three transverse suprapatellar images were acquired and manually segmented. Thickness and mean echo-intensity (EI) of the cartilage were quantified. A Pearson product moment correlation test was used to estimate the association between landing vGRF and cartilage outcomes. Cartilage thickness and EI in the dominant knee demonstrated weak to moderate, negative association with peak vGRF in both limbs ($r=-0.58$--0.35, $p=0.103$-0.999). However, cartilage thickness and EI in the non-dominant knee were not significantly associated with peak vGRF in both limbs ($r=-0.08$-0.12, $p>0.999$). Although the relationship between cartilage thickness and EI change was not significantly associated with pre-season vGRF, slight cartilage thinning was found for a majority of parti

WAVES VS RAYS: THE ASSOCIATION OF BONE MINERAL DENSITY AND ULTRASOUND ASSESSED SUBCHONDRAL BONE IN FEMALE ATHLETES
Presenter(s): Natalie Blake
Kinesiology
Mentor(s): Corey Grozier (College of Education), Matthew Harkey (College of Education)

Dual-energy X-ray Absorptiometry (DXA) offers a precise bone mineral density (BMD) assessment but lacks accessibility due to overwhelming cost and limited availability. Ultrasound imaging may be a more feasible option due to lower cost and ease of access, however, its use as a tool for bone assessment remains uncertain. Therefore, our study aimed to assess ultrasound imaging as an alternative to DXA when measuring bone health in Division I female athletes. Thirty Division I female athletes underwent DXA scans to determine lower extremity BMD. Three transverse suprapatellar ultrasound images were collected bilaterally to view the distal femoral trochlea. The subchondral bone was segmented at the midpoint between the sulcus and medial condyle, using ImageJ. Five 5x25 pixel boxes were placed deep to each other with the first box at the bone-cartilage border. A 25x25 pixel box superimposed the five prior boxes to assess an overall echo-intensity value. The mean echo-intensity (brightness,0[black]-255[white]) was assessed for each box. A Spearman's Rho was used to evaluate the relationship between lower extremity raw DXA scores and average ultrasound echo-intensity for each box bilaterally. Significant correlations were found between lower extremity DXA scores and average echo-intensity for the second (ρ=-0.374,p=0.042) and superimposing (ρ=-0.411, p=0.024) left limb boxes. Additionally, significant correlations were found for the first (ρ=-0.431,p=0.018), second

DIFFERENCES IN VISUAL AND SENSORIMOTOR SKILLS IN COLLEGE STUDENTS WITH AND WITHOUT A HISTORY OF CONCUSSION
Presenter(s): Giulia Castiglioni
Kinesiology
Mentor(s): Allie Tracey (College of Education)

Prior research suggests concussion may cause sensorimotor and visual skill impairments. The purpose of this study was to determine differences in visual and sensorimotor skills between college students with and without a history of concussion. A cross-sectional study of college students groups participants based on if they reported a history of concussion or not. Ten visual and sensorimotor assessments (e.g., visual clarity, contrast sensitivity, depth perception, near-far quickness, perception span, multiple object tracking, reaction time, target capture, eye-hand coordination, and go/no-go) on the Senaptec Sensory Station were completed. Mann-Whitney U tests compared differences in visual and sensorimotor skills between groups. Hedge's g effect sizes (ES) and 95% confidence intervals (95% CI) detected clinically meaningful differences. One hundred and thirty participants (94 female; age=21.7 ± 2.8 years) were included, with 48 (36.9%) reporting 1 or more concussions. The concussion history group had an average time since injury of 7.2 years (SD=2.8) and 23 (47.9%) had more than 1 previously diagnosed concussions. Participants with a concussion history performed better on visual clarity compared to those without a history of concussion (p=0.03, ES=0.39, 95% CI=0.03-0.75). No significant differences were observed between groups for the remaining 9 assessments. Findings suggest limited differences in visual and sensorimotor skills between college students with and withou

EVALUATING THE INFLUENCE OF SOCIOECONOMIC ENVIRONMENT ON PERCEIVED STRESS AND SOCIAL SUPPORT AMONG ADOLESCENTS AFTER KNEE SURGERY
Presenter(s): Aleah Huse
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Socioeconomic disparities significantly impact recovery from Anterior Cruciate Ligament reconstruction (ACLR) among adolescents, with prior studies linking lower socioeconomic status, as measured by the Area Deprivation Index (ADI), to increased depression and anxiety post-reconstruction. However, it is unclear how perceived stress and social support is affected by socioeconomic status in adolescent patients post-ACLR. Therefore, this study evaluates differences in perceived stress and social support in adolescents following ACL reconstruction between high and low area deprivation groups.Fouty-six adolescent patients (Female=32, Height=170.2±8.0cm, Weight=71.7±16.8kg, Age=17.0±1.2yrs, Time Since Surgery= 5.4±1.6mo). During their initial visit, patients completed both the Perceived Stress Scale (PSS) and the Multidimensional Scale of Perceived Social Support (MSPSS) to evaluate patient reported stress and social support, respectively. Patient surgical records were reviewed to ascertain their state-specific ADI scores, categorizing them as high (1-5) or low (6-10) area deprivation group according to their ADI rankings. An independent t-test was conducted to assess differences between PSS and MSPSS scores between those with high and low socioeconomic status. Sixty-five percent of the evaluated patients were within low deprivation area groups. However, no significant differences in PSS (t=0.034; p=0.973) or MSPSS (t=-0.478; p=0.635) scores between the low (PSS= 1.94±0.44,MSPSS=2.

FORCE PRODUCTION METRICS AND THEIR IMPLICATIONS FOR PEAK ACCELERATION IN DIVISION I WOMEN'S SOCCER ATHLETES
Presenter(s): Ben Parker, Evan Stanislaw
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Strength and jump landing mechanics are often used to assess athlete's readiness for competition. The interpretation of these measurements is limited due to the high dimensionality of the data, resulting in poor communication of in-lab measurements to coaches and performance practitioners. The purpose of this study was to assess the predictive relationship between preseason in-lab testing and in-game acceleration and to develop a predictive composite metric using principal component analysis (PCA). Twenty-four Division I female soccer athletes (Height:153.2±173.3cm, Weight:48.4±72.8 kg, Age:18.0±23.3 years) underwent preseason testing, which included drop vertical jump (DVJ) trials to evaluate landing force and loading rate, along with unilateral isokinetic knee extension and flexion assessments to measure peak strength. Two linear regression models were developed: 1) using raw testing data, 2) using PCA score data. The raw data model demonstrated a strong relationship between strength and landing mechanics with in-game acceleration (r2= 0.52, p = 0.08). Component 12 was the most associated composite metric to in game acceleration (r = -0.47, p = 0.03). The linear model fit to the data projected onto component 12 demonstrated a weak relationship to in-game acceleration (r2 = 0.19, p = 0.03). The raw data model showed that knee flexion and extension?strength and landing mechanics may predict in-game performance. Additionally, PCA revealed meaningful composi

RECTUS FEMORIS MUSCLE SIZE ASSOCIATION WITH PEAK QUADRICEP STRENGTH IN DIVISION 1 WOMEN'S ATHLETES
Presenter(s): Maddie Poirier
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Understanding the association between quadricep strength and size is essential in advancing and maintaining athletic performance and injury prevention methods. This relationship is exceptionally pertinent in collegiate athletes, where peak physical condition is paramount. Quadricep strength is an influential component of numerous athletic activities, affecting various factors from jump height to sprint speed. Contrarily, muscle size, frequently considered a determining marker of potential strength, may not directly correlate, or equate to the same level of functional performance. Henceforth, examining the link between these two variables can provide valuable insights into training efficacy and the development of targeted exercise programs. The purpose of this study was to determine the association between quadricep strength and size within a cohort of NCAA Division I female athletes. A cross-sectional study was conducted in a single session aiming to clarify how much quadricep size correlates to measurable strength, potentially influencing training and physical rehabilitation strategies. An isokinetic dynamometer was utilized to measure quadricep strength, quantified as the peak extension torque, while participants performed five consecutive knee movements. For muscle size assessment, ultrasound imaging of the rectus femoris was employed. Participants were positioned supine with their knees flexed between 20-30 degrees, and an examiner captured three panoramic images at the m

THE DYNAMICS OF OBJECT EXPLORATION: SEQUENCING INFANT MANUAL EXPLORATORY BEHAVIORS LONGITUDINALLY
Presenter(s): Georgia Berger, Lina Heinzmann
Kinesiology
Mentor(s): Jennifer Burns (College of Education), Mei Hua Lee (College of Education)

As infants develop, both the way in which they interact with the objects and the sequence of those interactions change. Understanding the sequence of these interactions, which is the order of actions used to explore the object, can provide insight into the developmental process. However, the sequence of manual exploratory behaviors dependent upon age within subjects and between subjects has yet to be analyzed. The purpose of this study is to investigate how the sequences of manual exploratory behavior develop over time in infancy. The infants were observed longitudinally over six to twelve months of age. The infants' manual behaviors were recorded by video cameras while they were interacting with nine objects of varying size (2" and 4"), texture (soft and hard), and shape (cube and ball). Exploratory behaviors were coded using Datavyu, an open-source behavior coding software, and categorized into exploration, manipulation, or transportation of the object. Results indicate that as infants grow older, they are able to sequence together more actions, increase the number of actions they engage in, and increase the complexity of their actions. The conclusions obtained from this study can bring focus to the developmental processes with object exploration during early infancy.

Furthermore, the knowledge gained can be applied in the clinical setting for recognizing the potential of movement disorders in children.

PHYSIOLOGICAL STRAIN EXPERIENCED BY A COLLEGIATE MASCOT DURING EVENTS

Presenter(s): John Morrison, Zane Francisco
Kinesiology
Mentor(s): Ashley Triplett (University Advancement), Sue Petrisin (UNIVERSITY ADVANCEMENT)

Heart rate (HR) and body temperature tracking have been used to monitor workload and athlete safety during competition. A group who also exerts substantial effort during sporting events is team mascots. Mascots wear heavy suits/uniforms leading to an environment not conducive to effective temperature regulation. Limited information is available examining mascot exertion; data are needed to determine the impact of performing in a mascot suit and to understand potential health risks. The purpose of this study was to describe the physiologic strain experienced by a collegiate mascot during sporting events. A physiologic tracking system evaluated HR of one individual who performed mascot activities "in-suit" during five sporting events. Core body temperature was measured using an ingestible temperature monitoring capsule and body weight was measured pre- and post-event to estimate sweat loss. Due to limited sample size, statistical analysis was limited to means and standard deviations. On average, the individual performed for 60.6±10.2 minutes and lost an estimated 2.3±0.8 lbs of sweat during events. Average HR during these events was 175±7 bpm and maximal HR achieved was 207 bpm while performing during a hockey game. Average core body temperature was 101.2±0.6°F during all events and maximal core body temperature achieved was 103.4°F during a football game. The mascot suit micro-environment posed great physiologic strain on the wearer. Fut

PROMOTION OF MENTAL HEALTH HELP-SEEKING AMONG COLLEGIATE ATHLETES

Presenter(s): Lexy Valianos
Kinesiology
Mentor(s): Jeemin Kim (College of Education)

Colligate athletes experience increased stress due to the combination of demands from their sport and education, which can contribute to mental ill-health. Though mental health problems are common among this population, not all student-athletes seek help while dealing with mental health concerns. Among several barriers, negative social norms surrounding mental health and help-seeking can discourage athletes from seeking help. Thus, it is important to investigate ways that can help promote more positive perceptions towards help seeking held by student-athletes. The goal of this study was to determine whether the presence of positive social norms about help-seeking among student-athletes affects their intentions to seek help. Online surveys were administered to student-athletes (N = 234) competing at the college level (i.e., NCAA, NAIA). The participants were randomized to receive different messages that featured the presence of positive social norms (e.g., "other athletes seek help") or education (e.g., "help-seeking is beneficial"). Results from a one-way ANOVA showed no statistically significant difference in intention to seek help between treatment and control groups, F (2,

151) = 0.89, p= .411. A regression analysis revealed that athletes' estimate of other athletes who seek help correlated with intention to seek help, Fchange (1,195) = 3.34, p = .069. Future studies may consider including more than one positive social norm message to re-test the influence on help seeking

LONGITUDINAL ANALYSIS OF KNEE CARTILAGE THICKNESS IN DIVISION I FEMALE ATHLETES
Presenter(s): Christian Burke
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Participating in high-performance sports places significant strain on athletes' knee joints throughout a competitive season. This study investigates preseason to postseason changes in knee joint cartilage thickness among female Division I NCAA athletes, aiming to inform injury prevention strategies. We included 30 female participants from Division I NCAA teams. Participants were members of field hockey (n=15), soccer (n=15) and they were, on average, 19.9±1.3 years old, 167±5.1 cm tall and weighed 63.87±7.9 kg. Participants completed a single research laboratory visit that included a knee cartilage ultrasound. Knee cartilage thickness was assessed bilaterally by a single investigator using a transverse scan with the knee in maximum flexion. The lead author traced the knee cartilage in three ultrasound images bilaterally and the average cartilage thickness for the dominant and non-dominant knees was quantified. A 2x2 ANOVA was used to determine how cartilage thickness changed from pre- to post-season in the dominant and non-dominant limb. Across both limbs, there was a statistically significant difference in cartilage thickness from pre- to post-season (F=5.791; p=0.023). However, there was no significant time by limb interaction (F=0.007; p=0.932) and no significant limb main effect for cartilage thickness (F=0.054; p=0.818). These findings underscore the importance of regular knee joint health assessments for female Division I NCAA athletes to identify potential injury risks

BREAKING FRAGMENTATION: A STANDARD APPROACH TO MOTOR LEARNING EXPERIMENTS
Presenter(s): Mark Endicott
Kinesiology
Mentor(s): Joey Wijffels (College of Education)

Motor learning is pivotal in skill acquisition and movement rehabilitation, yet the field faces a significant challenge: the lack of standardized task paradigms across laboratories. These paradigms often vary widely in task parameters and reliance on specialized/expensive equipment, hindering direct comparisons and reducing replicability. This project aims to address this issue by comparing task paradigms and ranking their model task potential using a subjective scale. Drawing from existing literature and analyzing different research methods, this project seeks to establish a foundation for a globally applicable model. By enhancing comparability and effectiveness, this research has the potential to significantly impact motor learning studies worldwide.

THE EFFECTS OF SURGICAL GRAFT TYPE ON LANDING MECHANICS IN ADOLESCENTS FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Presenter(s): Olivia Grasso
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Anterior cruciate ligament reconstructions (ACLR) have become increasingly common in adolescents in sport. The graft type used during ACLR can affect rehabilitation and lead to variability within jump landing tasks. However, there is limited information on how surgical graft types may influence limb symmetries during performance. Therefore, the purpose of this study was to compare landing biomechanics during a drop vertical-jump between patellar, hamstring, and quadricep tendon graft types within adolescents four- to six-months post-ACLR. This study involved forty-four participants (female=24, age=17.2±1.1yrs, height=171.07±8.7cm, weight=73.97±17.0kg, post-ACLR=5.5±1.2mo) with either patellar, hamstring, or quadricep tendon graft types. Patients performed five drop-vertical jumps from a 30-cm box, half their height away from force plates, to measure peak vertical ground reaction force (vGRF). Average peak vGRF of the involved limb was normalized to the uninvolved limb to calculate limb symmetry index (LSI) values. Differences in LSI values among the three graft types (patellar, hamstring, quadriceps tendon) were analyzed using a one-way ANOVA, with significance set at alpha 0.05. Of the forty-four participants evaluated, 14(32%) received patellar tendon grafts, 19(43%) received hamstring grafts, and 11(25%) received quadriceps tendon grafts. There were no significant differences in the peak vGRF LSI (F=0.489, p=0.617) between patellar (80.5±18.9), hamstring (75.0±16.8), or qu

ASSOCIATION OF WAIST CIRCUMFERENCE WITH MOTOR COMPETENCE IN LOW-INCOME CHILDREN

Presenter(s): Grayson Hagenbuch
Kinesiology
Mentor(s): Cailyn Vancamp (College of Education), Karin Pfeiffer (College of Education)

Motor development in children is a predictor of lifelong physical activity. The literature shows that different components of body composition are associated with motor competence, in particular waist circumference. Additionally, race, sex, and socioeconomic disparities factor into motor competence. Our purpose was to examine the association of waist circumference with motor competence, accounting for sex and race, in a low-income population. Participants (n=232, 50.4% female; 33% black) were recruited from four public schools in and around Flint, Michigan. Motor competence was examined by the Test of Gross Motor Development-2. Height (cm) and weight (kg) were measured via a stadiometer and bioelectric impedance scale, and waist circumference measurements were taken with Gulick tape. T-tests were used to examine demographic differences, and linear regression was performed to determine if motor competence (object control and locomotor product scores for 4 skills- kick, jump, run, throw) was significantly associated with waist circumference. Waist circumference was significantly related to kick and jump. Race was significantly related to jump and run, while sex differences existed for all skills. Results are similar to previous research that showed sex differences in

motor competence and associations of waist circumference and motor competence. However, since waist circumference was not a significant factor for all skills, it remains unknown how important its role may be in thi

FLIP THE SCRIPT - THE IMPACT OF PRIOR PRACTICE DURATION ON ADAPTATION TO NEW MOVEMENT PATTERNS
Presenter(s): Tim Earle
Kinesiology
Mentor(s): Brian Fox (College of Education), Rajiv Ranganathan (College of Education)

When learning a new task, such as swinging a golf club, people develop specific movement patterns. However, these movement patterns may have to be modified later due to injury, and it is possible that this existing movement pattern could affect the person's ability to learn a new pattern for the same task. This question is hard to address using real-world tasks that take several months or years to learn. We addressed this question with a novel motor task that asked participants to control a screen cursor using movements of the fingers. On the first day, participants learned one movement pattern to control the cursor (Task A), and on day two participants were given the same task but with a different movement pattern (Task B). Two groups were tested, which differed in the amount of practice that they had on Task A - one group practiced for 240 trials, while the second group practiced for 480 trials. We found that the group that performed more trials on Task A had a greater difficulty adapting to Task B. These findings have implications for understanding how to change maladaptive patterns, both for skill acquisition and movement rehabilitation.

CARDIOVASCULAR RESPONSES TO DEHYDRATION IN ELITE AND AMATEUR MOTORSPORT ATHLETES
Presenter(s): Grace Harrison, Makenna Ebling
Kinesiology
Mentor(s): Amy Boettcher (College of Education)

Motorsports athletes are unique competitors as they must maintain an increased heart rate (HR), repeatedly apply extreme force to a break pedal, must oppose intense gravitational (G) forces and endure high temperatures throughout a race. HR and oxygen consumption have been studied to determine the aerobic demands of motorsports athletes; however, heart rate variability (HRV) may be an insightful tool to understand hydration status and cardiovascular activity throughout a race. PURPOSE: To determine HR and HRV responses to motorsport racing in professional (PRO) and amateur (AM) drivers. METHODS: 4 male drivers (2 PRO, 2 AM) wore HR monitors at seven races over the course of a racing season. HR was collected throughout the duration of the race; HRV was analyzed offline by a single investigator. Repeated measures analysis of variance was completed to compare HR and HRV based on track distance and driver status. Significance was accepted at $P<0.05$. RESULTS: Mean age of PRO drivers was 41.5±0.5 years and AM was 30±5 years. There was no difference in root mean square of the successive difference (RMSSD) between short and long course races. AM drivers had increased HR in comparison to PRO throughout races ($P<0.0076$), while RMSSD was only different between groups at the end of races (PRO: 5.579±2.060, AM: 3.583±0.461; P = 0.0095). CONCLUSION: The results indicate that PRO and AM drivers have different cardiovascular responses to racing. Additional research could provide

HOW DOES OBSERVATIONAL LEARNING INFLUENCE MOTOR LEARNING OF A NOVEL COLLABORATIVE MOTOR TASK?

Presenter(s): Gordy Hartford, Morgan Waggoner
Kinesiology
Mentor(s): Brian Fox (College of Education), Rajiv Ranganathan (College of Education)

When learning a novel motor task with a partner, it has been suggested that observational learning can reduce time spent learning the task, due to the belief that it is easier to replicate a movement after seeing it. This can be beneficial for individuals learning to use a robotic prosthetic or assistive device, as they can see what successful task performance looks like before attempting the task themselves. However, it is possible that individuals engaging in observational learning are not truly learning the movement patterns required for successful task performance, but rather copying the movements of their partner. Thus, our research asks: is motor exploration as efficient as observational learning when applied to a collaborative motor task? Participants were asked to complete a Body-Machine Interface task with a trained expert using upper body movements. Two groups were tested: one group will perform the Body-Machine Interface task whilst being able to see their partner, and a second group that had a limited view of their partner. Testing conditions, completed independently, consisted of 24 reaches to a target displayed on the screen, while the training conditions, completed collaboratively, consisted of 20 reaches. We anticipate that the group with complete visibility of the expert during the task will be faster at performing the task. As the end goal for the learner is to be able to use the assistive device efficiently on their own, understanding how muc

VISUOMOTOR ADAPTATION UNDER THE CONDITION OF HEAD TILT, PART 2

Presenter(s): Ben Potts, Bhuvana Bhamidipati, Luke Jernigan, Meagan Rockafellow
Kinesiology
Mentor(s): Florian Kagerer (College of Education)

This study explores the characteristics of visuomotor adaptations during a head tilt. In doing so, participants controlled a cursor on a screen in front of them using a joystick; the vision of their hand was occluded. They were instructed to use the joystick to move the cursors in one swift motion from a starting position to a target position. During the baseline conditions, participants reached towards targets with veridical visual feedback. In the exposure trials, the visual feedback from the cursor is rotated counterclockwise such that participants had to reach clockwise to correct for the perturbation. In the washout trials, veridical visual feedback was returned as the cursor rotation was removed. During the visual kinesthetic condition, participants tilted their heads to the right while moving arm to the right, creating congruence between head tilt direction and arm movement direction. We expect that adaptation under conditions of head tilt will be decreased compared to the control.

USING POST WAVE VELOCITY MEASUREMENTS TO ASSESS ARTERIAL STIFFNESS DURING ACUTE BOUTS OF EXERCISE

Presenter(s): Chloe Murray, Ethan Kaul, Evan Murad, Lydia Elbert
Kinesiology
Mentor(s): Katharine Currie (College of Education), Wesley Blumenburg (College of Education)

It is well established that exaggerated blood pressure (BP) responses to acute exercise can predict future cardiovascular disease risk. However, the underlying blood vessel adjustments contributing to these exaggerated responses are less understood. While arterial stiffness is associated with BP at rest and post-acute exercise, it is currently unknown if it is associated with BP during exercise. The primary aim of this investigation is to assess the relationship between arterial stiffness and BP during acute exercise in young healthy males and females. Young healthy adults aged 18-39 yrs. were recruited for this investigation. Following 10?min of supine rest, we measured heart rate (HR) and BP via an automated machine, and arterial stiffness via carotid-femoral pulse wave velocity (cfPWV). Measurements were obtained in duplicate and averaged for analysis. Participants then performed a 3-min isometric handgrip exercise (IHG) bout at 30% of their maximum voluntary contraction. HR and BP were assessed at minute two and arterial stiffness was acquired in the final minute of IHG exercise. Associations between cfPWV and BP responses during HG will be assessed using Pearson's and Spearman's correlations, depending on normality. Data analysis is currently ongoing. We expect to see a positive linear relationship between BP and cfPWV responses to acute exercise. Information gained from this study will provide insight into the underlying blood vessel contributions to BP

ASSESSING FAT-TO-MUSCLE RATIO IN THE RECTUS FEMORIS: IMPLICATIONS FOR MUSCLE STRENGTH

Presenter(s): Romy Kennet
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Normalizing muscle size by the amount of overlying fat may offer crucial insights into the musculoskeletal health and athletic performance of female Division I NCAA athletes. This study delves into how the muscle-to-fat ratio in the rectus femoris influences muscle strength and force generation, with a focus on identifying modifiable factors that could enhance performance and reduce injury risk. Seventy female NCAA Division 1 athletes (age: 20±3 years, height: 171±9.0 cm, mass: 68±11.0 kg) participated. Rectus femoris strength, measured as peak knee extension torque (N*m), was assessed using an isokinetic dynamometer. Three panoramic thigh ultrasound images were captured for each athlete's left limb to evaluate the rectus femoris muscle and the overlying subcutaneous fat thickness. Measurements were analyzed using ImageJ, calculating the muscle-to-fat ratio by dividing muscle area by fat thickness. Spearman rho correlations assessed the association between this ratio and knee extension strength. A significant correlation emerged in the non-dominant limb, with a higher muscle-to-fat ratio associated with greater knee extension strength ($\rho=0.31$, $p=0.008$). No significant correlation was found in the dominant limb ($\rho=0.16$, $p=0.20$). This investigation highlights the muscle-to-fat ratio's critical role in determining muscle strength, particularly in the non-dominant limbs of female athletes. The findings suggest that targeted interventions aimed at improving muscle qualit

VISUOMOTOR ADAPTATION UNDER THE CONDITION OF HEAD TILT, PART 1
Presenter(s): Amy Liu, Anita Kompalli, Anja Olsen
Kinesiology
Mentor(s): Florian Kagerer (College of Education)

This study explores the characteristics of visuomotor adaptations during a head tilt. In doing so, participants controlled a cursor on a screen in front of them using a joystick; the vision of their hand was occluded. They were instructed to use the joystick to move the cursors in one swift motion from a starting position to a target position. During the baseline conditions, participants reached towards targets with veridical visual feedback. In the exposure trials, the visual feedback from the cursor is rotated counterclockwise such that participants had to reach clockwise to correct for the perturbation. In the washout trials, veridical visual feedback was returned as the cursor rotation was removed. During the experimental conditions, there was a congruence between the head tilt direction and the stimulus display axis. We predict that the congruence between the head axis and stimulus display will make visuomotor adaptations easier compared to the control group.

DIFFERENCES IN PERCEIVED SOCIAL SUPPORT BETWEEN MALES AND FEMALES WITH ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Presenter(s): Charlotte Pohl, Emiko Oku
Kinesiology
Mentor(s): Francesca Genoese (College of Law), Matthew Harkey (College of Education)

BACKGROUND: Anterior cruciate ligament (ACL) tears are a sport-related injury that requires ACL reconstruction (ACLR) to restore knee stability. After ACLR, females demonstrate worse outcomes and are less likely to return to sport when compared to their male counterparts. Psychosocial factors, such as perceived social support, have been shown to influence clinical outcomes among individuals with musculoskeletal conditions. Given that females with ACLR report experiencing motivational benefits from social support, a lack of social support may consequently contribute to the poor outcomes exhibited by this population. However, it is unknown whether differences in perceived social support exist between females and males with ACLR. The objective of this study was to explore differences in perceived social support between males and females with ACLR. METHODS: 74 individuals (49 females, 25 males; age= 18.59±2.71 yrs)with ACLR (time since ACLR= 5.9±1.8 months) participated. Perceived social support was assessed with the Multidimensional Scale of Perceived Social Support (MSPSS). The MSPSS includes 12-items with total scores ranging from 0-7, where higher scores indicate greater levels of perceived social support. Descriptive statistics (median[IQR]) were calculated for MSPSS scores and Mann-Whitney U tests were used to compare MSPSS scores between groups. A-priori α was set at $p<0.05$.

EXAMINING THE ROLE OF A GOLF-BASED POSITIVE YOUTH DEVELOPMENT PROGRAM ON PSYCHOSOCIAL OUTCOMES IN LANSING YOUTH

Presenter(s): Aarushi Lokhande
Kinesiology
Mentor(s): Chelsi Ricketts (College of Education), Leapetswe Malete (College of Education)

Physical activity-based positive youth development (PA-PYD) programs are considered beneficial for youth development. Notwithstanding, gaps exist regarding the transferability of assets learned from such programs to areas including personal, social, and cognitive skills. This study examined whether the perceived development of personal, social, and cognitive skills differed between Greater Lansing youth receiving a PA-PYD program (treatment) and those not receiving the PA-PYD program, but enrolled in PE (control group). Participants were 155 fifth and sixth grade students (male = 53.61%; Mage= 10.99, SD = 1.03) assigned to treatment (N = 74; male = 45.7%, Mage= 10.93, SD = 0.63) and control groups (N = 81; male = 54.3%, Mage= 11.05, SD = 0.65) in a quasi-experimental design. Participants completed measures of personal and social skills and cognitive skills. Regression analyses revealed no significant difference in the perceived development of personal and social skills between the treatment (M = 3.13, SD = 0.83) and control groups (M = 3.10, SD = 0.57; B = -0.04, p =.706). Perceived development of cognitive skills was significantly higher in the control group (M = 3.14, SD = 0.67; B = 0.37, p =.005) than in the treatment group (M = 2.78, SD = 0.91). The results could be explained in terms of the length of the intervention and potential methodological biases (e.g., potential lack of balance between groups). Notwithstanding, these findings underscore the value of PE programs fo

MOVEMENT VARIABILITY DURING SKILL LEARNING

Presenter(s): Nikolas Pearson
Kinesiology
Mentor(s): Narae Shin (College of Education), Rajiv Ranganathan (College of Education)

One of the hallmarks of skilled performance is the ability to not only produce a high level of output, but produce it consistently. However, despite these consistency in achieving the movement outcome, the movement patterns of skilled performers can also be quite variable - for example, as a shortstop in baseball can complete the same throw to first base while moving in different directions, throwing with different arm angles and velocities. We address the question of how movement variability changes with learning. Participants performed a bimanual virtual throwing task using a robotic manipulandum, where we can measure the positions and velocities of the hand movements. Each participant completed twelve blocks of twenty-five trials with constant target on day one, followed by two blocks of retention test on day two. To address our question, we measured the variability of the task outcome and the variability of the movement pattern. We compiled these data in unimanual sets, identified eleven equidistant points (0-100%) along the hand path, and compared standard deviations of each point of the trials in a block. The results showed that on average, variability in movement pattern decreased throughout training blocks, and slightly increased but remained below baseline on the retention test. Task success followed oppositely, increasing throughout training blocks and slightly decreasing during retention. This suggests a negative relationship between the co

THE EFFECT OF BILATERAL BLOOD PRESSURE MEASUREMENTS ON BLOOD PRESSURE VALUES
Presenter(s): Dalton Goodwin, Hannah Penfold, Nabeeha Ali
Kinesiology
Mentor(s): Amy Boettcher (College of Education), Katharine Currie (College of Education)

Hypertension (HTN), or high blood pressure (BP) is a leading risk factor for cardiovascular disease. To diagnose HTN, BP should be measured in both arms and the higher arm should be used for subsequent visits. It is unclear if the order in which BP is measured from both arms influences the readings. Further, in individuals with normal resting BP, BP responses to exercise may help to indicate cardiovascular disease risk. The purpose of this study was to 1) investigate whether the arm order of measurement affects the BP value, and 2) examine exercise-induced BP responses in healthy adults. We collected data on eight participants (87.5% female) between the ages of 18-39 years of age. Duplicate brachial BP measurements were taken from each arm with an automated BP device, with the order of measurements randomized: right arm followed by left arm, left arm followed by right arm, and both arms simultaneously. Participants rested for ten minutes prior to and between BP measurements. After resting measures, participants performed a three minute isometric hand grip effort at 30% of their maximal voluntary contraction with their dominant hand while BP was measured in the opposite arm every minute. Data analysis is currently ongoing. We do not anticipate measurement order will affect the BP values. We predict that individuals with greater interarm BP differences will also have an exaggerated BP response to handgrip exercise.

SEX DIFFERENCES IN SCAT-6 PERFORMANCE POST CONCUSSION
Presenter(s): Kate Ryan
Kinesiology
Mentor(s): Allie Tracey (College of Education), Haley Clark (INTERCOLLEGIATE ATHLETICS)

Current literature suggests that there are sex disparities in sport-related concussion (SRC) outcomes, such as women experiencing greater neurocognitive impairments and more self-reported SRC symptoms than men. Therefore, it is important to explore these sex differences in newly created SRC assessment and management measures. The Sport Concussion Assessment Tool-6th Edition (SCAT-6) is the most updated version of the SCAT. It aids in the diagnosis and management of SRC by assessing symptoms and neurocognitive functioning post-SRC. A prospective cohort study of college-aged (n=38, woman=18, man=20, m age=20.82, SD=1.47) athletes (e.g. recreational, intramural, club, varsity) with a concussion was conducted. Concussed athletes completed demographics, injury information, and the SCAT-6 within 5 days of sustaining injury. Independent samples t-tests determined differences in SCAT-6 composite scores between men and women ($p<.05$). There were no significant differences between men and women on any SCAT-6 outcomes, including total scores ($t(36)=1.22$, $p=0.23$, Cohen's $d=0.40$). To our knowledge, this is one of the first studies to explore sex differences in performance on the most updated version of the SCAT acutely post-SRC. Further research might consider a larger sample size and potential behavioral, biological, and societal implications of symptom expression and tolerance by each sex.

POSITIVE ILLUSORY BIAS IN CHILDREN WITH ADHD: USE OF MEDICATION TREATMENT AND BIOLOGICAL GENDER ON BIAS

Presenter(s): Claudia Seiler

Kinesiology

Mentor(s): Colt Coffman (College of Education), Lauren Bullard (College of Education), Matthew Pontifex (College of Education)

Attention Deficit Hyperactivity Disorder (ADHD), a disorder which is characterized by symptoms like inattention, hyperactivity, distractibility, and impulsivity, can have wide reaching effects on a child's overall functioning and wellbeing. Specifically, children and adolescents with ADHD may experience increased challenges in many dimensions, such as academically, socially, and behaviorally. Despite these ADHD-related difficulties, many children with the disorder develop positive illusory bias. Positive illusory bias (PIB) involves the overestimation of one's abilities and competence, which can often result in an increased positive perception of oneself. Although many studies have analyzed the increased rate of PIB in ADHD children, minimal research has been conducted on the potential effects of medication treatment and biological sex on PIB in ADHD children. Therefore, the purpose of this study was to determine whether there is a relationship between both medication use and biological sex at birth on PIB in a sample of children and adolescents with ADHD. Specifically, we assessed participants' self-reported ADHD symptomatology, using the ADHD-V rating scale, and collected behavioral and neuroelectric activity during response inhibition and inference control tasks. 81 subjects participated (35.8% female), ranging in age from 8 to 17 years old with a previous ADHD diagnosis. Of these 81 participants, 71 were medicated and 10 were unmedicated. Medication treatment types ranged

CHILD AND PARENT PERSPECTIVES OF AN ACCESSIBLE ONLINE NUTRITION AND EXERCISE PROGRAM FOR CHILDREN WITH DISABILITIES

Presenter(s): Sathvik Suryadevara

Kinesiology

Mentor(s): Darice Brooks (College of Education), Janet Hauck (College of Education)

Nearly 70% of youth with physical disabilities (PD) report exercising one or fewer times per week. Paired with lower bouts of exercise, youth with PD also consume fewer fruits and vegetables than their able-bodied peers. The accessible Online Exercise and Nutrition Program (A-ONE) is designed to improve the physical health of high-school-aged youth with PD by offering physical activity and cooking sessions in an online format. After completing the program, students and their caregivers were asked to participate in interviews to inquire feedback about the A-ONE program post-participation. Four participants (m=15 yo) and their caregivers were interviewed post-participation of the program. Included participants had to have a physical disability or autism spectrum disorder to be a part of A-ONE. The interview process was a semi-structured interview via Zoom which lasted anywhere between 15 minutes to 30 minutes. The interviews consisted of open-ended questions aimed at understanding the participants' experience while caregivers were asked questions about their child's overall health improvement. Each interview was transcribed by listening to the recorded video, following the pre-made Zoom transcription document, and fixing errors. For the coding process, the P.I and the research team members coded all eight interviews independently. Each interview was first coded for main ideas, these were analyzed and altered to reach agreement on all main ideas before creating subthemes if need

CARDIORESPIRATORY FITNESS FOLLOWING COVID-19 INFECTION IN NON-WHITE COLLEGE AGED ADULTS

Presenter(s): Will Tucker
Kinesiology
Mentor(s): Colt Coffman (College of Education), Lauren Bullard (College of Education), Matthew Pontifex (College of Education)

Following recovery from acute Coronavirus Disease-2019 (COVID-19) infection, many individuals continue to exhibit signs of persistent exercise intolerance which may restrict their cardiopulmonary output. However, little research has been done on the effects of COVID-19 in healthy, recovered college aged adults. Further, COVID-19 has disproportionately affected racial and ethnic minority groups, with higher rates of infection and post-COVID-19 complications compared to their white counterparts. Therefore, the purpose of this study was to examine the effects of COVID-19 infection on two distinct dimensions of cardiorespiratory fitness, VO2peak and Heart Rate Max (HRmax), in white and non-white college aged adults in order to gain a better understanding of the factors underlying exercise intolerance. 209 college aged participants aged 18-26 years old (57% female) completed a modified Balke protocol exercise test, as well as a series of demographic surveys which assessed their previous COVID-19 diagnoses and symptoms. Although we found no differences in VO2peak across races, there was a significant difference in HRmax across symptomatic and nonsymptomatic COVID-19 infected individuals for nonwhite participants only. These results indicate that, specifically in nonwhite college-aged adults, exercise intolerance associated with symptomatic COVID-19 infection is related to potential damages in the cardiorespiratory system.

THE VALIDITY OF THE CORE BODY TEMPERATURE SENSOR

Presenter(s): Gabriella Pluszczynski
Kinesiology
Mentor(s): David Ferguson (College of Education)

An athlete's temperature regulation during activity is imperative for both safety and optimal performance. Motorsport athletes operate their racecars in extreme temperature conditions, putting them at high risk for heat related illnesses that can severely impact their ability to drive. Typical measurement of core body temperature can be invasive, with the use of rectal thermometers or gastrointestinal pills. Because of this, there has been a shift towards noninvasive alternatives, such as wearable sensors. Recent research has brought into question the validity of the Core Body Temperature Sensors, which continuously tracks body temperature during activity with a wearable sensor in the armpit. This pilot study was conducted by the Spartan Motorsport Performance Lab to compare the validity of Core Body Temperature Sensors to the ingestible BodyCap eCelsius Performance Pill. 10 participants were asked to ingest the pill three hours before physical activity and then continuously engage in aerobic exercise of their choice for forty-five minutes. The data from both the Core Body Temperature Sensor and the eCelsius Performance Pill was then analyzed with a correlation statistic. Based on the data collected, the Core Body sensor is appropriate as the percent difference in temperature values was 1.186%.

Linguistics, Languages, & Speeches

STANZA EXTRAVAGANZA: IMPROVING LATIN AMERICAN SPANISH MORPHOLOGICAL CLASSIFIERS
Presenter(s): Daniel Francisco Helo Puccini, Kiara Gonzalez Almanzar
Linguistics Languages and Speech
Mentor(s): Cristina Schmitt (College of Arts & Letters)

Large corpora of data pertaining to Child Acquisition Research has long been an integral part of the development of the field. Resources like CHILDES contribute to the ease of data aggregation and analysis for the testing of various hypotheses related to acquisition patterns. Nonetheless, deficiencies in this research collective appear when the focus is put on languages different from English, especially those with differentiated dialects like Spanish. The research aims to bridge this gap by developing better morphological tagging tools for various Latin American dialects of spanish. By basing a natural language processing script on the Stanford Stanza open source library, this research integrated understood linguistic properties of Latin Spanish clitics to pre-process data for better adaptation to Stanza's resources. Additionally, the process was applied to a proprietary large corpus of Paraguayan and Argentinian Spanish, with the objective of enhancing the understanding of conflicting rule acquisition for children of this region. By publishing this computational resource, this research aims to expand the available toolset for Latin American Spanish data processing and facilitate the testing of hypothesis on similar corpora.

INVESTIGATIONS INTO LONG DISTANCE REFLEXIVES
Presenter(s): Nick LaCroix
Linguistics Languages and Speech
Mentor(s): Alan Munn (College of Arts & Letters)

In language, pronouns are phrases or words that depend on other noun phrases to derive their meaning. English has two kinds of pronouns, reflexive ("him/her/itself", etc.) and non-reflexive ("him/her/it", etc.). Reflexive and nonreflexive pronouns relate to their dependent noun phrases differently. In the sentence "John hurt him", "him" cannot refer to "John" but in "John hurt himself", "himself" must relate to "John". Sentence structure matters, because in a sentence like "John's brother hurt himself", "himself" can no longer depend on "John". Previous research on how reflexives behave has revealed that some reflexives are less restricted than these simple examples show, and that animacy plays a role in interpretation (Charnavel 2019). There is evidence that the antecedent of a reflexive can sometimes be split across two noun phrases as "Maria sent Laura a video of themselves dancing at the festival." where "themselves" refers both "Maria" and "Laura". There are also partial antecedents like, "Hank and his wife found sculptures of himself in a museum." This reflexive depends on "Hank" even though the noun phrase that we might expect to be the only possible antecedent also contains the phrase "his wife In previous research both types of these antecedents on top of the condition of animacy were tested to see which were the most agreeable (Charnavel 2019). In this research we report results from an acceptability judgement experiment testing the interaction betw

AGREEMENT PATTERNS: EXPLETIVES AND COORDINATION
Presenter(s): Evie Cook, Louis Konkoly, William McLaren
Linguistics Languages and Speech
Mentor(s): Alan Munn (College of Arts & Letters)

In American English, verbs must agree in number with their subjects. For example, 'The dog is running.' is grammatical, while 'The dogs is running.' is not. Conjunction phrases like 'the dog and the cat' behave like plural noun phrases: we say 'The dog and the cat are running' not 'The dog and the cat is running'. In sentences like 'There is a dog in the yard', the agreement is with 'a dog'. When the post-verbal noun phrase is plural, the agreement changes: 'There are dogs in the yard.'. However, here, conjunction phrases no longer trigger plural agreement: 'There is a dog and a cat in the yard' compared to 'There are a dog and a cat in the yard'. In this research we test people's judgements on this partial agreement, comparing conjunction phrases and plural noun phrases in the two types of sentence structures. To control for the possibility of contraction ("there's") we tested question forms of the structures: 'Is/are there a dog/two dogs in the yard?' vs 'Is/are there a dog and a cat in the yard?'. Our results show that partial agreement with conjunction phrases is a robust property of the English verbal agreement system.

BEYOND CAUSALITY: INVESTIGATING TEMPORAL INFLUENCE ON CONJUNCTION INTERPRETATION
Presenter(s): Darien Courter
Linguistics Languages and Speech
Mentor(s): Alan Munn (College of Arts & Letters), Cristina Schmitt (College of Arts & Letters), John Ryan (College of Arts & Letters), Yaxuan Wang (College of Arts & Letters)

Human beings are good at creating causal relationships between two events. However, causality is intertwined with temporality. While causally related events are necessarily temporally ordered, temporally ordered events are not necessarily causally related. It's already been observed that the English connective 'and' has temporal implicatures, meaning it encodes temporal information beyond its truth-conditional meaning. It is not clear whether this stems from causal relationships between events, or if 'and' is only attentive to temporal ordering. To answer this question, we conducted a naturalness-judgment study which asked speakers to judge whether a conjunction sentence with 'and' (e.g. 'The penguin did the laundry and folded the clothes') is natural or unnatural based on a provided short fairy tale. The results suggest that salient causal relations between the event conjuncts are not significantly influential on speakers' interpretation of 'and'. Rather, we found significant effects of the temporal order. In other words, when the events depicted in the fairy tale are said in the opposite order of how they were presented in the 'and' sentence, speakers perceive the target sentence uniformly as unnatural; when the events are uttered in the natural order as depicted in the fairy tale, the target sentence is always judged more natural. The results indicate that the English connective 'and' is more concerned with temporality than causality. From a big picture perspecti

DIFFICULTIES IN FRENCH LEARNING: HOW CAN WE HELP?
Presenter(s): Drake Howard, William McLaren
Linguistics Languages and Speech
Mentor(s): Anne Violin Wigent (College of Arts & Letters)

When learning a second language, many speakers encounter linguistic differences that interfere with or even inhibit their ability to learn this new language. In this study, we explore what specific hurdles and barriers exist for students learning French at the undergraduate level at MSU. The goal of this study is to obtain a better understanding of what particular aspects of the language are perceived by learners as hurdles or difficulties, what teaching and learning strategies are deemed helpful, and what suggestions they can provide to improve the MSU French curriculum and/or their French learning experience. We look at the responses of students in different levels of French (100, 200, 300, 400) who visited the French Learning Center during the spring semester of 2024, and look for commonalities and differences in their self-reported difficulties in various areas of the language, such as pronunciation, spelling, vocabulary, and grammar. We also examine what teaching and learning techniques are the most and least effective according to students, looking to see if there is a pattern or preferred method(s) to better understand and learn French.

SPEECH UNDERSTANDING IN DIFFICULT LISTENING CONDITIONS: ROLE OF TO-BE IGNORED BACKGROUND RHYTHM
Presenter(s): Lauren Sholler, Olivia Pell, Reese Westerdale, Riley Gailey
Linguistics Languages and Speech
Mentor(s): J McAuley (College of Social Science)

The ability to understand speech when there are difficult background noises present is vital to everyday life. There are many factors that impact an individual's ability to perceive speech in noise - one is rhythm. How does altering to-be-ignored background speech rhythm affect people's ability to understand to-be-attended speech? McAuley et al. (2020) proposed a Selective Entrainment Hypothesis (SEH) whereby listeners attention is entrained (synchronized) by to-be-attended (target) speech rhythms to aid in speech recognition. Thus, disrupting target speech rhythms is predicted to worsen speech recognition, but the SEH also predicts that disrupting to-be-ignored background speech rhythms should improve speech recognition. The present study tests the effect of disrupting background speech rhythms on target speech recognition in an audio-visual (AV) speech setting. Participants are shown a screen with two faces, being instructed to focus on one. An audio message plays with both faces saying five words in the presence of loud background noise. Participants attempt to correctly identify spoken word(s) of a target speaker in a series of conditions where speech rhythm of the to-be-ignored background talker is either kept intact or altered. Preliminary results show that altering AV speech rhythm of to-be-ignored face and voice improves target speech recognition, providing support for the Selective Entertainment Hypothesis.

PERFECT EVENT COMPLETION

Presenter(s): Hannah Choi, Jaina Kittle

Linguistics Languages and Speech

Mentor(s): Alan Munn (College of Arts & Letters), Cristina Schmitt (College of Arts & Letters), Jingying Xu (College of Arts & Letters)

Events can be described in different ways. When there is a set of three cookies and I eat them all, I can say, (A) 'I {have eaten/ate} {three cookies/the cookies}.' When not all cookies are eaten or are partially eaten, can sentences like (A) still be true? Does the rate of incompletion affect our judgments? Previous studies found an increase in rejections depending on tense ('have eaten' > 'ate') and determiner-type (numeral > definite). None of these studies, however, modified the levels of event incompletion for visual stimuli. In this study, we tested to what extent English-speaking adults accepted sentences as in (A) with events in which the character (i) ate two and a half cookies, (ii) took a bite from each of the three cookies, or (iii) ate most of each of the three cookies. Our results showed an effect of tense (more rejections with Present Perfect) and more importantly, a significant effect of visual stimuli. When 2 1/2 cookies were eaten, participants accepted the sentences with the definite, but rejected the sentences with the numeral. In the other two conditions where each cookie was partially eaten, no determiner-type effect was found. We argue that the visual stimuli lead participants to accommodate the sentences in predictable ways. When 2 1/2 cookies are eaten, the definite and numeral behave differently because 'the cookies' can be accommodated to refer to a set of 2 cookies. However, the definite cannot be accommodated for if each of the three cookies are

THE ROLE OF READING ACQUISITION IN ENHANCING CHINESE WRITING THROUGH ACTIVE VISUAL RECALL

Presenter(s): Katrina Liang

Linguistics Languages and Speech

Mentor(s): Wenying Zhou (College of Arts & Letters)

The evolution of Chinese writing from its earliest form in oracle bone inscriptions to its current logosyllabic system reflects its rich linguistic heritage. There are two types within the Chinese language: Simplified and Traditional. Chinese literacy, such as writing, requires much memorization due to its number of characters. The exploration of eye tracking in reading among non-native speakers remains insufficient, yet a significant portion of today's global population is multilingual. This pilot study examined whether promoting active recall in reading proficiency enhances Chinese writing skills for Chinese language learners, with a detailed analysis of fluency, efficiency, and accuracy. Our study focuses on undergraduates who are native English speakers, studying the Chinese language at an intermediate level. We aim to identify specific text features that may hinder comprehension and subsequently influence writing effectiveness. In addition, we supervised a writing examination before and after the reading task to compare and evaluate the improvements. Our hypothesis is that there will be a significant improvement in enhancing writing from reading. Preliminary findings suggest that active visual recall plays a pivotal role in bridging the gap between reading proficiency and writing competence for Chinese language learners. This study's results hope to bring proficiency development in writing for language learners.

CANADIAN RAISING AND METALINGUISTIC AWARENESS IN MICHIGAN ENGLISH
Presenter(s): Caroline Zackerman
Linguistics Languages and Speech
Mentor(s): Betsy Sneller (College of Arts & Letters)

Canadian Raising is a phonological rule by which the /ay/ diphthong raises before voiceless coda consonants (as in the word PRICE) (Chambers 1973). Speakers of Michigan English do exhibit regular Canadian Raising of /ay/; however, they often consider Canadian Raising to be a uniquely Canadian feature and fail to recognize it in their own speech (Niedzielski 1999; Preston 2005). This study investigates the relationship between a speaker of Michigan English's degree of Canadian Raising and whether or not they report similarities between Canadian English and Michigan English. Tokens of /ay/ are extracted from 8 speakers aged 22 to 40, all born and raised in Michigan. Participants were then asked whether they think that speakers in Michigan sound Canadian. Responses and data are collected from the MI Diaries Project, which collects responses from participants in the MI Diaries project, which sends weekly prompts to over 1,000 diarists, inviting them to self-record their audio responses. As hypothesized, there is a significant relationship between /ay/ height and a speaker's response to the Canadian question. All speakers exhibit raised /ay/ before voiceless consonants, but this effect is much stronger, resulting in higher /ay/ values, for speakers that reported thinking that Michigan English sounds Canadian. We therefore conclude that awareness of a feature in one's dialect is correlated with the production of the feature.

ASSESSING EFFECTIVE MODALITIES FOR FRENCH LANGUAGE ACQUISITION IN FLLC
Presenter(s): Jackson Humes, Jaden Loy
Linguistics Languages and Speech
Mentor(s): Anne Violin Wigent (College of Arts & Letters)

The French Language Learning Center (FLLC) is a new addition to the opportunities offered by MSU's College of Arts and Letters, designed to provide a resource for all French students with help for their French language classes as needed. With no precedent for undergraduate learning assistants (ULAs) on how best to aid students with French language acquisition, it is crucial to understand what demographic is interested in the FLLC and what would attract students in the future. Among many questions on how best to optimize the FLLC, an overarching question pervading throughout this study is what modalities of assistance would be most effective in helping students with the elements of the French language they struggle with? As the most effective modalities are revealed through a questionnaire, the opportunity arises for further studies on the efficacy of ULAs in ameliorating students' French language skills.

Microbiology, Immunology, & Infectious Disease

GENETIC SCREENING OF MEMBRANE STRESS AND TRANSPORT IN ENTEROBACTER
Presenter(s): Anna Barker
Microbiology Immunology and Infectious Disease
Mentor(s): Victor DiRita (College of Veterinary Medicine)

Enterobacter hormaechei is a Gram-negative, opportunistic pathogen that can cause infection in young children and the elderly. With increasing resistance to many antibiotics, including carbapenem, E. hormaechei is increasing challenge in hospital settings. New antimicrobials are needed, and we are targeting two key traits of this pathogen: the outer membrane barrier and active transport of nutrients across the cell membrane. Because the outer membrane helps Gram negative microbes resist antimicrobial therapeutics, one approach to developing new molecules against them is to include an adjuvant that acts on the outer membrane, enabling more ready access to intracellular targets. Further, the outer membrane per se is a good target for antimicrobial discovery. We are using transposon mutagenesis to identify E. hormaechei mutants with outer membrane defects. The anticipated phenotype of such mutants is generalized envelope stress, which we demonstrate by monitoring sensitivity to bile salt. Upon isolating mutants with envelope-stress phenotypes we will map the transposon insertion using DNA sequencing and identify the gene(s) whose disruption led to the envelope-stress phenotype for further study. We are also investigating nutrient transport across the membrane, an essential trait of bacteria. We constructed mutants lacking putative membrane transporters and are assessing their ability to grow and survive both in lab

RAPID DETECTION OF ANTIMICROBIAL RESISTANT GENES IN E. COLI USING A PLASMONIC BIOSENSOR
Presenter(s): Kaily Kao
Microbiology Immunology and Infectious Disease
Mentor(s): Evangelyn Alocilja (College of Agriculture & Natural Resources)

Antimicrobial resistance (AMR) is a rapidly growing global issue. The spread of drug-resistant pathogens threatens our ability to treat infections (WHO 2023). When pathogens contain or accumulate genes associated with AMR, the organism is more likely to display drug-resistant behavior. This means that it will not respond to certain medications. Detecting whether an organism is resistant or susceptible to an antibiotic will help treat patients with infections by allowing physicians to know what medicine will be effective. This will also prevent the further development of AMR by stopping the prescription of unnecessary or excessive antibiotics. *Escherichia coli* can accumulate resistant genes through horizontal gene transfer (Poirel et al. 2018). Two genes commonly linked with AMR are KPC and NDM genes. In this work, a DNA-based biosensor using gold nanoparticles (GNPs) as a signal reporter enables the differentiation between target and non-target DNA. This biosensor produces visible results due to the unique properties of GNPs. When GNPs aggregate, they become a blue or purple color, which signifies the absence of target DNA in the sample. A pink or red color signifies the presence of target DNA. In addition to qualitative results, absorbance spectra can numerically determine whether the sample contains target DNA. Preliminary data from pure DNA cultures shows successful differentiation between target DNA from *E. coli* strains containing AMR

LYMES DISEASE PREVELANCE FOR IXODES SCAPULARIS NYMPHS IN MICHIGAN

Presenter(s): Darren Hollander
Microbiology Immunology and Infectious Disease
Mentor(s): Michelle Volk (College of Agriculture & Natural Resources)

Ixodes Scapularis Nymphs were sampled from 21 different locations in the lower peninsula of Michigan. They were then tested for the presence of borrelia burgdorferi the bacteria that causes lymes disease and the regions were sorted into areas bases on the prevelance of lymes disease in the sampleing site.

ANTIBIOTIC RESISTANCE AND MICROBIAL DIVERSITY IN REDLINED VS NON-REDLINED ZONES IN LANSING, MICHIGAN

Presenter(s): Faith Persyn, Kayla Buchanan, Latrell Massey, Mia Mohtadi
Microbiology Immunology and Infectious Disease
Mentor(s): Shahnaz Masani (Lyman Briggs College)

Our research aims to investigate the question: what impact does redlining have on antibiotic resistance levels of microbial species and microbial species diversity in soil and what implications does this have for society? We studied antibiotic resistance and microbial diversity in Lansing, Michigan. This endeavor fills a gap in research by connecting antibiotic resistance and microbial diversity as most previous research studies one of these individually. Our research connects microbial diversity and antibiotic resistance to environmental racism, which establishes a societal relevance. We focused specifically on redlining; redlining is a historical practice of unfairly denying or limiting access to services for people in certain areas based on their race, ethnicity, or other prejudices. We collected soil samples from both redlined and non-redlined zones. We then created soil solutions for each sample and plated each solution. Each solution was plated on agar containing Ampicillin and agar that did not contain antibiotics. Bacteria were cultured and enumerated. We found a significant difference in microbial diversity between redlined zones and non-redlined zones on antibiotic plates. Our other subsets of data did not yield statistically significant results. Redlined zones have more different species of antibiotic resistant bacteria on average. These results imply that people living in redlined zones are more likely to be exposed to a pathogenic species of bacteria that is anti

THE STAPHYLOCOCCUS AUREUS GLUTATHIONE AND CYSTEINYL-GLYCINE TRANSPORTER, DTPT, IS A TARGET FOR THE TOXIC TRIPEPTIDE BIALAPHOS.

Presenter(s): Rosemary Northcote

Microbiology Immunology and Infectious Disease

Mentor(s): Neal Hammer (College of Natural Science), Paige Kies (College of Natural Science)

Staphylococcus aureus is an opportunistic pathogen that is the leading cause of a range of infections like osteomyelitis, pneumonia, or bacteremia. Proliferation within the host requires that the bacterium procures nutrients from tissue environments. Sulfur is one nutrient that *S. aureus* must acquire, but the metabolites obtained, and the mechanisms employed remain an incomplete area of study. Previous work demonstrates that *S. aureus* uses the glutathione (GSH) import system (Gis) and at least one other importer to scavenge GSH, the most abundant non-protein thiol in mammals, as a source of nutritional sulfur. The current study establishes that the di- tripeptide transporter, DtpT, supports *S. aureus* proliferation on GSH. Furthermore, we identify that *S. aureus* utilization of cysteinyl-glycine (Cys-Gly), the glutathione breakdown product, as a sulfur source largely depends upon DtpT. A systemic infection study underscores the relevance of DtpT as the transporter drives maximal colonization of *S. aureus* in the murine liver. Our investigations also demonstrate the exploitable nature of sulfur metabolism pathways by characterizing the DtpT-dependent susceptibility of *S. aureus* to the peptide antibiotic, bialaphos. Conservation of bialaphos toxicity towards staphylococci was used to identify the DtpT homologue, B4U56_10070, in *Staphylococcus epidermidis*, which lacks Gis but is still able to utilize GSH as a s

CHARACTERIZING THE AUXILIARY PROTEIN GRAX OF THE VRAFG-GRAXRS MODULE FROM STAPHYLOCOCCUS AUREUS

Presenter(s): Ellen Bennett

Microbiology Immunology and Infectious Disease

Mentor(s): Benjamin Orlando (College of Natural Science)

Antibiotic resistance poses a significant challenge in the clinical world, potentially resulting in severe and occasionally incurable infections. Gram-positive bacteria evolved defense mechanisms to fend off antimicrobial peptides. Exploring these defense mechanisms is crucial for gaining insights into overcoming antibiotic resistance. Staphylococcus aureus can survive diverse environments, due to sensitive signal transduction pathways that enable bacteria to monitor and respond to environmental signals. These mechanisms typically involve ATP-binding cassette (ABC) transporters and two-component systems. Bce modules in gram-positive species contain an ABC transporter forming a protein complex with a two-component system. In S. aureus, the VraFG-GraRSX Bce module provides resistance to a variety of antimicrobial peptides, including vancomycin and peptides produced by the innate immune system. VraFG is the ABC transporter and GraRS is the two-component system. However, unlike most Bce modules, the complex in S. aureus involves a fifth protein of unknown function, GraX. The goal of this investigation is to determine the function of GraX and how it fits into the Bce module. BLAST analysis reveals similarities between GraX and NAD-binding dehydrogenases as well as sugar epimerases. In this study, GraX has been expressed and purified. To validate the predictions of Grax binding to NAD, tryptophan and NAD(P)H fluorescence will be monitored. Additionally, GraX will be co-purified wit

THE ROLE OF MIGRATORY BIRDS IN SHIFTING TICK TRENDS AND LYME DISEASE RISK OVER TIME

Presenter(s): Alexis Litts

Microbiology Immunology and Infectious Disease

Mentor(s): Jennifer Owen (College of Agriculture & Natural Resources)

The black-legged tick (*Ixodes scapularis*) is the vector of the bacteria that causes Lyme disease, the most common tick-borne infection in the United States. Mammals are the primary hosts of this tick, but birds can also serve as hosts. Migrating birds have the potential to transport ticks long distances, and this dispersal mechanism has contributed to the rapid expansion of *I. scapularis* throughout the eastern United States in recent years. Although we know that migrating birds can transport ticks, we still do not fully understand the extent of their role as hosts for I. scapularis. In this study, we collected ticks from birds captured at the Burke Lake Banding Station, Michigan, USA, during fall migrations from 2018 to 2023. The goal of this study was to examine changes in the prevalence of *I. scapularis* over time. We also investigated how the proportion of *I. scapularis* has changed relative to other species of ticks collected and asked which bird species are the most important hosts for this tick. We found that the overall prevalence of I. scapularis infestation and the relative proportion of ticks identified as *I. scapularis* has increased relative to the beginning of the study. When looking at the prevalence of infestation by species, we observed a high degree of interspecies variation. Understanding patterns in the prevalence of *I. scapularis* infestation in birds offers new insights into the role of migratory birds as

SWITCHGRASS BIOMASS PATTERNS AS RELATED TO THE MICROBES PRESENT IN MONOCULTURE AND HETEROCULTURE ENVIRONS

Presenter(s): Emma Reeves

Microbiology Immunology and Infectious Disease

Mentor(s): Sarah Evans (College of Natural Science), Tayler Ulbrich (College of Natural Science)

Plants recruit soil microbes to help them access water and other resources, especially in stressful abiotic conditions. Studies have found that microbes carry on these benefits even when moved to other plants. Comparatively little research has been done on the effects of biotic factors on soil microbes, despite competition being a stress on plants' resources. We undertook an experiment to determine whether neighbor plants affect each other's rhizomal microbe community, hypothesizing that microbes conditioned in an environment shared between a focus plant and competitive, facultative or conspecific plants will result in bacteria that confer beneficial properties to the focal species when potted with plants in similar conditions. This would be shown as greater growth when compared to focal plants treated with conditioned bacteria and grown in the other two, differing conditions. Switchgrass (Panicum virgatum), the focal species of the experiment, was grown alongside a conspecific, a member of a comparatively more competitive species (Rudbeckia hirta, or Black-eyed Susan) or a plant whose microbe communities are notable for nitrogen fixation (Lespedeza capitada, or Round-Headed Bush Clover). The design of the experiment had the switchgrass plant flanked by two plants of one of the above species, with their root systems separated by porous material that allowed free movement of microbes and metabolites. The soil around the switchgrass was moved to another pot and planted with swi

AUTOIMMUNE REGULATOR (AIRE) DEFICIENCY CAUSES UNEXPECTED IMMUNE CELL INFILTRATION INTO THE NASAL CAVITY

Presenter(s): Joey Esparza

Microbiology Immunology and Infectious Disease

Mentor(s): Margaret Petroff (College of Veterinary Medicine), Soo Hyun Ahn (College of Veterinary Medicine)

Immune tolerance to self is critical for eliminating T cells that could cause autoimmune disease. AIRE (autoimmune regulator) is a transcription factor that induces expression of tissue-restricted antigens in the thymus, which in turn causes deletion of self-antigen specific T cells. In humans, mutations in AIRE cause autoimmune polyglandular syndrome type 1 (APS-1), a multi-organ disease characterized, in part, by infertility. Our mouse model of Aire deficiency (Aire-/-) recapitulates infertility in males, and other researchers have shown that immune cells in Aire-/- mice target vomeronasal organ (VNO)-specific proteins. Since the VNO and its associated glands play key roles in pheromone detection and mating, we hypothesized that immune cells in Aire-/- mice target the VNO. To test this, we examined nasal passages of 20-week-old male Aire wild-type (Aire+/+) and Aire-/- mice by histology and immunohistochemistry (n=3). Nasal passages of Aire-/- mice showed lymphocyte infiltration and loss of septal and lateral glands, but not olfactory or respiratory mucous glands. Control mice had intact glands and no inflammation. Inflammatory cells consisted of CD4+ and CD8+ T cells. When present, nearby tissue also showed necrosis and T cell infiltration into the lacrimal gland, cornea, optic nerve, and retina. Collectively, these results suggest that immune cells in Aire-/- mice target certain secretory glands of the nasal passages,

ZINC AND QUORUM SENSING REGULATE CYCLIC DI-GMP IN VIBRIO CHOLERAE VIA A GENOMIC ISLAND-ENCODED PHOSPHODIESTERASE

Presenter(s): Marissa Malleck

Microbiology Immunology and Infectious Disease

Mentor(s): Aathmaja Anandhi Rangarajan (College of Osteopathic Medicine), Christopher Waters (College of Osteopathic Medicine)

Vibrio cholerae is a bacterial pathogen responsible for the diarrheal disease cholera. The El Tor biotype of V. cholerae is responsible for the ongoing 7th cholera pandemic. El Tor differs from previous classical pandemic strains by two acquired genomic islands, VSP-I and VSP-II. Zur, the major repressor that regulates adaptation to zinc in bacteria, represses the vc0512-vc0515 operon in the VSP-II genomic island in the presence of zinc. This operon encodes a predicted chemotaxis-related protein (vc0514) and a cyclic di-GMP phosphodiesterase (vc0515). Cyclic di-GMP (c-di-GMP), a signaling molecule, regulates biofilm formation and motility and contributes to bacterial infection in V. cholerae. Intracellular levels of c-di-GMP are regulated by diguanylate cyclases (DGCs), which synthesize c-di-GMP, and phosphodiesterases (PDEs), which degrade c-di-GMP. We observed increased motility in a Δzur mutant due to the derepression of vc0512-vc0515 genes. Using qRT-PCR, we also found that the relative fold expression of vc0515 in Δzur mutants is higher than wild type, indicating that zur is a repressor of vc0515. Swimming motility decreased and biofilm formation increased in a Δvc0515 mutant due to increased c-di-GMP concentrations. The upstream region of vc0515 also includes a predicted hapR binding site that represses the promoter of vc0515. HapR, the central regulator of quorum sensing in V. cholerae, is induced at high-cell density. We observed the expression of vc051

ASSESSING EFFICACY OF POPULAR ORAL RINSES ON ISOLATED ORAL MICROBE FOR INFORMED PERSONAL CARE CHOICES IN THE UNITED STATES

Presenter(s): David Owens

Microbiology Immunology and Infectious Disease

Mentor(s): Poorna Viswanathan (College of Natural Science)

Oral hygiene is a critical component contributing to the overall health of the United States of America. A comprehensive oral health routine that is focused on both preventive maintenance by trained dental professionals, and the use of personal care products (toothbrushes and paste, floss, and oral rinses) are crucial to preventing disease. Improper oral healthcare in the United States is an expensive issue and is estimated to cost US citizens approximately $45 billion dollars in productivity. Due to rising costs of professional dentistry in the United States it is increasing important for US consumers to make informed decisions regarding personal care products. To investigate the efficacy of three popular PCP's we performed a disk diffusion assay of 3 popular oral rinses against a common oral microbe. The study was twofold: 1) the collection, isolation, and genotypic/phenotypic characterization of a strain of bacteria in the oral microbiome, and 2) testing the efficacy of various home oral hygiene rinses against the isolated strain. The results of the first part of the experiment indicated that the isolated strain was in the genus *staphylococcus*. The second part of the experiment indicated statistically significant differences between the zones of inhibition of the three oral rinses tested. Our investigation demonstrated that although many products claim to be effective at preventing potentially harmful flora, there is a significant discrepancy in the efficacy

IDENTIFYING NOVEL PHAGE DEFENSE SYSTEMS IN VIBRIO CHOLERAE

Presenter(s): Elise Trost

Microbiology Immunology and Infectious Disease

Mentor(s): Christopher Waters (College of Osteopathic Medicine), Jasper Gomez (College of Natural Science)

The rise of antibiotic resistance is one of the greatest public health threats today. Thus, it is important to find alternate methods to combat multi-drug resistant bacterial pathogens. One alternative is phage therapy, which has been used for almost a century and has renewed interest due to its ability to target and lyse specific bacteria without disrupting the microbiome. Bacteria, however, have evolved a myriad of defense mechanisms to protect against phage infection. Thus, it is important we uncover new phage defense systems and study their underlying mechanisms. To identify new phage systems, we study the bacterial pathogen Vibrio cholerae which is intimately linked to phage predation both during environmental persistence and during infection in humans. Additionally, three novel phage defense systems have been recently discovered in this bacterium. I hypothesized that V. cholerae still harbors undiscovered phage defense systems. A previous screen of a V. cholerae cosmid library encoding a 25kb fragment of V. cholerae genome within Escherichia coli confers protection against T2 coliphage. Further analysis of this 25kb fragment showed multiple genes identified as domains of unknown function. Using molecular techniques, I have identified one candidate gene, IT1766, which could be involved in phage defense, and has not been shown to be involved in any previously established phage defense systems. Currently, I am using molecular techniques to confirm that this gene confers ph

VISUALIZATION OF MHC-I DEGRADATION VIA THE AUTOPHAGY PATHWAY IN HPV+ HEAD AND NECK CANCER

Presenter(s): Prerna Chahal
Microbiology Immunology and Infectious Disease
Mentor(s): Dohun Pyeon (College of Human Medicine), Lexi Vu (College of Natural Science)

Human papillomavirus (HPV) is the causative agent of approximately 25% of head and neck cancers (HNCs). Immune-recognition of HPV-positive (HPV+) tumor cells is critical for preventing progression of HPV+ HNC. An important component of the immune system that is specifically involved in immune-recognition is major histocompatibility complex class I (MHC-I), found on all nucleated cells in the human body. MHC-I is downregulated in HPV+ HNCs, but the mechanism has yet to be elucidated. Our lab has shown that the HPV oncoproteins, E6 and E7, upregulate MARCHF8, an E3 ubiquitin ligase that ubiquitinates surface immune receptors including MHC-I. Following ubiquitination, most proteins are degraded via the proteasome. Interestingly, treatment of HPV+ HNC cells with inhibitors against the major protein degradation pathways in the cell identified not the proteasome, but autophagy as the major degradation pathway of MHC-I. Therefore, we hypothesize that the upregulation of MARCHF8 by HPV directs MHC-I for degradation via autophagy. To test this hypothesis, we evaluated the co-localization of MHC-I with subcellular organelles involved in the autophagy pathway in HPV+ HNC cells, with and without MARCHF8, using confocal microscopy. Following MARCHF8 knockdown, co-localization of MHC-I with the endoplasmic reticulum increased, while co-localization with the autophagosomes decreased. Our results suggest that MARCHF8 ubiquitinates MHC-I to be localized to the autophagosome, leading to decrea

EVOLUTION OF BACTERIOPHAGES ICP1 AND ICP3 IN VARIOUS VIBRIO CHOLERA HOSTS
Presenter(s): Mehak Banga
Microbiology Immunology and Infectious Disease
Mentor(s): Christopher Waters (College of Osteopathic Medicine), Kaylee Wilburn (Lyman Briggs College)

Bacteria and bacteriophages are in a constant evolutionary arms race; with the predation of one leading to the selection of the other, all for one goal: survival. A well-known bacterial species, Vibrio cholera, interacts with various aquatic microorganisms and exists in numerous environmental and biological reservoirs. However, when V. cholera enters its infectious stage, it has the potential to cause a global pandemic. To combat the latter, specific bacteriophages that target this species were isolated. These phages are called ICP1, ICP2, and ICP3. The purpose of this study is to examine the genomes of those three bacteriophages- ICP 1, ICP2, and ICP 3- in relation to their V. cholerae hosts and identify the mutations that occur in the phages' genes when placed in V. cholerae wild type versus its mismatch repair (MMR) deficient mutant- ΔmutS. To accomplish this, 15 generations of the ICP phages will be grown, selected, amplified, and purified. Once the process is complete, an intensive genomic analysis of the first, fifth, tenth, and the fifteenth generation phage will be conducted. The sequencing and studying of the phage mutations over its initial, fifth, tenth, and fifteenth generation has the potential to underscore the effects a bacterial MMR deficient system has on the phage mutation rates. A greater insight into the way bacterial defense systems impact phages' genomes allows for a better foundational understanding of bacteria-bacteriophage interactions and potent

INVESTIGATING REGULATORY MECHANISMS OF AVCID PHAGE DEFENSE SYSTEMS
Presenter(s): Aubree Muethel
Microbiology Immunology and Infectious Disease
Mentor(s): Christopher Waters (College of Osteopathic Medicine), Micah Ferrell (College of Osteopathic Medicine)

AvcID is a novel type III toxin-antitoxin system encoded on the VSP-1 island of *Vibrio cholerae* that functions as an anti-phage defense system with homologous systems found in many medically important bacteria. AvcD (Antiviral Cytidine Deaminase) is an enzyme that deaminates deoxycytidine, effectively starving phages of nucleotides necessary for replication. There are two domains present in AvcD, a C-terminal deoxycytidylate deaminase (DCD) domain which deaminates dCTP and dCMP and an N-terminal P-loop NTPase (PLN) domain of unknown function. Purified AvcD was inhibited by high concentrations of ATP and AvcD overexpressed in bacterial cells was not active in growth inhibition until the stationary phase, when ATP concentrations decline. We hypothesize that AvcD deamination by the DCD domain is regulated by the cell's energy state via ATP binding to the PLN domain. To test this, we have evaluated mutations in a putative nucleotide binding pocket of the PLN domain for enzymatic activity, deoxycytidine starvation, and phage defense. Evaluating PLN domain mutants will elucidate how AvcID toxin-antitoxin systems function in a cellular context to confer anti-phage defense. Understanding regulation of phage defense systems like AvcID is key to future deployment of effective phage therapy as an alternative to antibiotics.

EFFECTS OF DHA AND GLUCOCORTICOID TREATMENT ON INFLAMMATION AND AUTOIMMUNITY
Presenter(s): John Liddle
Microbiology Immunology and Infectious Disease
Mentor(s): James Pestka (College of Agriculture & Natural Resources)

Glucocorticoids (GCs;steroids) such as prednisone are mainstay treatments for lupus and other autoimmune diseases but have many insidious side effects such as bone loss, diabetes, and cardiovascular disease. Dietary supplementation with fish oils that contain omega-3 fatty acids might be steroid-sparing adjunctive interventions that could be used to reduce GC dosages and associated adverse effects. This study will compare the impacts of a moderate GC prednisone (PDN) and/or moderate omega-3 fatty acid docosahexaenoic acid (DHA) supplementation in the diet to the effects of efficacious subcutaneous cyclophosphamide (CYC), a common immunosuppressive treatment for lupus nephritis, on spontaneous autoimmune disease progression in lupus-prone mice. Five (5) groups of 6 female NZBWF1 mice will each be raised until the 26-week mark where each group will respectively receive a distinct diet of control food, control food supplemented with 10 mg of PDN per kg diet, control food supplemented with 7g of DHA per kg diet, control food supplemented with 7g of DHA + 10mg of PDN per kg diet, and finally control food with the addition of weekly CYC intraperitoneal injections in amounts equivalent to the current human standard injection for body weight in mice. Mice body weight and proteinuria will be monitored for a 14-week period until they are necropsied for testing of the kidneys, spleen, and blood of the specimen including a histopathologic assessment of lupus nephritis, IHC fo

INVESTIGATING LPG1685'S ROLE AS A POTENTIAL METAEFFECTOR FOR RAVZ
Presenter(s): Grace Glavich
Microbiology Immunology and Infectious Disease
Mentor(s): Stephanie Shames (College of Osteopathic Medicine)

Legionella pneumophila is a Gram-negative bacilli that utilizes over 300 effector proteins to invade and replicate within host cells . RavZ is an effector protein in L. pneumophila that utilizes a pathway that inactivates Atg8 proteins during infection to inhibit autophagy. The Atg8 protein is associated with protein light chain 3 (LC3). This protein is involved in LC3-associated phagocytosis. When RavZ is present, the protein inhibits autophagy, and there are higher levels of LC3-I. However, without RavZ, there is abundance of LC3-II and autophagy. The effector Lpg1685, is thought to be a metaeffector to RavZ. Metaeffectors are translocated regulatory effector proteins that bind and regulate the function of other effector proteins. The purpose of this research project is to identify the true function of the Lpg1685 protein and whether it is a metaeffector of RavZ. The hypothesis is that Lpg1685 is a metaeffector for RavZ and inhibits RavZ function. To test this hypothesis, eukaryotic cells will be transfected to expressing the RavZ and Lpg1685 proteins. LC3-I and LC3-II abundance will be measured using a Western blot to confirm if autophagy occurred. An abundance of LC3-I would imply autophagy is being inhibited, and an abundance of LC3-II would imply that Lpg1685 is inhibiting RavZ. It is predicted that Lpg1685 will specifically bind to RavZ, and transfected cells with both RavZ and Lpg1685 will show autophagy.

ISOLATION OF BACTERIAL CO-CULTURES FROM ANCIENT SOIL
Presenter(s): Krishen Patel
Microbiology Immunology and Infectious Disease
Mentor(s): James Tiedje (College of Agriculture and Natural Resources), John Quensen (College of Agriculture and Natural Resources)

Microbes grow in a wide variety of ecological niches, one of the most ecologically relevant being soil. The soil microbiome composition has great diversity depending on soil type, location, and history. Our collaborators have drilled soil cores from 22 meters deep in Loess Hills, Iowa. The Tiedje Lab has previously recovered different microbial isolates from these soil cores, some of which grew as co-cultures. 16S rRNA sequencing identified which taxa were present. Characterizing and understanding the microbiome of these paleosols from over 75,000 years ago will enhance geobiological knowledge and deepen our understanding of bacterial resilience. We hypothesize that there is an obligatory exchange of essential metabolites between species resulting in a co-culture. We used genome sequence to define the co-culture members and gene annotation to determine which essential pathways may be missing. We are using a combination of varying pH, incubation temperatures, media, and growth factors to separate members of the 5 glycerol stocks which are co-cultures. Taxa found in the co-cultures include *Rhodococcus*, Micrococcaceae, a bright red *Methylobacterium mesophilicum*, and a *Bacillus* that will only grow with Micrococcaceae. Taxa that were successfully isolated from other bacteria from the glycerol stocks include *Microbacterium*, Micrococcaceae, and *Methylobacterium mesophilicum*. Of the 8 distinguishable taxa from the original glycerol stocks,

V. CHOLERAE MUTANT FITNESS IN TCBS COMPLETE MEDIA
Presenter(s): Drew Johnson
Microbiology Immunology and Infectious Disease
Mentor(s): Alex Wessel (College of Natural Science), Christopher Waters (College of Osteopathic Medicine)

Thiosulfate Citrate Bile-Salts Sucrose (TCBS) agar is commonly used as both a selective and differential medium for isolating marine Vibrios. While it is valuable as a rapid and inexpensive diagnostic tool, we have observed that certain V. cholerae mutant strains grow poorly when cultured on TCBS agar. In particular, certain strains of DNA repair mutant V. cholerae are strongly attenuated for growth on TCBS agar. We have used a randomly-barcoded transposon insertion (RB-TnSeq) mutant library of V. cholerae to identify more mutant strains that cannot be easily cultivated using TCBS agar. We've begun to validate the results of the screen by competing individual transposon (Tn) insertion mutants against an otherwise WT marked strain. Our results indicate that there are many mutant strains that fail to grow competitively on TCBS agar, therefore, there may be mutant Vibrios in nature that cannot be cultivated using this selective medium.

PSEUDOMONAS PHAGE RESISTANCE
Presenter(s): Tara Ott
Microbiology Immunology and Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

Pseudomonas aeruginosa Infects the lungs of patients with cystic fibrosis. Cystic fibrosis is a debilitating disease that affects children for their entire lives. Pseudomonas adheres to surfaces where a matrix is formed to create a biofilm. Biofilms increase resistance to antibiotics, due to the matrix and also to altered bacterial metabolism. We observe Pseudomonas using in vivo bioluminescence imaging in order to test alternatives to antibiotics. Some alternatives to antibiotics include phage, which are viruses that infect bacteria. Pseudomonas aeruginosa can become phage resistant and the phage resistance mechanisms are not all understood. Phage-resistant Pseudomonas variants were isolated and we observed that they had altered phenotypes that were unexpected. These phenotypes may provide clues to the resistance mechanism. The next steps will be to determine the mechanism of resistance by sequencing six phage-resistant variants. Understanding biofilm formation will also be an important topic to study as well. These isolated mutants have recently been sequenced and the data have been analyzed. Seven main genes are similar in all resistant strains. These genes could be responsible for the increased biofilm formation causing phage resistance.

USING 16S V4 SEQUENCING TO ANALYZE THE ROLE OF GUT MICROBIOTA EARLY IN LIFE IN ASTHMA-ASSOCIATED RESPONSES USING MICE CROSS-FOSTERED AT BIRTH
Presenter(s): Sophie Quirk
Microbiology Immunology and Infectious Disease
Mentor(s): Ivon Moya Uribe (College of Natural Science), Linda Mansfield (College of Veterinary Medicine)

The gut microbiota can have a large influence on the host's metabolic functions and immune responses. Some bacteria in the gut have been associated with an increase in airway hyper-responsiveness (AHR), which is a distinct feature within asthma. Previously, we identified a human gut microbiota associated with asthma (INF-B). Mice transplanted with this microbiota showed higher AHR in a mouse model of asthma compared to mice carrying a conventional mouse microbiota (CM). In the present study, we hypothesized that changes in gut microbiota in early life can revert the specific AHR phenotype observed in these mice . Newborn mice with CM microbiota were either cross-fostered to INF-B or CM which were then compared to non-cross-fostered control mice. Results revealed that mice born with CM and then cross-fostered to INF-B microbiota displayed increased AHR compared to CM mice cross-fostered to CM. Next, a genetic analysis of the gut microbiota of the parents and offspring of each group was made. 16S V4 PCR and sequencing was performed to compare the bacterial distribution and abundance in each mouse and between treatment groups. Cross-fostered mice had a microbiota composition that was similar to their foster parent, but not to their birth parent. INF-B microbiota showed the lowest diversity compared to all other groups, and mice born with INF-B cross-fostered to CM displayed increased diversity compared to the INF-B control group. These results suggest that changes in gut microbi

ANALYSIS OF CARDIOLIPIN SYNTHASES' ROLE IN BACTEROIDES FRAGILIS RESISTANCE TO INCREASED OSMOLARITY.

Presenter(s): Tim Baldwin

Microbiology Immunology and Infectious Disease

Mentor(s): Matt Schnizlein (College of Natural Science)

Cardiolipins play a major role in the regulation of inner membrane function in the bacteria Bacteroides fragilis. B. fragilis is a Gram-negative, obligate anaerobe, that colonizes the human large intestine. The synthesis of cardiolipins, catalyzed by cardiolipin synthases, in the inner membrane, contributes to cell membrane fluidity, and is vital in minimizing ion leakage across gut bacterial membranes. I hypothesize that increases in osmolarity will increase the level of cardiolipin synthase activity to resist osmotic stress. Growth curve analysis was performed using B.fragilis wildtype(WT), ΔclsA, ΔclsB, andΔclsAΔclsB. Growth of each strain was compared across conditions with four sodium concentrations (i.e.,1.7%,1.3%,0.9%,0.5%) and a growth medium control. cls gene expression was measured using RT- qPCR in WT, ΔclsA, and ΔclsB strains exposed to 1.3% sodium for 20 minutes. Growth curve analysis showed decrease in all 3 gene knock outs when compared to WT. RT-qPCR analysis showed 2-fold increase in expression of ΔclsA when compared to WT. Increasing osmolarity negatively affects B. fragilis growth. When exposed to high solute concentrations in the environment, internal turgor pressure increases pushing the cell towards lysis. Cardiolipin synthase activity increases to produc

ANTIBIOTIC SYNERGY OF TOBRAMYCIN AND ANTIMICROBIALS AGAINST PSEUDOMONAS BIOFILMS

Presenter(s): Julia Cameron

Microbiology Immunology and Infectious Disease

Mentor(s): Jonathan Hardy (College of Human Medicine)

The goal of this project is to research Pseudomonas aeruginosa, a bacterium that commonly causes lung infections in children with cystic fibrosis. Pseudomonas aeruginosa is known to form a biofilm resistant to antibiotics, making the infection difficult to treat. Tobramycin is currently used to treat these lung infections. However, we are working to see if tobramycin and other antimicrobials can synergize to have a greater effect on the breakdown of biofilms. Currently, we are focusing our attention towards triclosan. On its own, we found triclosan acts as a carbon source for the bacteria, feeding the Pseudomonas. Therefore, the concentration of both tobramycin and triclosan must be very specific. For our research, we will use vivo bioluminescence imaging in order to test promising substances that could treat previously formed biofilms that are otherwise resistant. In order to research the ability of these substances and their antibiofilm agents, we will be using bioluminescent Pseudomonas aeruginosa.

ASSESSING ANTIBIOTIC RESISTANCE IN E. COLI AND K. PNEUMONIAE USING ZETA POTENTIAL
Presenter(s): Josie Cayen
Microbiology Immunology and Infectious Disease
Mentor(s): Evangelyn Alocilja (College of Agriculture & Natural Resources)

Antimicrobial Resistance (AMR) is a developing issue in public health where infectious bacteria, viruses, parasites, and fungi no longer respond to the available antimicrobial pharmaceuticals [1]. This has created a problem in emergency rooms where microbial infections can become impossible to treat, increasing disease spread and death rates. In 2019 alone, AMR was a contributor to 4.95 million deaths [1]. The rapid determination of a bacterium's antibiotic resistance profile is critical in decreasing the overuse of last-resort carbapenem antibiotics which select for Carbapenem Resistant *Enterobacterales* (CRE). One of the areas 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]. As such, this work develops a database of zeta potential measurements for a rapid diagnostic method to determine drug susceptibility. Preliminary results distinguish the zeta potential of meropenem-resistant *Escherichia coli* samples from meropenem-susceptible *E. coli* controls, and distinction between meropenem-resistant *Klebsiella pneumoniae* samples from drug-susceptible *K. pneumoniae* strains. The experimental samples contained bacterial strains with the following Carbapenem-resistant genes: *KPC, NDM, OXA-48, or VIM*. Developing a database of zeta potential measurements for drug-resistant and drug-susceptib

BIOLUMINESCENCE IN THE COLONIZING STRAIN OF GROUP B STREPTOCOCCUS.
Presenter(s): Shreya Kankanalapalli
Microbiology Immunology and Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

Group B Streptococcus, is a bacterium that can cause severe infections in fetuses during pregnancies. GBS colonizes about 20% of women uteri and requires them to receive preventative antibiotics. Not all of the 20% of GBS is virulent or invasive; some can be avirulent. However, the differences in strains can drastically impact how we approach antibiotic treatment. In the Hardy Lab, we focused on three specific strains of GBS: strain 653, which is colonizing; strain 411, which is virulent; and finally strain 112, which is also virulent. We studied the differences between colonizing strains of GBS and virulent strains of GBS while looking at electroporation methods to discover bioluminescence in our strains. It was found that the colonizing 653 strain produces the strongest bioluminescence when incorporated into the toxin-antitoxin system. This gives us a backbone to study the future progression of the GBS 653 strain in pseudopregnant mouse models. We plan to also continue our study with efforts to further analyze the differences between these strains of GBS and understand what promotes strains 112 and 411. Understanding the virulent and avirulent pathways in a pregnant model can greatly affect future research and antibacterial treatment or preventative measures for each strain.

NATIVE BACTERIOPHAGE HOST RANGE ANALYSIS AND SEQUENCE COMPARISON

Presenter(s): Elise Straub
Microbiology Immunology and Infectious Disease
Mentor(s): George Sundin (College of Agriculture & Natural Resources), Kristi Gdanetz MacCready (College of Agriculture and Natural Resources)

Pseudomonas syringae pv. syringae (PSS) is a plant pathogen that causes bacterial canker, a devastating disease that is widespread in cherry orchards across Michigan. There are few options available to growers for bacterial canker management, and so the interest in biological controls, such as bacteriophage, has risen. The objective of this study is to evaluate the host range of environmental bacteriophage as well as examine the potential genomic links between bacteriophage and PSS host bacteria. This project will use three bacteriophage previously isolated from Northwest Michigan cherry orchards to characterize the host range of native Michigan bacteriophage. The bacteriophage will be tested against PSS isolates collected from orchards across Michigan. These results will be compared to previously collected host range data using bacteriophages that comprised a commercial preparation used for biocontrol. In addition, a subset of the tested PSS isolates will undergo genomic sequencing and annotation. The expected findings are overlapping, broad host ranges for the three native bacteriophages when tested against Michigan PSS hosts as well as genomic sequences that may indicate bacteriophage susceptibility. The results of the study would inform further research into the viability of native bacteriophage-based biological controls.

UNDERSTANDING THE ROLE OF KU80 IN NHEJ VIA THE DOMAIN SWAP DIMER

Presenter(s): Addy Walia
Microbiology Immunology and Infectious Disease
Mentor(s): Katheryn Meek (College of Veterinary Medicine)

DNA-PK is a large protein kinase complex that initiates DNA double-strand break repair by the non-homologous end-joining pathway. DNA-PK is comprised of three polypeptides, the large catalytic subunit of the kinase (DNA-PKcs) and the Ku70 and Ku80 heterodimer, a ring-shaped protein that initially binds DNA double-stranded ends. During DNA repair, DNA-PK forms two kinds of dimers that facilitate tethering the two DNA double-stranded ends together so that the ends can be "glued" back together. It is known that in the process of creating the domain swap dimer of DNA PKcs, Ku80 plays a crucial role in reaching over with its C terminal domain to the other molecule of DNA-PKcs to tether to two molecules of DNA-PK (bound to a DNA end) together. Previous studies in my lab have shown that the Ku80 domain swap dimer is essential for promoting nucleolytic end processing. My research will aim to better understand the role of the domain swap dimer and its ability to perform NHEJ by introducing a deletion in Ku80 that removes the C-terminus that is responsible for the interaction. The effect of the deletion of the Ku80 C terminus affects other NHEJ factors will be a downstream study of my research.

A COMPARISON OF MEDIA CONDITIONS IN CULTURING METHODS FOR SPIROBACILLUS CIENKOWSKII
Presenter(s): Claire Peterson, Victoria Agrella
Microbiology Immunology and Infectious Disease
Mentor(s): Nina Wale (College of Natural Science)

This research was a novel foray into different culturing methods with the end goal being to culture a previously uncultured pathogen of common water fleas. We intend to find both a medium and preferred temperature which allows for the growth of Spirobacillus cienkowskii in order to further future research with Daphnia species. We investigated different media conditions that closely resemble the environment that S. cienkowskii normally colonizes, which is Daphnia hemolymph. Different temperatures, media types, and Daphnia specimens were used in hopes of successfully culturing Spirobacillus cienkowskii. Theoretically, this would then allow for a better understanding of the metabolic functions of S. cienkowskii in the future, how it interacts with its environment, and what happens as infection progresses in its host. This research is integral to determining how it interacts with Daphnia in the wild in various capacities, and would also broadly contribute to novel culturing methods as a whole.

CHARACTERIZING ANCESTRAL ETHYLENE FORMING ENZYME
Presenter(s): Bryce Delaney
Microbiology Immunology and Infectious Disease
Mentor(s): Robert Hausinger (College of Natural Science), Shramana Chatterjee (College of Natural Science)

The ethylene-forming enzyme (EFE) is a member of the mononuclear non-heme Fe(II)- and 2-oxoglutarate (2OG)-dependent oxygenase superfamily. EFE can convert 2OG into ethylene and three CO?. EFE can also hydroxylate L-arginine. Ethylene is one of the most used hydrocarbons commercially. It is used as the feedstock for many polymers and chemicals such as plastic packaging, anti-freeze, and synthetic rubber. Ethylene is commonly derived from a process known as thermal cracking which uses natural gases and leads to a high output of CO_2 into the atmosphere. The use of EFE to produce ethylene through biological synthesis provides a more environmentally friendly alternative for production. The scope of this project encompasses the characterization of the gene product from the in vitro recombination synthesis of a computationally generated gene encoding an ancestor of EFE. The primary objective is to map the ancestry of EFE to understand the evolutionary dynamics of ethylene production and L-arginine hydroxylation. Implementation involves inserting a pre-synthesized target gene into the pET28a vector. Subsequently, the gene of interest will undergo overexpression within Escherichia coli. The ancestral EFE will be purified by using sonication to disrupt the cells, centrifugation to remove membranes and cell debris, and column chromatography. The enzyme will be characterized for its ability to generate ethylene by using a gas chromatography assay and for its L-Arg hydroxylation activity

SMALL COLONY VARIANTS OF XEN36 S.AUREUS IN THE SKIN
Presenter(s): Cameron Lee
Microbiology Immunology and Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

Staphylococcus aureus is a harmful organism that is present on 20-30% of humans without knowing. When this organism encounters wounds or lesions in the skin, chronic inflammatory diseases, such as eczema (atopic dermatitis), cause symptoms not experienced by a common eczema patient. Chronic infections induce harm primarily in infants (roughly 90% of patients) within the first five years of life. Symptoms of chronic infections include skin dryness, itching and eczematic lesions. Relapsing flares can persist for a lifetime and confer increased sensitivity to infection. Staph has been known to invade the prominent skin cells in the epidermis, keratinocytes, but whether it replicates intracellularly in these cells is controversial. Variants of Staph called "small colony variants (SCV)" are known to form during antibiotic treatment. Using a Xen36 S. aureus strain, I developed SCV's to have tested for antibiotic resistance, bioluminescence, and mutations from DNA sequencing. SCV's mutate the protein, quinolone, in the electron transport chain to allow the bacterial DNA to keep replicating in the infections.

SELECTIVE AUTOPHAGY RECEPTORS ASSOCIATED WITH THE DYSREGULATION OF MHC-1 IN HPV+ HEAD AND NECK CANCER
Presenter(s): Will Eckerman
Microbiology Immunology and Infectious Disease
Mentor(s): Dohun Pyeon (College of Human Medicine), Lexi Vu (College of Natural Science)

Major histocompatibility complex class I (MHC-I) expression is frequently observed to be dysregulated in cancers as a means of immune evasion and this holds true for HPV+ head and neck cancers (HPV+ HNC). MHC-I surface expression is crucial for recognition by CD8+ T cells, for antitumor immunity. This low level of MHC-I in HPV+ HNC has been recognized to be a significant barrier in the use of immunotherapies for patients. Therefore, it is critical to understand the mechanisms responsible for the decrease in MHC-I expression in HPV+ HNC. Our lab has performed a genome-wide CRISPR screen that identified genes involved in selective autophagy, a major cellular degradation pathway, among the top negative regulators of MHC-I expression. Further, treatment of HPV+ HNC cells with autophagy inhibitors increased MHC-I expression. Therefore, we hypothesized that MHC-I is degraded via the selective autophagy pathway in HPV+ HNC. To test this hypothesis, we investigated the selective autophagy receptors that were identified in the CRISPR screen. These receptors are critical for recognizing and shuttling targets to autophagosomes for degradation. Using CRISPR/Cas9, we individually knocked out the three major autophagy receptors, NDP52, p62, and NBR1 in HPV+ HNC cells. Following validation of knockout, we evaluated MHC-I surface expression. Our results suggest that knockout of the receptors increase MHC-I expression. These findings suggest selective autophagy to be a potentia

DIGITAL GAMING INTERVENTIONS TO IMPROVE VACCINATION AMONG ADOLESCENTS AND YOUNG ADULTS: A SYSTEMATIC REVIEW

Presenter(s): Alison Frommeyer, Kieona Sims

Microbiology Immunology and Infectious Disease

Mentor(s): Angela Chia-Chen Chen (College of Nursing)

Despite the proven efficacy of vaccines, vaccination rates remain suboptimal among youth. Digital gamification is a promising approach to address this public health issue. This study aimed to review the effectiveness of digital gaming interventions on vaccinations among adolescents and young adults. We searched empirical papers through 5 databases (e.g., PubMed) with keywords (e.g., vaccine, digital game, youth). Non-review articles were included if they (1) published in English, peer-review journals; (2) used digital game as an intervention; (3) targeted individuals aged 9-26; and (4) measured vaccine-related variables (e.g., knowledge, attitude, intention/uptake). Four researchers screened for eligibility in a two-step process in Covidence and coded articles using a data extraction spreadsheet. Among the eight included studies, three (37.5%) were conducted in the U.S, three (37.55%) targeted college students, five (62.5%) targeted HPV, five (62.5%) used a 2 x 2 or pilot RCT design, and four (50%) adopted behavior change theories. Approximately 50% of them demonstrated effects on knowledge improvement and 25% on attitude, perceived risk, self-efficacy for vaccination, or vaccination intention. Digital gaming interventions showed improvement in knowledge and other factors related to vaccine uptake. While most studies had limited external validity of the results due to study design, small sample size, and lack of vaccine uptake data, digital gaming interventions demonstrated i

SOMATIC HYPERMUTATION IN CH12-F3 CELLS AND THE ROLE OF BCL6

Presenter(s): Kaitlyn Hutchins

Microbiology Immunology and Infectious Disease

Mentor(s): Kefei Yu (College of Human Medicine), Li Han (College of Natural Science)

Although widely used as a model for class switch recombination (CSR), CH12-F3 cells (mouse B cells) are unable to undergo somatic hypermutation (SHM), which is an essential process for optimizing antibody affinity by mutating the sequences encoding the antigen-binding pocket. CH12 cells can be induced to express AID (activation-induced cytidine deaminase), which is the master gene that initiates CSR and SHM. The reason for the inability of CH12 to undergo SHM is unclear. Our previous mRNAseq data revealed that CH12 cells do not express Bcl6 gene, which is an essential regulator of the germinal center where SHM takes place. I will test the hypothesis that restored expression of the Bcl6 gene in CH12 will restore SHM. If so, it will open up additional research opportunities to figuring out what Bcl6 downstream factors contribute to the SHM process. This will lead to novel insight into the differential regulation of SHM and CSR, which are both relying on AID-initiated DNA lesions. We have established a reporter cell line where SHM can be monitored by loss of GFP expression. My work thus far has included cloning and transfection of Bcl6 expression vectors into CH12 cells and confirming Bcl6 transgene expression. High throughput next-generation sequencing will be performed to study the detailed analysis of V region SHM in CH12 cells.

ISOLATION AND ANALYSIS OF SPIROBACILLUS CIENKOWSKII
Presenter(s): Anne Lemek
Microbiology Immunology and Infectious Disease
Mentor(s): Nina Wale (College of Natural Science)

Understanding the biology, host interactions, and life cycle of a pathogen is important for explaining how and why it causes disease in its host. However, studying these factors is reliant on isolation of the pathogen as experiments need to be reproducible and controllable. *Spirobacillus cienkowksii* is a pleomorphic, carotenoid-producing bacterial pathogen of the zooplankton *Daphnia spp*.. Infection is associated with high mortality rates, rapid growth within the host, and quick infection and transmission periods, but little is known about its biology, metabolic pathways, and infectious cycle. *S. cienkowskii* additionally has proven difficult to culture, making it difficult in turn to effectively study. The goal of this experiment is to identify the ideal conditions to isolate *S. cienkowskii* from infected *Daphnia* hosts. Liquid and semi-solid media were inoculated with crushed, infected *Daphnia*, and these cultures were then incubated at either 4˚ or room temperature. Cultures with growth were plated and incubated at their respective temperatures to obtain isolated colonies. Cell and colony morphologies, as well as motility and structural characteristics, were observed and recorded. The results of this experiment will indicate what types of bacteria can be isolated from infected *Daphnia* under varying conditions, and give insight into what *S. cienkowskii* may look like when cultured in vitro.

INVESTIGATING COVID-19 CLOTTING: CLONING AND EXPRESSION OF SARS-COV2 ORF8 VARIANTS
Presenter(s): Maggie Naco
Microbiology Immunology and Infectious Disease
Mentor(s): Michael Bachmann (College of Human Medicine)

The COVID19-associated blood clotting disorder (CAC) has been affecting many severely ill COVID patients and possibly some who are suffering from Long Covid. In these patients, a critical clotting factor, the von Willebrand factor (VWF) is elevated while its antagonist, the protease ADAMTS13, is reduced. Our hypothesis is that the increased blood clotting in severe COVID-19 patients is not just due to inflammation, the currently favored hypothesis, but directly linked to one of the protein products of the SARS-CoV-2 virus, the ORF8 protein. Supporting this, our preliminary data have shown a direct interaction between the SARS-CoV2 protein ORF8 and the ADAMTS13 protein. Here, we will clone and express a number of ORF8 genes that are either naturally occurring variants or deliberate mutants. The resulting small library of ORF8 mutant proteins will be tested for binding to its ligands, such as ADAMTS13 and the interleukin 17 receptor A (IL17RA). We will analyze protein-protein interaction using co-immunoprecipitation and Western blotting together with computational modeling and thus map ligand binding sites on the surface of the ORF8 protein. These valuable insights into the pathogenesis of COVID19 will pave the way for the development of novel therapeutic interventions in severe COVID-19 cases.

LISTERIA MONOCYTOGENES AS A VECTOR FOR CANCER IMMUNOTHERAPY
Presenter(s): Austin Huckins
Microbiology Immunology and Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

The obligate intracellular pathogen, Listeria monocytogenes, has long been viewed as a nuisance, given its ability to cause severe, life-threatening infection in pregnant women, newborns, and the elderly. In recent years, the pathogen has been viewed from a new, more optimistic lens: Listeria monocytogenes is a powerful tool in cancer immunotherapy. In collaboration with Laguna Bio, a San Francisco-based biotech company, we have tested attenuated strains of Listeria monocytogenes with immunogenic properties in a mouse model, specifically assessing the ability for the bacterial cells to grow within the catheter through which they are injected. Post-injection, the mice are observed for six days, during which they are imaged using in vivo bioluminescent imaging, allowing for localization of the injected bacterial cells within the mouse body and within the catheter. We found that neither strain studied, LADD or QUAIL, was unable to grow in the intravenous catheter of the mouse. Furthermore, there does not appear to be a linear relationship between the size of the initial inoculum and the number of CFUs obtained from the catheter post-excision on day 6. The results of this study necessitate further testing of the QUAIL strain in vivo and in vitro, to determine the mechanisms that it uses to continue to grow extracellularly.

CHARACTERIZING LEGC4'S MOLECULAR MODE OF ACTION IN MACROPHAGES
Presenter(s): Oscar Valenzuela
Microbiology Immunology and Infectious Disease
Mentor(s): Stephanie Shames (College of Osteopathic Medicine)

Legionella pneumophila is an accidental pathogen of humans and causes a form of pneumonia coined Legionnaires' Disease. *L. pneumophila* achieves its status of pathogenicity by producing over 300 effector proteins and excreting them via its type IV secretion system. Due to the accidental nature of human infection, some effector proteins hinder virulence within macrophages. One such example of an effector protein hindering *L. pneumophila* virulence is called legC4 which blocks host mRNA translation and has been shown to decrease fitness within macrophages but not its natural protozoan hosts. LegC4 is capable of interacting with two proteins produced within macrophages, one being the nascent associated polypeptide complex(NAC) and the other being proteasome activator (PA) 28alpha. NAC is known to be closely associated with ribosomes during translation and aid in properly folding proteins, which if disrupted can induce autophagy. PA28alpha is known to aid in the removal of damaged and unfolded proteins when activated. It is not known which of these interactions is necessary to display this phenotype and is thus the goal of this project. Interactions between both NAC and PA28alpha will be performed using several truncated forms of LegC4 in order to find which regions of LegC4 are required to bind to either NAC or PA28alpha. Upon the discovery of regions that only bind to PA28 alpha or NAC, cell culture methods utilizing bone marrow derived macrophages and

DOES GLUTEN STIMULATE PRODUCTION OF AUTOANTIBODIES IN MICE?
Presenter(s): Chris Van Antwerp
Microbiology Immunology and Infectious Disease
Mentor(s): Rick Jorgensen (College of Agriculture & Natural Resources), Tamil Selvan Arul Arasan (College of Agriculture & Natural Resources), Venugopal Gangur (College of Agriculture & Natural Resources)

Gluten is linked to immune mediated diseases such celiac disease, non-celiac gluten sensitivity and gluten hypersensitivity. Mechanisms underlying these diseases are incompletely understood at present. Although in celiac disease autoantibodies are produced, the mechanism of how exposure to gluten activates autoantibody production is unknown. In this project, I propose to test the hypothesis that wheat gluten administration to mice results in the production of autoantibodies against the small intestine antigens. An adjuvant-free mouse model of gluten-induced immune response developed by Dr. Gangur, and co-workers will be employed to test this hypothesis. I plan to establish ELISA based assays to measure autoantibodies in this mouse model. I will produce and use small intestine tissue protein extracts and several control protein extracts in these assays. I plan to present the results from this project during the MSU undergraduate research symposium. I will work collaboratively with the research team of Dr. Gangur in his food allergy and immunology laboratory during this research work.

INVESTIGATING TRANSMISSION OF ESBL-PRODUCING E. COLI PLASMIDS FROM HUMANS TO COMPANION ANIMALS THROUGH CONJUGATION
Presenter(s): Sam Waite
Microbiology Immunology and Infectious Disease
Mentor(s): Charles Whitehead-Tillery (College of Natural Science), Julia Bell (College of Veterinary Medicine), Linda Mansfield (College of Veterinary Medicine)

Extended spectrum beta-lactamase-producing Enterobacteriaceae (ESBL) pose a growing healthcare threat amid the escalating antibiotic resistance in bacterial infections. Increased antibiotic use in healthcare, food, and veterinary practices has led to a surge in antibiotic-resistant ESBL-producing bacteria. ESBLs are enzymes produced by the bacteria that hydrolyze beta-lactam antibiotics. The primary concern stems from these bacteria's capability to transfer antibiotic resistance genes via plasmid-mediated conjugation. Common infections associated with ESBL-producing bacteria include pneumonia and urinary tract infections (UTIs). ESBL infections mainly occur in the hospital setting; however, ESBL infections can also be caused by various community settings like soil, wastewater, livestock and companion animals. Most research looking into ESBLs focuses on transfer within the hospital setting, but community-onset infection have been on the rise specifically between humans and companion animals. Consequently, these interactions lead to plasmid transfer between bacteria in the gut microbiota. Therefore our research will address if ESBL-producing E. coli plasmids derived from humans can transfer to dog-derived E. coli recipients via conjugation. In vitro filter-based conjugation assays will be performed on a collection of human-derived ESBL-producing E. coli with 3 dog-derived E. coli strains. Antibiotic selective plates will be used to confirm positive transfer of the ESBL-producin

DESICCATION STRESS IN CARBAPENEM-RESISTANT ENTEROBACTER
Presenter(s): Dylan Luce
Microbiology Immunology and Infectious Disease
Mentor(s): Beth Ottosen (College of Natural Science), Victor DiRita (College of Veterinary Medicine)

Enterobacter hormaechei is a Gram-negative bacterium that is a common inhabitant of the environment and human gut microbiota. *E. hormaechei* is frequently found within hospital settings, where it can be an opportunistic pathogen. Due to the increasing prevalence of carbapenem resistance in *Enterobacter*, studying modes of transmission and developing methods of preventing infection are essential to increasing patient safety. *E. hormaechei* primarily spreads through contact between patients and contaminated surfaces. To survive on fomites within hospitals, *E. hormaechei* must resist environmental stressors, including desiccation. We demonstrated that carbapenem-resistant clinical isolate, CRE14, survives desiccation for at least one month, retaining viable cell levels comparable to the well-characterized desiccation-tolerant pathogen *Acinetobacter baumannii.* This suggests that long-term survival of *E. hormaechei* on fomites could facilitate transmission between patients. We aim to identify and characterize genes essential for surviving desiccation stress by using targeted and non-targeted genetic approaches. We hypothesize that *otsAB*, an operon responsible for trehalose biosynthesis found in multiple pathogens, may contribute to the desiccation tolerance of *E. hormaechei*. To investigate this, we are constructing a deletion mutant of *E. hormaechei* using lambda-red recombination. We will measure

LISTERIA MONOCYTOGENES INFECTION IN THE PLACENTA
Presenter(s): Abby Cummings
Microbiology Immunology and Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

Listeria Monocytogenes is a pathogenic bacterium that infects the placenta. The Hardy lab is researching, at a molecular level, the mechanism of infection and transmission of this bacterium. This study is of high significance as the placenta, being composed of both fetal and maternal cells, undergoes immune responses that are necessary to fight infection. However, inflammation of the placenta can harm both the mother and the fetus, putting this of higher importance. In my research study we plan to develop tissue culture models of the placenta, called organoids. We will do this by using transwell assays, creating these placental organoids from trophoblast stem cells, which are fetal cells at the maternal-fetal interface of the placenta. Transwell systems and placental organoids will help us reveal the role of unusual variants of the Listeria protein InlP that is of interest to us, in placental invasion.

EXPLORING GENOTYPIC RELATIONSHIP THROUGH FLUORESCENCE ANALYSIS IN MALARIA INFECTED TRANSGENIC MICE

Presenter(s): Jimin Son

Microbiology Immunology and Infectious Disease

Mentor(s): Lindsey Thompson (College of Natural Science), Nina Wale (College of Natural Science)

Malaria is a disease caused by blood parasites of the species Plasmodium, which infects over 200 million people per year and results in over half a million deaths, mainly in Sub Saharan Africa and Southeast Asia. Disease severity is thought to correlate with the age of red blood cells (RBCs) a malaria parasite can infect; however, this idea has not been rigorously tested due to methodological difficulties associated with aging RBCs in infected individuals. Our ultimate goal is to use fluorescent proteins expressed in the RBCs of transgenic mice to age said RBCs and thus determine the RBC age range that different parasite species can infect. To achieve this goal, here we investigate 1) if fluorescent proteins are expressed in the RBCs of transgenic mice, 2) if fluorescence changes with mouse genotype and 3) if immature and mature RBCs differ in their fluorescence. Our preliminary results confirm that the fluorescent protein is expressed in the RBCs of the transgenic mice. Further, the relative strength of this fluorescence correlates with mouse genotype, with homozygous transgenic mice producing the strongest fluorescence. Finally, we found, as expected, immature and mature RBCs differ in their relative fluorescence. Future work will target aging RBCs quantitatively using the degree of fluorescent protein degradation within the RBCs. With the ability to age RBCs in infected mice, we can further understand the relationship between disease severity and the RBC age breadth of dif

Neuroscience

VISUALIZATION AND ANALYSIS ON CLINICAL AND SOCIO-DEMOGRAPHIC VARIABLES OF ALZHEIMER DISEASE

Presenter(s): Morgan Fox

Neuroscience

Mentor(s): Gillian MacDonald (College of Social Science)

Alzheimer's disease is a neurodegenerative condition that is characterized by progressive memory loss and cognitive decline. Medical advances have been made and utilized to temporarily reduce the symptoms of the disease, however, there is currently no cure. Alzheimer disease accounts for over half of dementia cases and is considered a leading cause of death. To identify patterns and relationships in the disease, it is essential to develop a better understanding of the condition as a whole. This can be done by extracting clinical and socio-demographic data on Alzheimer's disease to filter, clean, and visualize through code. The python library, Pandas, is a great tool for filtering data to create accurate and relevant datasets. Utilizing the new filtered data set allows for descriptive data visualizations to be created. Coding using the python library seaborn, allows access to the create various graphs to visualize the relationship, distribution, and correlation between clinical and sociodemographic variables on Alzheimer's disease. Having multiple diagrams permits further analysis of the disease which makes for key connections and important highlights between socio-demographic and clinical features, allowing for a better understanding of the condition as a whole.

VITAMIN D INTERVENTION FOR TREATING DEPRESSION
Presenter(s): Danielle Okeke, Jack Burke, Mia Simone
Neuroscience
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

Depression is a global health concern affecting roughly 350 million people worldwide. Emerging evidence links low vitamin D levels to an increased risk of depression. However, the effectiveness of vitamin D supplementation for improving depressive symptoms remains unclear. The aim of our study was to determine if vitamin D supplementation improves depressive symptoms in patients diagnosed with depressive disorders and those with baseline vitamin D deficiency. Electronic search of databases was carried out by our team for published randomized controlled trials and other research conducted to better understand the biological mechanisms underlying the relationship between vitamin D and depression. The primary outcomes we looked for were change in depressive symptoms and production of hormones (i.e. serotonin) which aid in mood regulation. Collectively, these studies suggest vitamin D supplementation results in both psychological (reduced depression) and biological (increased serotonin) benefits relevant to mood regulation. However, the research is not strong enough to be used as conclusive evidence, therefore further randomized controlled trials are needed to definitively establish the potential of vitamin D supplementation for the treatment of depression.

A MORPHOLOGICALLY DISTINCT SUBCLASS OF SOMATOSTATIN-EXPRESSING INTERNEURONS IN THE SOMATOSENSORY CORTEX ARE STRONGLY RECRUITED BY INPUT FROM THE MOTOR CORTEX
Presenter(s): Mya Sebek
Neuroscience
Mentor(s): Shane Crandall (College of Osteopathic Medicine)

The motor cortex (M1) and somatosensory cortex (S1) are strongly interconnected, and their interactions are essential for sensory perception and motor execution. However, the mechanisms by which M1 activity modulates sensory processing within S1 are poorly understood. Particularly, M1 recruitment of distinct GABAergic inhibitory cells could impact S1 responsiveness. We identified a subpopulation of somatostatin (SOM) expressing inhibitory interneurons in layer 6 (L6) of S1 that are strongly recruited by M1 input. We hypothesize these M1-responding L6 SOM cells are an electrophysiological and morphologically distinct subclass. To stimulate this pathway, we injected adeno-associated virus encoding channelrhodopsin-2 in M1 of postnatal day 21 (+/-1) mice in vivo. After three weeks of expression, we prepared acute coronal brain slices for targeted loose-patch recordings and selective optical stimulation of M1 terminals. We found two groups of L6 SOM cells based on their spiking behavior during photostimulation: responsive (15%) and non-responsive (85%). Whole-cell recordings and neurobiotin injections revealed electrophysiological and morphological differences between the groups. Anatomical reconstructions indicate the non-responsive group (n=12) exhibits Martinotti and non-Martinotti morphologies, whereas the responsive group had axonal arborizations projecting toward the underlying white matter (n=10). The responsive SOM cells had quasi-fast-spiking properties. The non

ANALYSIS OF OPERANT SELF-ADMINISTRATION BEHAVIOR WITH DEEPLABCUT
Presenter(s): Leo Pereira Sanabria
Neuroscience
Mentor(s): Amy Arguello (College of Social Science)

Exposure to drug-associated stimuli can elicit craving for drug, despite long periods of abstinence (incubation of craving). Using an abbreviated cocaine self-administration (Coc-SA) procedure, we found that adolescent rats display incubation of craving in a cocaine-associated context. Coc-SA behavior yields information about a rat's craving for drug in terms of active or inactive lever presses (resulting in drug or no drug infusion respectively). The use of supervised machine learning to approximate poses in video recordings allows for rapid and efficient analysis of such complex behavioral profiles. By obtaining videos of lever training sessions we aimed to 1) obtain pose estimation data using the supervised machine learning software DeepLabCut and local high performance computer cluster, and 2) compare proof of principle of standard self-administration lever press data vs lever quadrant time analysis generated from pose estimation data. Overall, we found video acquisition to be efficient and that pose estimation outputs from DeepLabCut could be used to recapitulate comparable lever press behavioral results.

UNCOVERING THE GENETIC BASIS OF A NEURAL CREST PHENOTYPE IN ZEBRAFISH
Presenter(s): Matthew Spaulding
Neuroscience
Mentor(s): Ann Davidson (College of Natural Science), Julia Ganz (College of Natural Science)

During development, the dorsal region of the neural tube gives rise to the neural crest cell (NCC) population which generates various tissue types. Abnormal NNC development can lead to neurocristopathies in humans such as Hirschsprung disease (HSCR). HSCR, which has a prevalence of 1/5000 in live births, is characterized by a reduction in neurons of the enteric nervous system (ENS) in the distal gut. To study the genetic basis of neurocristopathies, we use zebrafish (Danio rerio) as model organisms. Zebrafish are advantageous due to their large clutches of 100-600 embryos and translucent larvae to visualize NCC development. Previous work has identified a zebrafish mutant with defects in NCC derivatives, including reduced jaws and an HSCR-like ENS phenotype. This mutant line was generated by CRISPR/Cas9 genome editing targeting the zebrafish gene ednrbb, which is one ortholog of the HSCR candidate gene EDNRB. However, upon genotyping phenotypically mutant larvae, I found wildtype alleles at the target locus suggesting that the mutant phenotype is not due to functional loss of ednrbb. We hypothesize that offsite binding of the ednrbb guide RNA created a mutation underlying the NCC phenotype. I used bioinformatic tools to identify candidate offsite target sites and tested five loci, but did not identify a mutation. We are currently mapping the mutant locus using whole-genome sequencing. Future work will identify the developmental basis of the NCC phenotypes. Identifying the gene

TISSUE RESPONSE TO DEEP BRAIN STIMULATION ELECTRODES: NEUROHISTOPATHOLOGICAL, ANIMAL, AND COMPUTATIONAL MODELING STUDIES
Presenter(s): Dorothy Zhao
Neuroscience
Mentor(s): Erin Purcell (College of Engineering)

Deep brain stimulation (DBS) is an invasive neuromodulation therapy that utilizes implanted electrodes to deliver electrical stimulation to targeted areas within the deep brain. Modern DBS was developed in the late 1980s as a last-line treatment for the motor symptoms of movement disorders, i.e., tremor in Parkinson's Disease patients. Recently, there has also been increasing interest in the potential that DBS holds as a treatment for treatment-resistant psychiatric disorders. However, many key aspects of DBS, including the brain-tissue response to DBS electrodes are insufficiently explored. Previously, DiLorenzo et al. (2014) conducted a systematic review that included 40 cases on histopathological postmortem human tissue studies with DBS. They identified fibrillary gliosis, reactive astrocytes, microglial activation, neuronal loss, and mononuclear leukocytes in over 60% of the cases. I aim to review the current research on the brain-tissue response in both animal studies with DBS and histopathological postmortem human tissue studies with DBS. The results of this study will inform understandings of the tissue response to electrical stimulation from implanted electrodes in both animal and human brains.

CHRONIC COCAINE EFFECTS ON ER STRESS IN VENTRAL HIPPOCAMPUS
Presenter(s): Ashley Harlock
Neuroscience
Mentor(s): Alfred Robison (College of Natural Science)

The ventral hippocampus is important in the drive to seek and take drugs. We have found that chronic cocaine produces changes in physiology and gene expression in ventral hippocampus neurons. These changes may underlie aberrant cocaine-seeking and reward. We recently found that chronic cocaine increases calreticulin mRNA and protein in ventral hippocampus neurons. Calreticulin is an endoplasmic reticulum (ER) chaperone protein important in binding to misfolded proteins and preventing them from being exported. Misfolded proteins can cause the unfolded protein response (UPR), a compensatory process initiated by ER stress. However, it is unknown whether cocaine-induced calreticulin is linked to ER stress or whether this alters ventral hippocampus function or drug responses. Thus, we hypothesized that cocaine induces calreticulin in ventral hippocampus neurons to alter the UPR and regulate ER stress. Initially, we examined whether chronic cocaine increases UPR proteins, such as ATF6, phosphorylated IRE1, and PERK, in ventral hippocampus tissue from cocaine-treated mice using Western blotting and immunohistochemistry. Preliminary experiments suggest that cocaine may be increasing the expression of ATF6, PERK, and phosphorylated IRE1 in the ventral hippocampus. Ongoing experiments are also examining whether calreticulin mediates cocaine effects on UPR proteins, using conditional calreticulin knockout mice and viral-mediated overexpression of calreticulin in ventral hippocampus neur

USING DREADDS TO INVESTIGATE NEUROANATOMY AND BEHAVIOR CHANGES IN ALZHEIMER?S DISEASE
Presenter(s): Manbir Singh
Neuroscience
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

Alzheimer's Disease (AD) is a neurodegenerative disease. There is not one singular known cause of AD. Multiple hypotheses exist on what causes AD, such as the Beta Amyloid Hypothesis, the Tau Hypothesis, and the Cholinergic Hypothesis. This proposal is designed based on the Cholinergic hypothesis. The cholinergic system (CS) of the brain is an important system that plays a role in memory function. Acetylcholine (ACh) is a neurotransmitter that controls the CS. ACh binds to receptors and sends an excitatory signal. ACh has a known role in learning and memory. AD patients have a deficiency of ACh, which causes a reduction of cholinergic neurons, which leads to neurodegeneration of the hippocampus, resulting in dementia. Designer Receptors Exclusively Activated by Designer Drugs (DREADDs) are receptors that medications can activate. The proposal is to inject a gene into the hippocampus of a rodent model that codes for an excitatory DREADD. Then, wait for the expression of the gene. Administer designer drugs to the rodent at the appropriate dosage. After a few days of administration, test behavior that relates to memory. Also, along the way, medical images such as fMRI should be taken to compare and see if there is a change in the anatomy and activity of the brain between the beginning and end of administration. The hypothesis we will test is that if we use DREADDs to mimic the function of the CS in the hippocampus, we will see an increase in function and behavior that results in

LATERAL ENTORHINAL CORTEX PROJECTIONS TO THE NUCLEUS ACCUMBENS ENCODE CONTEXTUAL FEAR MEMORY
Presenter(s): Grace Stys
Neuroscience
Mentor(s): Alfred Robison (College of Natural Science), Andrew Eagle (College of Natural Science)

The lateral entorhinal cortex (LEC) is a brain region important in associative memory. The LEC contains a subpopulation of neurons that project to the nucleus accumbens (NAc; LECNAc), a region important in reward, avoidance, and motivated behavior. Glutamatergic projections from other regions (e.g. cortex, amygdala) to NAc become hijacked in neuropsychiatric diseases like depression and addiction, however, the role of LECNAc neurons are unknown. Because LEC mediates associative memory and NAc mediates motivated behavior, we hypothesized LECNAc neurons may mediate associative memories underlying motivated behavior via activation during encoding and retrieval of a contextual memory. To investigate this, we inactivated LECNAc neurons using DREADDs during contextual fear conditioning (CFC), specifically during the learning (encoding) and test (recall) period. Additionally, we performed CFC in a separate cohort and collected LEC tissue 1 hour post learning to test for c-fos immunohistochemistry, which is a protein marker of high neuronal activity. Inactivation of LECNAc neurons impaired contextual fear learning, but didn't affect the recall, suggesting LECNAc neurons are necessary for the encoding, but not the recall, of a contextual fear memory. Quantification of c-fos expression in LECNAc neurons suggested these neurons are activated by a novel context, rather than specifically during encoding or recall. These findings elucidated a previously unknown role of this understudied ne

INVESTIGATING MICROGLIA ACTIVATION IN RESPONSE TO DIFFERENT FOOD SOURCES IN A NEONATAL PIGLET MODEL
Presenter(s): Maria Faraj
Neuroscience
Mentor(s): Ashley McDonough (University of Washington)

Premature infants are at a higher risk of infections and comorbidities that can cause neurodevelopmental delays. There is evidence that food source may affect development of the intestines, systemic inflammation, and neuroinflammation and modulate comorbidities, but these connections are not well characterized. Our collaborators are investigating the effects of infant formula and human breast milk on these outcomes. A piglet model was used to investigate these questions since piglets have a high homology to human infants with particular respect to their intestinal and brain growth trajectory and neuroanatomy. Microglia are the resident immune cells of the central nervous system and are the first responders to injury or infection. Their activation is a key indicator of neuroinflammation. We hypothesize that piglets fed human milk will have less neuroinflammation and thus have less microglial activation than piglets fed infant formula. To test this, we performed a pilot study with 6 male piglets, which were assigned to either a human milk or infant formula feeding group. Piglets were fed for 28 days and then euthanized. The right prefrontal cortex was removed and sectioned using a cryostat. Immunohistochemical staining was performed to stain for microglia (Iba1) and proliferative cells (Ki67). Stereology was used to quantify microglia and proliferative cells in an unbiased manner and a Matlab script was used to skeletonize microglia and quantify morphological parameters. The re

ANDROGEN HORMONES REGULATE THE PRODUCTION ON THE PAIN-INDUCING INFLAMMATORY MOLECULE IL-1B IN A MOUSE MODEL OF INFLAMMATORY PAIN
Presenter(s): Hari Ramakrishnan
Neuroscience
Mentor(s): Geoffroy Laumet (College of Natural Science), Jaewon Sim (College of Natural Science)

Chronic pain prevalence varies between sexes with a higher incidence and duration reported in women compared to men. This disparity suggests that biological factors, such as sexual hormones, may influence pain perception and development. Among the key players in pain mechanisms, interleukin-1 beta (IL-1β), an inflammatory molecule, has been identified to activate neurons involved in pain sensation. This study explores the hypothesis that sexual hormones, particularly androgens, regulate IL-1β production in inflamed tissues, thereby influencing pain responses. To investigate this, we induced inflammatory pain in male and female mice using Complete Freund's Adjuvant (CFA), injected into the hind paw. To assess the effect of sex hormones on the production of IL-1β and pain, we modulated the levels of sex hormones by surgical and pharmacological approaches: ovariectomy, orchidectomy, and administration of flutamide, an androgen receptor antagonist. The analysis of IL-1β levels was conducted through quantitative Polymerase Chain Reaction (QPCR). We measured mechanical pain sensitivity thresholds using the von-Frey method. Our results indicate that injection of CFA drastically increased the levels of IL-1β in the inflamed skin. Blocking IL-1β significantly reduced pain sensitivity. We found decreasing systemic androgen levels, by orchidectomy or flutamide, significantly increase IL-1β expression and pain recovery times. Overall, we found tha

DAILY RHYTHMS AND SLEEP IN RAI1 DEFICIENT NILE GRASS RAT, A DIURNAL MODEL OF SMITH-MAGENIS SYNDROME
Presenter(s): Nolan Lucera
Neuroscience
Mentor(s): Lili Yan (College of Social Science)

The Retinoic-acid induced 1 (RAI1) gene, that encodes a histone-binding protein, is a major gene contributing to a rare neurodevelopmental disorder, Smith-Magenis Syndrome (SMS). SMS is characterized by a low intellectual quotient, obesity, behavioral problems, and disrupted circadian rhythms in sleep and melatonin secretion. Every reported individual with SMS experiences sleep disturbances including daytime sleepiness, frequent nighttime awakenings, and decreased total sleep time beginning in early childhood. Additionally, most of them display an inverted secretion pattern of melatonin. Multiple Rai1-mutant mouse lines exist, but these mice (C57BL/6) are melatonin-deficient and lack circadian rhythm phenotype. It is unclear whether the lack of circadian rhythm phenotype in Rai1 mice was due to melatonin deficiency, their nocturnal nature, or both. Therefore, a diurnal model with intact melatonin secretion will help better understand the role of Rai1 in regulating circadian rhythms and sleep, which may better translate to humans. We have developed a diurnal model of SMS, using CRISPR-mediated gene editing to delete Rai1 gene in the Nile grass rat, Arvicanthis niloticus, a well-established diurnal rodent species. In the present study, we compared daily rhythms and sleep between mutant animals and their WT littermates (Rai1+/- vs. Rai1+/+). In-cage locomotor activity was monitored by a motion sensor, Sleep/wake w

ROLE OF VENTRAL TEGMENTAL NEUROMEDIN-S NEURONS IN MORPHINE BEHAVIORS
Presenter(s): Katie McGrath
Neuroscience
Mentor(s): Michelle Mazei-Robison (College of Natural Science)

Despite the presence of treatments for opioid use disorder (OUD), opioids remain the leading cause of overdose deaths in the U.S. By studying neurobiological effects of chronic opioid use, we hope to better understand OUD, which could lead to better treatments. The ventral tegmental area (VTA) of the brain is a critical brain region for motivated behaviors. Specifically, dysfunction of dopaminergic neurons (DA) of the VTA can contribute to addictive behavior. The expression of the gene neuromedin S (NMS) in VTA DA neurons is increased by chronic morphine addiction. Thus, we're interested in identifying the role of VTA^{NMS} neurons in drug behaviors. To investigate this, we used NMS-Cre mice previously injected with Cre-dependent excitatory or inhibitory DREADDs (Designer Receptors Exclusively Activated by Designer Drugs) and, with clozapine-n-oxide (CNO), we activated or inhibited VTA^{NMS} neurons. These mice underwent morphine locomotor and morphine conditioned place preference (CPP) experiments to determine behavioral differences induced by VTA^{NMS} neuron manipulation. Most recently we found that inhibition of VTA^{NMS} neurons can decrease morphine CPP, suggesting these neurons are necessary for morphine reward. After behavioral studies, the mice brains were perfused and postfixed to prepare for slicing. Then, immunohistochemical analysis was performed to confirm virus expression. Additionally, the slices were stained to analyze the over

MODULATORY ROLE OF OREXIN/HYPOCRETIN IN NEUROINFLAMMATORY RESPONSE POST BRAIN INJURY IN A DIURNAL RODENT MODEL (ARVICANTHIS NILOTICUS)

Presenter(s): Samy Athreya, Viola Weber

Neuroscience

Mentor(s): Allison Costello (College of Social Science), Lili Yan (College of Social Science)

Traumatic brain injury (TBI) is associated with attenuation of orexin/hypocretin. Orexin, a neuropeptide upregulated with light in humans and other diurnal species, plays a modulatory role in homeostasis, sleep/wakefulness, and cognition. The severity in loss of orexin in TBI patients is correlated with their sleep deficits, depressive symptoms, and the recovery of cognitive and/or motor functions. Orexin has been demonstrated to promote synaptic plasticity and upregulate neurotrophic factors, as well as to buffer pro-inflammatory response, which is heightened following TBI and directly impacts recovery. The direct effects of orexin as an therapeutic agent in TBI is not well understood. In the present study, we examined the effects of orexin on neuroinflammatory response to brain injury, using Nile grass rats (Arvicanthis niloticus). In male and female grass rats, TBI in the frontal cortex was introduced by implanting a metal canula into the lateral ventricle. One week following the surgery, animals received daily intracerebroventricular (ICV) infusion of orexin-A (OXA) or artificial cerebrospinal fluid (CSF) as control over 7 days. Brains were collected at the end of the treatment for analyzing neuroinflammatory markers. We hypothesized that OXA treatment will reduce pro-inflammatory response, i.e., microglia activation, around the site of the cannula implantation. We used immunohistochemistry to visualize microglia proliferation and phenotype, for both structural and functi

CHARACTERIZATION OF A NOVEL CELL TYPE IN ZEBRAFISH GUTS
Presenter(s): Rebecca Myatt
Neuroscience
Mentor(s): Ann Davidson (College of Natural Science), Julia Ganz (College of Natural Science)

Due to their transparent embryos, rapid embryonic development, and numerous shared genes with humans, zebrafish (Danio rerio) have emerged as a popular animal model to research the intestine. In zebrafish, analysis of an *mnx1:Gal4*:UAS:GFP transgenic line depicts a novel cell type that is positive for green fluorescent protein. These novel cells appear in the gut of embryos at approximately three days, and bear resemblance to resident macrophages. This cell type is located in close proximity to the enteric nervous system (ENS) and its neurons, a region in which immune-neuron cell interactions are less frequently studied. Using cell markers, we have shown that this cell type does not belong to various known cell types including ENS neurons, ENS glia, ENS proliferating cells, smooth muscle cells, and interstitial cells of Cajal. Strikingly, the most common macrophage cell marker, *mpeg*1, is not expressed in this cell type. Despite this, expression analysis reveals that six immune cell markers, including macrophage markers (*ccr2, ctsk, marco, mfap4, ptprc, spi1b*) are expressed in the gut of embryonic zebrafish. Additionally, qualitative analysis of s*ox10* zebrafish mutant larvae shows that this cell type develops normally in total absence of an ENS, which confirms these cells are not neuronal. To further explore this cell population, we are currently performing RNA-sequencing using fluorescent-activated cell sorting to isolate

CNS NEURONS GROW SLOW BECAUSE THE ENTIRETY OF THE NEURITE SHAFT MOVES TOWARDS THE CELL BODY
Presenter(s): Bashar Jawich, Francesca Oprea, Jenny Dibley, Lorenzo Thrasher, Malhar Amin, Shakthishree Velmurugan, Sydnie Schafer
Neuroscience
Mentor(s): Kyle Miller (College of Natural Science)

Compared to the periphery, Central Nervous System (CNS) neurons grow and regenerate in a slower fashion. The mechanism associated with slower outgrowth in CNS neurons is unknown. Peripheral nervous system (PNS) neuronal outgrowth is paired with bulk forward flow of microtubules (MTs) and organelles along the axon. Here, we examined the bulk flow of CNS neurons and observed docked organelles, such as mitochondria and ER, in addition actin filaments and beads bound to the outside of the neurites, all flow backward to the neuronal cell body. To investigate the mechanism, we disrupted RAC, myosin II and actin assembly. We found that the disruption of actin and myosin II blocked retrograde bulk flow and resulted in a burst of outgrowth at the growth cone. In turn, disruption of RAC, which controls growth cone traction force generation, and the addition of trypsin, which causes disruption of the cell attachment to the substrate resulting in growth cone retraction. Collectively, this suggests that like PNS neurons, CNS neuron's growth cones pull the axon forward. They differ that in CNS neurons myosin II activity along the neurite pulls material to the cell body, which may explain why CNS neurons regenerate more slowly than PNS neurons.

IDENTIFYING HISTOLOGICAL BIOMARKERS ASSOCIATED WITH PEDIATRIC CONCUSSION
Presenter(s): Shaun Subbaiah
Neuroscience
Mentor(s): Galit Pelled (College of Engineering)

Traumatic Brain Injury (TBI) poses a significant threat to children, with approximately 500,000 cases reported annually in the United States alone among those aged 0-14 years. Understanding the extent of brain damage is crucial in addressing this issue. Presently, there are no conclusive identifying markers for TBI. The research at the PELLED lab aims to fill this gap by identifying new markers for TBI, by using 16-week-old pigs as experimental subjects. In the study, 3 pigs were subjected to mild TBI and 3 pigs underwent sham procedures, and after a 12-week period, their brains were extracted. 5-micron sections of the frontal cortex were prepared on slides, which were subsequently stained with Luxol Fast Blue (LFB). LFB was chosen due to its ability to highlight changes in white matter content by staining the myelin in white matter, crucial in assessing potential white matter damage resulting from TBI. Microscopic images of the slides were captured at 4X magnification, followed by analysis using ImageJ software. Through pixel intensity threshold selection, the white matter region was selectively highlighted. Our analysis revealed that pigs that had mild-TBI showed a significant decrease of white matter of 6.4% compared to controls ($p=0.006$, Student T-test). These results highlight the role of mild TBI in inducing white matter damage, as evidenced by histological quantification. These findings contribute to a deeper understanding of TBI pathology and the importanc

ANESTHETICS AND MYELIN DECOMPACTION IN ADULT MICE
Presenter(s): Charlotte Best
Neuroscience
Mentor(s): Rebecca Knickmeyer (College of Human Medicine)

Myelination is an important process in which oligodendrocytes surround axons with an insulating sheath, increasing the speed of neural signals. Previous studies show that anesthetics such as isoflurane during critical periods of mouse development hinder neuronal and oligodendrocyte development, altering myelination and overall brain function. However, these studies have only examined the impact of anesthetics on very young mice, and they have not explored the impact of anesthetics on myelin sheath decompaction. As part of a study on the microbiome-gut-brain axis, myelin phenotypes for 28 adult mice (16 male, 12 female) were assessed using electron microscopy. 18 of these mice (10 male, 8 female) underwent MRI scanning prior to sacrifice, and were administered isoflurane and dexmedetomidine. Axons in the prefrontal cortex, amygdala, nucleus accumbens, and hippocampus were assessed for myelin decompaction level using ImageJ software. Preliminary results show that anesthetic protocol may impact myelin decompaction level, as mice that received anesthetics, on average, had around 1.6 times the proportion of highly decompacted axons that anesthetic-free mice had. This difference was significant with a p-value of less than 0.0001. Gut microbiome composition and sex do not appear to play a significant role in decompaction or myelin sheath layers. To our knowledge, this is the first study showing that this particular anesthetic protocol may induce demyelination and myelin decompaction

CHEMOKINE LIGAND 12 (CCL12) MEDIATES POST SURGICAL PAIN IN MICE
Presenter(s): Hannah Hua
Neuroscience
Mentor(s): Geoffroy Laumet (College of Natural Science), Sabrina de Souza (College of Natural Science)

More than 200 million people undergo surgery involving skin incision each year, but clinical pain management after surgery is far from being successful. Skin injury triggers the release of inflammatory markers and some are known to induce pain. However a comprehensive study of these inflammatory mediators released following skin injury has not been investigated in mouse models of postsurgical pain. We aim to screen the inflammatory mediators produced in the skin following surgical incision and assess their role in pain. After surgery, paw skin was collected and processed for a cytokine array to screen 60 inflammatory mediators, polymerase chain reaction (PCR), and enzyme-linked immunosorbent assay (ELISA). The chemokine ligand 12 (CCL12) was the most upregulated.To determine whether CCL12 contributes to postoperative pain, we injected a neutralizing antibody anti-CCL12 to block CCL12, or phosphate buffered saline (PBS) as control, in the operated paw. Pain sensitivity was measured with von Frey filaments. Neutralizing CCL12 alleviated postsurgical pain. Then, to test whether CCL12 was sufficient to induce pain, we injected recombinant-CCL12 or PBS was injected into naïve mice and pain was assessed. Injection of CCL12 induced mechanical and heat pain. Additionally, PCR showed that CCL12 induced increased interleukin-1 beta (IL1b) expression, a pain-causing molecule. Our work identifies that CCL12 is important in mediating postoperative pain and a potential therapeutic target.

AI USAGE IN REMINISCENCE THERAPY
Presenter(s): Blake Seelenbinder
Neuroscience
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

Dementia is a general term for a condition by which an individual will suffer from loss of memory and/or cognitive function. This proposal aims to aid in the therapy for patients with dementia by augmenting the current regimen for reminiscence therapy by use of AI generated images. To do this, first a close relative or acquaintance would provide a combination of images of scenes that the patient remembers and does not remember. Then, an AI image generator will compile those images and generate new ones based on the provided images. Patients will then be asked whether they recall the scenes presented in the images while hooked up to an EEG or fMRI. These results would then be compared to a control group of individuals without dementia who were subjected to the same conditions. The results of this proposal would show which areas of the brain are being inhibited by the patients dementia, as well as the extent to which AI can be used in reminiscence therapy by the initiation of false remembrances in the patients with dementia.

NEURAL DIFFERENTIATION OF ENDOMETRIAL VS HEALTHY CELL LINES FOR ENDOMETRIOSIS DETECTION
Presenter(s): Shreshta Sinha
Neuroscience
Mentor(s): Simon Sanchez (College of Engineering)

The delineation of pathophysiological paradigms underlying endometriosis through advanced neuroengineering methodologies presents a frontier for diagnostic innovation. This study elucidates the differential neural responses elicited by olfactory stimuli derived from endometrial versus healthy cell lines, utilizing the Locusta migratoria model. Leveraging the intrinsic olfactory sensitivity of locusts, we introduce a novel diagnostic paradigm by exposing these organisms to volatile organic compounds (VOCs) emanating from diseased and healthy endometrial cells. Subsequent to exposure, electrophysiological recordings were procured from the locusts' antennal lobes, the primary olfactory processing centers, to capture the neural codification of these complex chemical signatures. Employing an array of analytical techniques, including high-dimensional data analysis and spike sorting algorithms within a MATLAB environment, we meticulously dissected the resultant neural spike trains. This rigorous analytical framework facilitated the extraction of salient neural features, revealing distinct electrophysiological patterns correlating with the pathological state of the cell lines. Our findings underscore the presence of discernible neural signatures specific to endometriosis-afflicted cell lines, as opposed to their healthy counterparts, thereby demonstrating the feasibility of this bio-hybrid detection system. This pioneering investigation not only augments our understanding o

ESTABLISHING A NEW TRANSGENIC MOUSE MODEL: AVIL-ICRE: IL-10RA, TO UNDERSTAND THE ROLE OF IL-10 IN PAIN RESOLUTION
Presenter(s): Dashiell Jones
Neuroscience
Mentor(s): Geoffroy Laumet (College of Natural Science), Joseph Folger (College of Natural Science)

Current treatments for chronic pain, such as opiates, easily lead to addiction and death by overdose. Non-addictive alternatives are urgently needed. Our lab has found that the cytokine Interleukin-10 (IL-10) plays a crucial role in promoting pain resolution and may lead to effective, non-addictive treatment of chronic pain. IL-10 facilitates pain resolution without activating tolerance and addiction. This project aims to establish a new transgenic mouse model, *Avil-iCre/ERT2: Il10ra*, to further understand the role of IL-10 in pain resolution. This model will cause the removal of IL-10 receptors solely from "pain-sensing" sensory neurons in the dorsal root ganglia (DRG). We hypothesized that IL-10 receptor activation on sensory neurons accomplishes the body's innate resolution of pain. This mouse model utilizes Cre enzymes, which remove a flagged DNA sequence in DRG encoding IL-10 receptor formation. Since the Cre enzyme is attached to an estrogen receptor, it is activated only upon tamoxifen injection, an estrogen inhibitor, allowing for the Cre enzyme to enter the nucleus during an effectively controlled time. This model significantly improves over past error-prone models where receptor removal occurred during embryonic development. To optimize this model, the expression of IL-10 receptors in the DRG will be monitored across several time points after injection using fluorescence staining to visualize IL-10 receptors. Once we validate the model, we will test

MESOLIMBIC CIRCUITRY IS INTEGRAL FOR NEW BEHAVIORAL APPROACH TO ATTENUATING DRUG SEEKING BEHAVIOR
Presenter(s): Toria Fex
Neuroscience
Mentor(s): Alexander Johnson (College of Social Science), Bing Mo (College of Social Science)

Cocaine is a readily abused psychoactive drug; deaths from overdosing have risen to ~20K/year and annual healthcare costs increased to over $700 million. Unfortunately, there is a lack of effective treatment strategies. Accordingly, many previous users display relapse to cocaine-taking behavior, particularly when exposed to drug-related cues or contextual stimuli, even after long periods of abstinence. Thus, there is a critical need to develop strategies to disrupt drug-related activities. We have developed an approach in which memories associated with cocaine-seeking are devalued by pairing these memories with gastric malaise. This mediated devaluation approach results in a marked reduction (>50% reduction) in cocaine-seeking behavior. Furthermore, we have begun to isolate the brain circuitry underlying this phenomenon. This was achieved by a dual-viral intersectional strategy, in which a retrograde Cre-recombinase virus was placed into the nucleus accumbens (NAc), and a Cre-dependent inhibitory DREADD, hM4Di, injected into the ventral tegmental area (VTA). This enabled silencing of VTA cells projecting to NAc when rats were injected with the actuator, clozapine-N-oxide (CNO). This study provides evidence that the VTA → NAc circuit is integral in the mediated devaluation paradigm and should be further investigated for targeted methods of treating drug addiction.

HYPOTHESIS: NEURITES ARE EVOLUTIONARILY HOMOLOGOUS TO CYTOKINETIC BRIDGES
Presenter(s): Bashar Jawich
Neuroscience
Mentor(s): Kyle Miller (College of Natural Science)

The evolution of neurons as a cell type was a transformative event that allowed the first multicellular animals to convey information from one part of the body to another. Doing so empowered collections of cells to respond to the environment in a coordinated manner. Paired with the long-distance transmission of information, the ability of cells to change synaptic strength gave rise to memory formation, which helped ensure that responses to environmental stimuli were appropriate to the situation. While much attention has been directed at understanding synaptic evolution, how neuronal processes called neurites evolved, to the best of our knowledge, has yet to be considered. Here, we review the literature to compare the cell biology, biophysics, and evolutionary histories of cytokinesis, mesenchymal migration, amoeboid migration, neuronal migration, and neurite outgrowth. Based on recent studies that indicate that the biophysical mechanisms, core cytoskeletal proteins, signaling pathways, and subcellular morphology are closely related, we propose the hypothesis that the actomyosinbased traction force-generating machinery used to pull daughter cells apart during cytokinesis evolved into cell-crawling as the result of mutations which allowed the partial continuation of cytokinesis during interphase. Noting the structural similarities between neurites and cytokinetic bridges, such as actin rings and microtubule organization, leads to the hypothesis that neurites evolved due

INVESTIGATING THE ROLE OF NEUROGENIN 3 IN ENTERIC NERVOUS SYSTEM DEVELOPMENT IN ZEBRAFISH
Presenter(s): Barbara Kulaszewicz
Neuroscience
Mentor(s): Julia Ganz (College of Natural Science)

The enteric nervous system (ENS) is the largest part of the peripheral nervous system. The ENS is essential for gut mobility, blood flow and immune response. Zebrafish are an ideal model for studying ENS development due to their easy gene manipulation, transparent larvae, fully sequenced genome and fast development. A set of genes are known to regulate ENS development, but identifying which genes regulate in specific areas remains to be determined. Previous work has identified a mutant allele sa211 that result in an early stop codon in neurogenin 3 (ngn3) gene. Ngn3 is a developmental protein with a crucial role in neurogenesis. Preliminary data suggest that ngn3 mutants lack ENS neurons in the midgut as well as secretory cells in gut epithelium. To support this theory, we identified heterozygous carriers of the sa211 mutant allele and generate homozygous mutant embryo. In the next step we performed immunohistochemistry with 6-day old larvae. We used GFP to label the neurons in ENS and RFP to label secretory cells in gut epithelium. To identify the genotype of the larvae we used a PCR. Finally, we compared the WT/ /HET/ HOM ENS with respect to the number of neurons. We expect a reduction of neurons in mid gut for HOM carriers. This work will contribute to a better understanding of genes that regulates ENS development in zebrafish. Further research will try to figure out why does ngn3 has this effect and why is it region specific.

ROLE OF VENTRAL TEGMENTAL AREA SGK1 PHOSPHORYLATION AND ACTIVITY IN DRUG-ASSOCIATED BEHAVIORS
Presenter(s): Avani Prasad
Neuroscience
Mentor(s): Michelle Mazei-Robison (College of Natural Science), Samantha Caico (College of Osteopathic Medicine)

The mesolimbic dopamine system, vital for motivated and rewarding behavior, is modulated by drugs of abuse through alteration of cellular activity and gene expression within the ventral tegmental area (VTA). These alterations promote addiction-related behaviors. Our lab's previous work found that chronic cocaine and morphine administration increased activity and phosphorylation (at Ser78) of serum- and glucocorticoid-inducible kinase 1 (SGK1) in the VTA. We investigated whether decreasing VTA SGK1 activity and phosphorylation affects drug responses by utilizing viral vectors. We found that blunting SGK1 activity (overexpressed catalytically inactive SGK1 mutant K127Q) or preventing SGK1 Ser78 phosphorylation (via overexpressed SGK1 mutant S78A) decreased cocaine CPP and morphine preference in a two-bottle choice assay. Our current and future work focuses on investigating the mechanism in which SGK1 promotes drug-associated behaviors. Little is known about which proteins SGK1 phosphorylates, however, we do not think that SGK1's known substrate n-myc downregulated gene (NDRG) is playing a major role in promoting drug elicited behaviors. Thus, we are investigating potential candidates such as murine double minute 2 (MDM2), a ubiquitin ligase. The literature suggests that SGK1 phosphorylates MDM2 in vitro. We hypothesized that SGK1 also phosphorylates MDM2 in vivo, specifically after repeated administration of cocaine or morphine. We are testing MDM2 antibodies for western blot t

INVESTIGATING LPO NTSR1 NEURONS FOR REGULATION OF OBESITY AND OBESITY-INDUCED PAIN

Presenter(s): Charlotte Schultz
Neuroscience
Mentor(s): Gina Leinninger (College of Natural Science), Grace Lee (College of Natural Science), Raluca Bugescu (College of Natural Science)

Obesity is a growing problem in the United States, and projections indicate that by 2030, nearly half of the population will be obese. Obesity also increases the risk of developing chronic pain, yet there remain few effective treatments for comorbid obesity-pain. The neuropeptide Neurotensin is implicated both in supporting weight loss and in relieving pain, suggesting it could hold promise for addressing obesity and pain simultaneously. However, it remains unclear where and how Neurotensin signals in the brain to mediate these effects. We hypothesized that Neurotensin acts via Neurotensin receptor 1 (NtsR1)-expressing neurons in the lateral preoptic area (LPO) to reduce feeding, promote locomotor activity, and reduce body weight and pain. To test this hypothesis, we expressed excitatory Designer Receptors Exclusively Activated by Designer Drugs (DREADDs) in LPO NTsR1 neurons of normal-weight and obese mice. We treated the mice with either vehicle (control) or the DREADD ligand, CNO, to activate the LPO NtsR1 neurons and measured how it impacted body weight, food and water consumption, locomotion, and pain threshold. We found that CNO-mediated activation of LPO NtsR1 neurons decreased food and water intake, resulting in a lower body weight. We are currently examining how activation of LPO NtsR1 neurons impacts locomotion and pain. Collectively, these studies will reveal whether LPO NtsR1 neurons may be targets to address obesity-pain and improve life for individuals with obes

THE EFFECTS OF TIANMA GOUTENG YIN ON PARKINSON'S DISEASE USING A DROSOPHILA MODEL

Presenter(s): Eshwar Sivaram
Neuroscience
Mentor(s): Byron Gipson (College of Natural Science)

Parkinson's disease (PD) poses a significant challenge due to its progressive neurodegenerative nature, impacting motor functions and quality of life. Tianma Gouteng Yin (TGY), a traditional Chinese medicine, has shown promise in mitigating PD symptoms through its neuroprotective properties. This study aims to replicate and validate previous findings regarding TGY's efficacy using a Drosophila melanogaster model. Building upon prior research demonstrating TGY's potential neuroprotective effects, we conducted a series of experiments utilizing four conditions: control, TGY, rotenone, and TGY + rotenone. Rotenone was used to simulate PD-like neurodegeneration. Results indicated a significant decrease in fly motility in the rotenone group compared to the control, consistent with prior expectations. Surprisingly, no significant difference was observed between the TGY and TGY + rotenone groups, contrary to previous findings. Statistical analysis confirmed these results ($F(3,8) = 4.928$, $P < 0.05$). This discrepancy suggests a potential limitation in translating TGY's neuroprotective effects observed in other models to the Drosophila system. Future investigations should explore optimal TGY concentrations and consider alternative models to elucidate its therapeutic potential further.

Nutrition & Food Science

SATISFACTION EVALUATION ON THE HAPPY FAMILY, HEALTHY KIDS INTERVENTION
Presenter(s): Reese Buhlman
Nutrition and Food Science
Mentor(s): Jiying Ling (College of Nursing)

This study aimed to evaluate parents' and teachers' satisfaction on a healthy eating and stress management intervention. Previous interventions on promoting healthy eating and preventing obesity did not focus on the important stress-eating connection, resulting in limited effects. Happy Family, Healthy Kids intervention aimed to improve healthy eating, anthropometrics, and mental well-being among preschoolers and families from low-socioeconomic status. The quasi-experimental study was conducted among 107 Head Start parent-child dyads. The 14-week intervention included 3 components: child 'Eat My ABCs' curriculum, parent-child letter, and parent program (a Facebook-based program, 3 parent meetings, and weekly motivational text messages). During intervention, parents completed an evaluation survey for each parents' meeting. After intervention, teachers completed a survey on evaluating children's curriculum, and parents completed a survey on assessing the entire intervention. Twelve participating teachers agreed that the content was informative, 11 mentioned the curriculum helped children eat more fruits and vegetables, and 9 planned to continue teaching the curriculum in the future. All parents found meeting contents helpful and 96.4-100% would recommend the meeting to other parents. A total of 84 parents completed the evaluation survey, 90.5% said the Facebook-based program's materials were easy to understand, and 88.1% would use the information in the future. Additionally, 90

SATISFACTION EVALUATION OF THE FIRSTSTEP2HEALTH INTERVENTION
Presenter(s): Sophia Tadavich
Nutrition and Food Science
Mentor(s): Jiying Ling (College of Nursing)

There is a need to develop and test daycare-based interventions with active parental involvement to prevent obesity among preschoolers. The FirstStep2Health intervention was developed to address this critical need and included five components: a Facebook-based parent program, three parent meetings, three weekly motivational text messages, weekly child letters, and a daycare-based child program. A cluster RCT was conducted to evaluate the intervention among 97 (53 intervention, 42 control) economically marginalized preschoolers. For the intervention evaluation, 11 daycare teachers completed a survey evaluating the child curriculum,10-26 parents evaluated the parent meetings, and 38 parents completed an evaluation survey. About 90.9% teachers said the curriculum was developmentally appropriate for preschoolers and helped children to engage in a healthy lifestyle. Additionally, 90.9% teachers were satisfied with the curriculum and planned to continue teaching it. Among the parents who completed evaluations for parent meetings, 90-100% found all meetings helpful and 95-100% would recommend the meetings to other parents. Among the 38 parents completing the post-intervention evaluation survey, 97.4% thought the materials posted on the Facebook program were easy to understand and assisted in having a healthy lifestyle for their family, 92.1% said they would use the information learned on the Facebook program in the future, all perceived the weekly letters by their child helpful, and

DOES HEALTHY EATING IMPROVE HOUSEHOLD FOOD INSECURITY
Presenter(s): Ava Deason, Ella Brakke
Nutrition and Food Science
Mentor(s): Autumn Ashley (College of Nursing), Jiying Ling (College of Nursing)

We aim to identify the effects of the Happy Family Healthy Kids Intervention on household and adult-child dyad food insecurity and the effects of a healthy eating and stress management program on food insecurity for parent-preschooler dyads. Many families face food insecurities due to issues such as unemployment, poverty, and the rising cost of living, resulting in unhealthy eating habits and increased stress. Past studies and interventions often overlook the correlation between it all, thus limiting possible results. Happy Family Healthy Kids targets low-income households, aiming to explain the relationship between healthy eating and stress management to improve healthy eating habits and decrease food insecurity. The sample of participants included preschoolers and their parents. Among the preschoolers, 54.2% were female, 19.6% were Black, and 8.4% were Hispanic. Among adult participants, 95.3% were female, 15% were Black, 6.5% were Hispanic, and 39.4% were single parents. Regarding education, 38.4% of parents have high school as their highest level of education, 43.4% are not employed, and 44.4% of families have an income of less than $20,000 a year. In rural and urban areas, positive changes in nutrition knowledge and problem-focused coping strategies were observed. Urban preschoolers saw a small decrease in food insecurity (d=-0.37), while parents/families saw marginal decreases in food insecurity (adult d=-0.03, p=.781; family d=-0.05, p=.674). Results support the invers

ANALYZING MICROSTRUCTURAL CHANGES IN POPCORN KERNELS USING HIGH-RESOLUTION SEM IMAGING

Presenter(s): Mahir Gandhi
Nutrition and Food Science
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

This research project aims to investigate the morphological changes in popcorn kernels using Scanning Electron Microscopy (SEM) imaging. My decision to investigate popcorn kernels is rooted in my desire to observe the structural transformations that occur during popping. This research also aims to investigate the elemental composition and expansion by conducting a comparative analysis between full-fat microwaved butter popcorn and the popular "skinny pop" on campus. The samples, popped and un-popped, will be sliced with precision and coated with a conductive material before being observed under the Scanning Electron Microscope. The results of the research aim to provide valuable insights to the consumers about the popcorn they eat, to determine if "skinny pop" is worth it, and to hopefully improve product quality and manufacturing processes.

DETERMINANTS OF BODY IMAGE

Presenter(s): Alayna Tisch
Nutrition and Food Science
Mentor(s): David Ortega (College of Agriculture & Natural Resources)

Body image is the collection of an individual's thoughts, feelings, behaviors, and attitudes, either positive or negative, surrounding their body and its appearance. Previous research has found measures of body image to be highly associated with mental health, with negative body image connected to depression, eating disorders, and anxiety. Specifically, in the case of adolescents, body image dissatisfaction can be related to healthier or more restrained eating habits, while for adults research suggests that dissatisfaction is associated with unhealthy eating habits including higher consumption of ultra-processed foods. This study implements the Body Appreciation Scale (BAS-2) on an online survey of US adults (n = 1328) to evaluate the socio-economic and anthropometric determinants of body image. Our analysis finds an inverted U-shaped relationship between body image and Body Mass Index. Factors such as strong political ideology, living in a rural area, religious convictions, and higher levels of education were associated with higher body image scores. Identifying determinants of body image can help target early interventions that address mental health issues.

EFFECTS OF THE 'HAPPY FAMILY, HEALTHY KIDS" INTERVENTION ON IMPROVING PRESCHOOLERS' DIETARY INTAKE AND ANTHROPOMETRICS

Presenter(s): Asjoat Kaur
Nutrition and Food Science
Mentor(s): Jiying Ling (College of Nursing)

This study examined the effects of a healthy eating and stress management program on improving fruit and vegetable intake and the anthropometric outcomes among preschoolers from socioeconomically marginalized families. A quasi-experimental study was conducted with 107 racially/ethnically diverse preschoolers recruited from Michigan Head Start programs. The Happy Family, Healthy Kids intervention program, including a daycare-based healthy eating component for preschoolers, a child learning and parent practice connection component via child letters, and a home-based stress management and healthy eating component for parents, could contribute to reducing health disparities and promoting health equity. Children were introduced to multiple different fruits and vegetables in daycares, which they would go home and share with their parents what they liked most so those healthy foods could be introduced at home. The average age of the preschoolers was 47.32 months. About 54.2% of the preschoolers were female, 8.4% were Hispanic, and 19.6% were Black. For parents, 95.3% were female, 6.5% were Hispanic, 15% were Black, 39.4% were single, and 43.4% were unemployed. The intervention has positive effects on reducing preschoolers' BMI z-score and food insecurity as well as improving fruit and vegetable intake. Regarding urban-rural differences, the intervention tended to have better effects on increasing rural preschoolers' fruit and vegetable intake while greater effects on reducing

EXPLORING ECO-BEHAVIORS THROUGH FOCUS GROUPS

Presenter(s): Alaina Bennett, Lauren Garrison, Lea Saputo, Lelaina VanderPloeg, Rebecca Gekonde, Wes Kim
Nutrition and Food Science
Mentor(s): Katherine Alaimo (College of Agriculture & Natural Resources)

The climate and nature crises threaten life on Earth. To address these crises, changes to our daily practices such as reducing home energy use, eating plant-based foods, and walking and biking for transportation are necessary. The Earth Is My Home initiative is designed to motivate and empower individuals to adopt sustainable behaviors. The initiative promotes a checklist of eco-friendly actions, personal conversations, and advocacy. This study: 1) conducted a review of current climate-impact apps, and 2) conducted focus groups. Thirty eco-apps that ask users to assess their climate footprint and actions were reviewed in the categories of messages, sources, ease of use, and engagement. A checklist of eco-conscious behaviors was created covering six categories: nature, home energy, food, material waste, transportation, and advocacy. Four focus groups were conducted to gauge attitudes, awareness, opinions, and current and expected behaviors of eco-friendly checklist actions. Focus group participants were asked questions involving opinions and current or future participation in said actions, including thoughts on the future of this project. Focus group conversations were recorded and transcribed verbatim. Data were analyzed using Atlas.ti and themes were developed. Actions

suggested in eco-apps were categorized and summarized and used to develop focus group questions. Focus group findings will be summarized in the following categories: eco-actions for food, waste, tran

IDENTIFYING PATTERNS OF ALLERGEN EXPOSURE IN 12-TO-36-MONTH-OLD CHILDREN AND THE GUT MICROBIOTA AT 24 MONTHS IN A MICHIGAN COHORT

Presenter(s): Heli Sheth
Nutrition and Food Science
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

As the prevalence of food allergies continues to rise, it has become a major health concern for parents to reduce the incidence of food allergies and other atopic diseases. This study aims to characterize the consumption patterns of 7 major food allergens in children in a Michigan cohort to determine if nutritional guidelines for early exposure to food allergens are being followed by caregivers. This study also aims to identify gut microbiota differences at 24 months of age based on allergen exposure. This longitudinal study assessed childhood allergen intake using 24-hour and year-long recall parent-report, food intake questionnaires at 12, 24, and 36 months of age. Following extraction, amplification, and sequencing of fecal samples, gut microbiota data will be analyzed for diversity metrics. All statistical analyses are conducted in R using the R Studio Interface. Apart from dairy and wheat, most allergens were avoided within the first year of life. Dairy was the most consumed allergen in the 24-hour diet recall at all time points. Whereas wheat was the most consumed allergen based on the year-long diet recall at each of the three time points. Over the first three years, peanuts were consumed by 30-50% of the participants based on 24-hour recall. Based on 24-hour and year-long diet recall across all time points, soybeans were the least consumed allergen. Tree-nut, egg, and soybean consumption significantly increased with age. Overall, the diet diversity score, based on 24-

THE ROLE OF THE GUT MICROBIOME IN NEURODEVELOPMENT OF CHILDREN AND ADOLESCENTS

Presenter(s): Neha Gopalakrishnan
Nutrition and Food Science
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

The gut microbiome consists of millions of bacterial families which play a crucial role in metabolism, digestion, and immunity. In recent years, emerging studies have described a bidirectional relationship between the gut and brain, termed the gut-brain axis. Research conveys that neurons within the intestinal system can communicate with the brain and vice versa, suggesting that gut health may modulate mood regulation and cognitive abilities. This study aims to assess relationships between gut bacterial abundance and diversity in children and adolescents in relation to their cognitive neurodevelopment. 45 participants, between the ages of 4-13 years, were recruited; each participant underwent a cognitive assessment using the NIH toolbox, and fecal samples were obtained for microbiota analysis. DNA extractions and PCR was performed on each fecal sample to amplify the 16S gene, and samples were sent for sequencing to determine bacterial compositions of the gut microbiome. Data analysis platform

R was utilized to analyze microbial abundance and diversity, and then R was used to further associate these patterns with the participant's cognitive scores as well as measures of memory, attention, and verbal learning. As a result, this study aims to elucidate the role of the gut microbiome in neurodevelopment within early and middle childhood. Better understanding the link between the gastrointestinal and central nervous systems can improve physical and mental health, influencing the o

SURVIVAL OF SALMONELLA ON WHEAT GRAIN IN STORAGE THROUGH FREEZE-THAW CYCLES

Presenter(s): Shaney Rump

Nutrition and Food Science

Mentor(s): Teresa Bergholz (College of Agriculture & Natural Resources), Yawei Lin (College of Agriculture & Natural Resources)

This study will assess the behavior of Salmonella on wheat during simulated storage temperature fluctuations akin to those encountered in grain elevators across key wheat-producing counties in the United States. Freeze-thaw cycles across these counties have average lows of -24.3˚C and average highs of 3.85˚C immediately following the lowest temperatures- the highest average temperature reached before refreezing is 10.73˚C. These data will be used to simulate controlled freeze-thaw cycles of inoculated grain. The study aims to elucidate the survival, growth, and potential interactions of this pathogen under conditions reflective of real-world storage environments. Through controlled laboratory experiments, we intend to explore the impact of varying temperature regimes on the proliferation and persistence of Salmonella, which is of significant concern for low-moisture foods. While the study is ongoing, the data and insights into the behavior of this pathogen will contribute to our understanding of foodborne illness risks associated with grain storage and handling practices.

SALMONELLA LETHALITY DURING PILOT-SCALE ROTISSERIE CHICKEN ROASTING

Presenter(s): Ava Chavez

Nutrition and Food Science

Mentor(s): Bradley Marks (College of Agriculture & Natural Resources), Ian Hildebrandt (College of Agriculture & Natural Resources), Michael James (College of Agriculture & Natural Resources)

The revised USDA FSIS Cooking Guideline Appendix A identified a scientific gap regarding Salmonella lethality on the surface of rotisserie cooked chicken, given the potential for surface drying that may promote Salmonella survival. Purpose: The purpose of this study was to validate Salmonella surface lethality during pilot-scale cooking of rotisserie chickens. Methods: Raw whole chickens were sourced from a local supplier. The chickens were surface-inoculated with an 8-strain Salmonella cocktail and refrigerated. Two inoculated and 4 uninoculated carcasses were cooked in a retail-scale rotisserie oven, until an internal temperature ≥73.9ºC was reached. Skin sections then were excised from the upper/lower anterior and posterior and from the left/right wings and legs. The excised samples were chilled in peptone water, stomached, serially diluted, plated, incubated, then enumerated. Results: The average cook time and yield were 53.8±2.8 min and 77.7±5.2%, respectively. Although some individual samples exceeded 7 log reductions, the mean Salmonella log reduction for the upper and lower anterior, wings, legs, upper and lower posterior were 5.73±1.20, 5.84±1.08, 5.70±1.00, 5.83±1.50, 5.55±0.99, and 5.62±1.50, respectively. Sample location did not impact Salmonella reductions (α = 0.05). None of the sample locations exceeded the 7-log reduction target (α = 0.05). Significance

PERCEPTION OF SWEETNESS IS DICTATED BY MORE THAN JUST SWEET TASTE: AN INVESTIGATION OF HONEY AROMA ON SWEETNESS PERCEPTION.

Presenter(s): Alyssa Hawkins

Nutrition and Food Science

Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources), Hannah Mulheron (College of Agriculture & Natural Resources)

Sweetness enhancement using aromas is an approach that can be used as a tool for sugar reduction of food products. In a previous study we found that the aromas present in honey increased the perception of sweetness, but it is still unknown as to what aroma molecules were contributing to that increase in sweetness perception. This present study worked to quantify the impact of individual aromas on sweetness perception. We tested 10 individual aroma molecules (8 with which were identified in honey), and 12 mixtures of the aromas that were tested individually; all aromas were added to sugar water solutions (25g/L). Panelists (n=55) rated sweetness intensity and the intensity of other sensations (how strong the flavor is) using the Global Sensory Intensity Scale (GSIS). Blinded samples were pumped into 2oz black cups(20mL) and served in replicate; presentation order was determined by a randomized complete block design (RCBD). It was found that vanillin aroma and "fruity" aroma molecules (decanal, phenylacetaldehyde, 2-phenylethanol) sample showed the highest increase in sweet taste of the samples. Additionally, it was found that ratings of high in intensity of other sensations were high in samples with mixtures of "fruity" and "green" aroma molecules. These results help us determine aroma compounds that can be implemented in low sugar food products with the knowledge that consumer acceptance is highly correlated to sweetness intensity. In the long run with this strate

ENCOURAGING EATING COMPETENCE IN UNDERGRADUATE STUDENTS

Presenter(s): Ava Bell, Erykah Boynton, Wes Kim

Nutrition and Food Science

Mentor(s): Blair Burnette (College of Social Science), Katherine Alaimo (College of Agriculture & Natural Resources)

Disordered eating is common among college students. College nutrition classes offer students opportunities to learn about health-promoting eating patterns, but paying attention to one's diet can also elicit negative behaviors and feelings. This study's purpose is to understand students' understanding of their eating competency. We analyzed data from a subset of students (N=50) enrolled in an introductory nutrition course at a large midwestern university. Participants completed an assignment that involved completing an index of eating competency and then reflecting on their scores. Data were de-identified and exported for analysis. Inductive content analysis was used to analyze the data. The research team included three undergraduate students and two faculty advisors. First, the team immersed themselves in the data by thoroughly reviewing responses and making notes on common themes. Then, the team developed a codebook that included the most common responses related to insights generated by their diet, desire to change, and the emotions elicited by the assignment. We coded the responses of 50 students, noting the presence of each respective coding category. Preliminary themes identified included realization of current diet composition and identification of areas for improvement, including fruit and vegetable intake. Many participants' responses reflected a feeling of empowerment and positive desire to change their eating competency. A subset of students expressed anxi

THE AFFECT OF AROMAS PERCEPTION OF SWEETNESS ON A DOSE RESPONSE
Presenter(s): Rhajani Shepherd
Nutrition and Food Science
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources), Hannah Mulheron (College of Agriculture & Natural Resources)

Aromas play a major role in our perception of sweetness. Studies show that sweet enhancement by aroma could be the resolution to sugar reduction in consumer foods and beverages. Which is important in public health standing, over-consumption of sugar is leading to obesity, low energy, and dental risk across many nations but mostly the United States. During this study we specifically looked at how aromas Vanillin and Limonene would affect the dose response curve based on highest and lowest sugar detectable threshold. 3 dose responses were represented, and 6 concentrations were tested with a sensory panel of 55. Each panelist underwent training prior to the study using the global sensory intensity scale. 6-series of concentration sets 0,12.5, 25, 50,100, 2000g of sugar per liter were prepared in 3 different aroma conditions. No aroma presents to serve as the dose response control, 10pm with Vanillin present and 10ppm with Limonene present. Each panelist was served 2 of each aroma condition, total of 6 samples. During the study panelists were asked to rate sweet intensity and other sensations for each sample. We hypothesized that when sugar is at a lower concentration and aromas are at a higher concentration, the sweetness perception will be more potent. Results suggest our hypothesis was proven that there is a significant difference between sweetness intensity at 0 concentration between all aroma conditions, at 12.5,25 and 100 concentrations between 1 of the aromas and no

ELEVATED BASELINE HAIR CORTISOL DECREASED INTERVENTION EFFECTS ON DIETARY INTAKE AND ANTHROPOMETRICS
Presenter(s): Abigail Tassin
Nutrition and Food Science
Mentor(s): Jiying Ling (College of Nursing)

Children and parents from socioeconomically marginalized families experience high levels of stress limiting their engagement in healthy lifestyle. However, no study has explored how elevated chronic stress (hair cortisol) influences the effects of a healthy behavior promotion intervention. The Happy Family, Healthy Kids is a 14-week mindful eating intervention aimed to improve young children's fruit/vegetable intake and anthropometrics (body mass index, % body fat). This secondary data analysis aimed to examine whether elevated hair cortisol affected the intervention effects on these outcomes. Among the 107 parent-child dyads participated in the quasi-experimental trial, parents were predominately women and children were 52.8% girls. About 6.5% parents were Hispanic, 15.0% were Black, 39.4% were single, and 43.4% were unemployed. Children's hair cortisol was positively related to their parents' hair cortisol (r=.49, p<.001). Children's elevated hair cortisol decreased the intervention effects on their own % body fat (r=.31, p=.020). Both elevated children's hair cortisol and parents' hair cortisol decreased the intervention effects on increasing children's fruit/vegetable intake (r=-.19, p=.195; r=-.18, p=.186). Parents' elevated hair cortisol decreased the intervention effects on reducing their BMI (r=.20, p=.150). Although the study's results need further confirmation in a future large RCT, the results suggest that stress could attenuate intervention effects on improving

BIOLOGICAL SEX DIFFERENCES IN QUALITY OF LIFE AMONG YOUNG URBAN ADOLESCENTS
Presenter(s): Alisha Shahab, Katie Nguyen
Nutrition and Food Science
Mentor(s): Logan Hobbs (College of Nursing), Lorraine Robbins (College of Nursing), Sheldon Donald (College of Nursing)

Comprehensive information is lacking about whether underrepresented young male and female adolescents who live in underserved urban communities differ in their perceived quality of life (QOL). A secondary analysis of baseline data from a NIH-funded R61/R33 study (HL144896) was conducted to examine biological sex differences in QOL among predominantly minority adolescents living in underserved communities. Adolescents in 5th to 8th grade (N=163) attending four schools in Michigan participated. Before participating, parental consent and adolescent assent were obtained. Adolescents completed a demographic survey in addition to the 23-item Pediatric QOL Inventory via Qualtrics to report how much of a problem something has been over the past month (0=never to 4=almost always). Adolescents responded to 4 QOL domains: physical, emotional, social, and school functioning. Items were reverse-scored and then converted to a 0-100 scale (0=100, 1=75, 2=50, 3=25, 4=0) with higher scores indicating better QOL. Weight status (underweight/healthy weight [UW/HW] and overweight/obese [OW/OB]) based on body mass index (BMI) was estimated from height and weight (objectively measured with portable stadiometer and Tanita scale, respectively). Mann-Whitney U test and Chi-squared test via SPSS28 were used to analyze the data with p<.05 being considered as statistically significant. The groups were similar regarding age. No biological sex differences were noted in the percentages of adolescen

EFFECT OF PROCESSING AND CULTIVAR ON PULSE FLAVOR: QUANTIFICATION OF SENSORY ATTRIBUTES AND VOLATILE COMPOSITION USING DESCRIPTIVE SENSORY ANALYSIS AND GC-MS

Presenter(s): Sarah Coyne
Nutrition and Food Science
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources), Kaveri Ponkshe (College of Agriculture & Natural Resources)

Pulse flours are increasing in popularity as an ingredient in consumer products. This is due to the beneficial effects on human health, the cropping system, and environmental impact. The goal of this study is to characterize these flavors in order to be able to incorporate more pulses in consumer products. However, due to their sensory characteristics, it can be challenging to incorporate pulse flours and still achieve a satisfactory product. The key to minimizing common off-flavors in pulses including earthy/musty, green, bitterness, and astringency relies on the choice of cultivar and processing method. We used different processing methods of 8 different pulse cultivars (Navy, White Kidney, Great Northern, Cranberry, Otebo, Mayacoba, Manteca, and Kabuli Chickpea) to produce the following samples: 1) unroasted pulse flours, 2) roasted pulse flours (dry heat), and 3) boiled pulses (wet heat). Preliminary data from GC-MS showed volatile composition differs due to cultivar (e.g. musty odorant geosmin is only present in white kidney) and processing method (e.g. chocolate-like 2,5-dimethyl pyrazine content is highest in roasted samples). Subsequent analysis will quantify variations across samples. Volatile organic compounds were identified through headspace solid-phase microextraction/gas chromatography-mass spectrometry (SPME GC-MS). In the future, this research will provide insights for product developers to refer to when considering what pulses they will use for their pr

CHANGES IN THE FATTY ACID PROFILE OF EGGS ACROSS THE GRAZING SEASON IN A SOUTHERN OHIO-BASED PASTURE-RAISING SYSTEM FOR LAYER HENS

Presenter(s): Kayla Fenton
Nutrition and Food Science
Mentor(s): Rachel Vanduinen (College of Agriculture & Natural Resources)

There is growing interest in regenerative egg farming with a focus on soil health, increased biodiversity, and symbiosis between the chickens and the environment. Foraging allows poultry access to nutrient-rich and biodiverse feed, producing eggs with a more favorable nutrient profile for human health. However, throughout the seasons, the quality and composition of the feed may vary. The objective was to characterize seasonal changes in the fatty acid profile of pasture-raised eggs across the foraging season. Methods: Twenty-four egg samples were collected monthly from May to December and pooled to form n = 12 replicates per month. Egg yolk fatty acids profiles were determined using gas chromatography-mass spectrometry analysis. Results/Conclusions: Coming soon, currently undergoing analysis

TEMPORAL METABOLIC RESPONSES TO HIGH-INTENSITY INTERVAL TRAINING IN POSTNATAL GROWTH RESTRICTION

Presenter(s): Shrika Gubbala

Nutrition and Food Science

Mentor(s): David Ferguson (College of Education)

Introduction: Approximately 24% of children globally are impacted by growth restriction. Postnatal growth restriction (PNGR) significantly increases the likelihood of cardiometabolic disease in adulthood. Exercise capacity (Wmax) improves health outcomes. Recent findings show the positive effects of high-intensity interval training (HIIT) in improving Wmax in PNGR. Metabolic outcomes and their association with Wmax are still unclear. Therefore, the purpose was to determine the relationship between Wmax in PNGR and metabolic responses after 4 weeks of training. Methods: Growth restriction was induced by nursing mice from dams fed a low protein diet (LP; 8%) or a control diet (CON; 20%) until weaning at the postnatal age of 21 days (PN21). At PN21, all mice were fed the CON diet until adulthood (PN70). Previously collected Wmax data and categorized metabolic abundances were used to determine relationships through regression analyses. Results: Wmax and amino acids were positively associated ($p<0.0001$, $r2=0.633$), while Wmax and fatty acids were weakly associated ($p=0.005$, $r2=0.169$). Separate treatment group analysis showed strong positive relationships between Wmax and amino acids in PUN-TRD ($p=0.002$, $r2=0.5125$) and CON-TRD ($p= 0.004$, $r2=0.4944$). There was a negative relationship between Wmax and fatty acids for CON-TRD ($p>0.05$, $r2=0.03601$), and a positive relationship in PUN-TRD ($p= 0.0002$, $r2=0.5122$). Conclusion: The relationship between amino

OPTIMIZING PULSE FLOUR: IMPACT OF DIVERSE PROCESSING ON FUNCTIONALITY

Presenter(s): Katie Runstrom, Saamia Hasan

Nutrition and Food Science

Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources), Kaveri Ponkshe (College of Agriculture & Natural Resources)

Pulse flour demand as an ingredient in processed food is on the rise internationally with higher growth rates than wheat and other flours. There is increased recognition from food processors and consumers that pulses are nutrient-dense, rich in plant protein, and environmentally sustainable. While the nutritional and environmental attributes of pulses are very appealing, there are flavor, functionality, and processing barriers that must be overcome to ensure their usefulness and long-term adoption. To gain a better understanding of pulses and how they can be used in foods, we are testing Pinto beans, Navy beans, and Chickpeas for their functional properties. Starting with pre-processing techniques like cleaning and drying, treating with roasting, and infrared radiation. Consequently, using a variety of different milling techniques like hammer, roller, stone, and compression mills to produce untreated, roasted, and infrared pulse flours. To observe the effects of these pre-processing techniques we will perform several functionality tests: particle size, bulk density, water absorption and well as recording their starch, protein, and moisture content. The objective of this study is to determine the effect of various milling systems as well as study the effect of infrared radiation and roasting on pulse flours. Breeders, farmers, millers, food product developers, and other groups involved in the pulse flour value chain, would all benefit from consistent and tested recommenda

EXPLORING VAGINAL MICROBIOTA VARIATION THROUGHOUT REGIONS OF MICHIGAN
Presenter(s): Yash Khiraya
Nutrition and Food Science
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

The composition of the vaginal microbiome significantly contributes to a woman's general and reproductive health. A typical health vaginal microbiome is widely characterized by the presence of the *Lactobacillus crispatus-dominated vaginal microbiota (CST I*), and its composition can be disrupted by alteration in vaginal health behaviors, sexual activity, antibiotic usage, and hormones. Conversely, low levels of *L. crispatus* are associated with a greater incidence of bacterial vaginosis and recurrent urinary tract infections (UTI). Moreover, in pregnancy, the monitoring of changes in the vaginal microbiota becomes of greater importance as bacterial infections possess the ability to adversely impact maternal and fetal health. While studies have reported that *Lactobacillus* abundance in the vaginal microbiome is partially attributed to the effects of consuming probiotic-rich foods or supplements, there is minimal research available assessing fluctuations in vaginal microbiota concentrations across regions throughout Michigan. Exploring the regional differences in the vaginal microbiome will help raise awareness and promote science-based nutrition education concerning the rise of studies emphasizing the benefits of consuming probiotics. Hence, this project observes the variations in vaginal microbiota abundance, specifically *Lactobacillus crispatus*, with respect to probiotic consumption status from urban (n=44)

DEVELOPMENT OF THE 1-MONTH INFANT FECAL MICROBIAL COMMUNITIES: BIOACTIVE MARKER (HMO) HUMAN MILK OLIGOSACCHARIDE AND INFANT FORMULA INTAKE
Presenter(s): Katrina Liang
Nutrition and Food Science
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Breastfeeding, the recommended diet for human newborns, is crucial in shaping the infant's gut microbiota. Human milk oligosaccharides (HMOs), one of the highly concentrated bioactive factors in human milk, are polymers of simple sugars which contribute to the development of the infant's microbiota. By acting via various mechanisms, they protect against infections (pathogens) and improve brain development. Infant formula is a substitute method of feeding, which can provide the necessary nutrients. Currently, some infant formulas include one or more HMOs, though these formulas still lack the other bioactive ingredients in human milk. The objective of the study was to screen specific HMO-metabolizing genes in genomic DNA of 1-month infant stool using quantitative real-time PCR (qPCR). Then, using that data and information about infant formula and human milk intake, we will evaluate and compare the effects of human milk and infant formulas on the presence and abundance of HMOs metabolizing genes in 1-month infant stool. Our findings indicate that the exposure to human milk is responsible for the varying concentrations of HMOs metabolizing genes in infants.

Future studies of infant formula and microbial genes of the gut microbiota are needed to fully understand the impact of diet on gut microbes and subsequent effects on infant development.

PRELIMINARY FINDINGS OF TART CHERRY SUPPLEMENTATION ON SLEEP OUTCOMES

Presenter(s): Dharshini Senthilkumar, Olivia Bartunek, Sruti Mathi
Nutrition and Food Science
Mentor(s): Eric Gurzell (College of Agriculture & Natural Resources), Jenifer Fenton (College of Agriculture & Natural Resources), Robin Tucker (College of Agriculture & Natural Resources)

Nearly 1 in 3 Americans do not get enough sleep. Insufficient and poor-quality sleep are linked to negative health outcomes including obesity, hypertension, and dyslipidemia. Montmorency tart cherries (TC) may help resolve sleep issues due to bioavailable melatonin - a hormone that promotes sleep. The objective of this RCT study is to determine if TC supplementation improves the duration and quality of sleep in overweight individuals. A preliminary cohort of 22 participants, 72.7% female, aged 18-50 y, with a BMI ≥ 25.0 kg/m2 completed the study. Baseline and post-treatment insomnia, sleep quality, and Fitbit data were collected. The average age of the participants was 35.2 ± 11.8 y and BMI was 33.5 ± 8.2 kg/m2. Insomnia Severity Index scores for participants did not change based on treatment (pre TC: 12.5 ± 5.4 vs. post TC: 11.0 ± 5.1; pre ctrl: 12.6 ± 5.1 vs. post ctrl:11.5 ± 4.6; $p > 0.05$;). Pittsburg Sleep Quality Index score improved in the placebo group (pre ctrl: 9.0 ± 3.2 vs. post ctrl: 8.0 ± 2.9; $p=0.008$) and nearly in the TC group ($p=0.050$). Contrary to the hypothesis, TC supplementation resulted in shorter sleep duration (pre: 7.0 ± 1.0 h vs, post: 6.4 ± 0.9 h; $p=0.021$); whereas, the control group experienced longer sleep duration (pre: 6.6 ± 1.2 h vs. post: 7.1 ± 0.9 h; $p =0.019$). These preliminary results raise questions about whether TC supplementation aids in positive sleep outcomes. With the addition of more participant data, these results are subject

EVALUATING THE USE OF AROMATIC SWEETENERS TO FACILITATE REDUCED SUGAR INTAKE: A CASE STUDY COMPARING HONEY AND SUGAR IN DIVERSE FOOD PRODUCTS

Presenter(s): Anna Wagner
Nutrition and Food Science
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources), Hannah Mulheron (College of Agriculture & Natural Resources)

Studies have found that sweetness is dictated by more than just sugar content; certain aromas have been shown to enhance sweetness perception. Sweetness plays a large role in consumer liking of a food product. Our research is investigating the sweetness-enhancing potential of aromas in honey, looking to see if the use of this aromatic sweetener can be used to decrease added sugar consumption while maintaining sweetness intensity and consumer liking of food products. In a previous study, we found that honey and sugar were equivalently sweet per unit mass, in water. To validate these findings in food mediums, 6 foods (oatmeal, plain Greek yogurt, leafy greens salad, hot black tea, hot herbal tea, and iced black tea) were sweetened with equal masses of either sugar or honey. Consumers ($n \geq 102$) rated overall liking (GLMS) and sweetness intensity (VAS) for each sample. Paired two-tailed T-tests were used to determine whether there were significant differences ($\alpha=0.05$) in perceived sweetness and overall liking between the sweetened products. It was found that sugar-sweetened samples were more liked (except for hot black tea and leafy greens salad) and more sweet (except for leafy greens salad) for the products tested. These results show that the level of sweetness that is influenced by aroma, varies by food product. With this information, further research can be conducted to analyze which specific aromas and tastants can be paired together to reduce added sugars while m

UNDERSTANDING PACKAGING-DRIVEN FOOD WASTE AT U.S. HOUSEHOLDS.

Presenter(s): Antonia Suchy, Isabel Stauffer, Rachel White
Nutrition and Food Science
Mentor(s): Brian Werner (INFORMATION TECHNOLOGY SERVICES)

Our research aims to investigate the impact of food packaging features on consumer-level food waste. In this research, we have developed a diary study with the length of 8 weeks to understand the impact of various packaging features (i.e., reseal-ability, transparency, size-wise fitted for the consumer's need, and rigidity) on the waste of seven food products. In partnership with Qualtrics, the team recruited more than 2,500 panelists for participation in this project. The study contains two types of survey that should be taken by panelists every week: a shopping survey and a post-consumption survey. For the shopping survey, the panelists report what food items they have purchased in that week. In addition, they are required to take a picture of their food such that the team could retrieve packaging format information from that image later. For the post consumption survey, the panelists are required to report their weekly consumption and waste by taking pictures of their discarded food before sending it to the trash bin. The data collection has been started from November 13, 2023, and will be continued until at least 300 panelists successfully complete the 8-week diary study. We as a team of undergraduate students read those images from the shopping and post-consumption surveys and translate them to the numbers and texts. For example, we are required to check the image of the food packaging for baby carrots and translate it to resealable plastic bag or non-resealable plastic

CHARACTERIZING STRAWBERRIES GROWN IN CONTROLLED ENVIRONMENTS: DESCRIPTIVE ANALYSIS AND CONSUMER ACCEPTANCE

Presenter(s): Lily Wei
Nutrition and Food Science
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources)

Strawberries are beloved and grown worldwide. With increasing consumer demand, strawberries have expanded into controlled environment (CE) production. Albion, the primary cultivar for CE production, currently doesn't achieve the yield efficiency needed for profitability under CE; therefore, other cultivars need evaluation as better alternatives to deliver high yield and quality for CE production. We aim to quantify quality attributes and understand consumer liking of different strawberry cultivars grown at varying temperature treatments under CE production. Three strawberry varieties were used: Albion, Monterrey, and Cabrillo. Each variety was grown under 5 temperature treatments, ranging from a high of 27ºC/19ºC day/night temperatures to a low of 15ºC/7ºC day/night temperatures. A team-tasting panel (n=11) came in weekly, where indoor-grown strawberries were evaluated for color (interior and exterior), attribute intensity (flavor and texture), liking (overall, appearance, flavor, size, and texture), and Just-About-Right (JAR) scaling (size, firmness). Two of six sessions are completed; samples are presented in replicate, with panelists receiving each sample twice throughout the sessions. Sensory attribute intensity and hedonic rating differences were analyzed via ANOVA and LSD post-hoc tests, while JAR ratings were analyzed via binomial tests (α=0.05). Albion strawberries (18ºC/10ºC) were significantly sweeter than Cabrillo (18ºC/10ºC). Cabrillo strawberries (21ºC/13ºC)

Pharmacology & Toxicology

VOIDING DATA COLLECTION AFFECTS UNRESTRAINED VOIDING BEHAVIOR IN MICE
Presenter(s): Mackenzie Brasseur
Pharmacology and Toxicology
Mentor(s): Nathan Tykocki (College of Osteopathic Medicine)

Mice, like humans, exhibit conscious voiding behavior, but measuring murine urinary voiding behavior for an extended period of time can be difficult. Even though mice are nocturnal, most measurements were made during daylight hours and for 4 hours or fewer. Recently, the UroVoid System was developed to measure unrestrained voiding behavior for 48 hours or longer and repeatedly over months. We hypothesized that mice would void less often as they aged, and that void volume and time between voids would increase. Over the 6-week experiment, a cohort of mice (N=5) were placed in the UroVoid cages weekly for 48 hours with *ad libitum* food and water. Another cohort of mice (N=6) were used to measure voiding behavior every other week for 8 weeks. After completion, data were analyzed and compared over time. When measured weekly, mice voided with increased frequency, decreased void volume, and decreased void interval as compared to week 1. Interestingly, the opposite occurred when measured every other week: void volume increased, and void frequency decreased. We conclude that how voiding measurements are made influences mouse voiding behavior. This may be because mice were placed in a different chamber every week in the first cohort, or because voiding was recorded weekly instead of every other week in said cohort. Future experiments will be changed by only doing the experiment every other week and ensuring that the mice are placed in the same chamber for every experiment.

IMPACT OF 19, 20-EPOXYDOCOSAPENTANOIC ACID ON THE PRODUCTION OF MATRIX METALLOPROTEINASES BY PRO-FIBROTIC MONOCYTES
Presenter(s): Alondra Ladymar Rodriguez Torres
Pharmacology and Toxicology
Mentor(s): Bryan Copple (College of Human Medicine)

Chronic liver injury (CLI) can progress to liver fibrosis (LF), a life-threatening condition characterized by excess deposition of extracellular matrix in the liver. Currently, there are no treatments for this disease. As a result, LF is the 14th leading cause of death worldwide underscoring the importance of identifying new treatments. During CLI, monocytes are recruited to the liver where they release proinflammatory cytokines and growth factors that stimulate the deposition of fibrotic matrix in the liver. Experimental studies have shown that during spontaneous fibrosis reversal, these monocytes differentiate into macrophages that produce matrix metalloproteinases (MMPs), including MMP-13, that degrade the extracellular matrix. Prior studies have demonstrated that 19, 20-Epoxydocosapentaenoic acid (19,20-EDP) modifies the phenotype of myeloid cells such as monocytes. However, the mechanism is unknown. In the current studies, we hypothesized that 19,20-EDP stimulates the conversion of monocytes into MMP-producing macrophages. To test this hypothesis, monocytes were purified from the livers of mice with fibrosis and treated with 19,20-EDP. mRNA levels of MMPs and proinflammatory cytokines were quantified by real-time PCR. Treatment of pro-fibrotic monocytes with 19,20-EDP produced a change in cell morphology consistent with the conversion into macrophages. Moreover, 19,20-EDP treatment increased mRNA levels of MMP-9 and MMP-13, while decreasing levels

TUMORIGENIC POTENTIAL OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) AND CHEMOPREVENTION BY NATURAL COMPOUNDS
Presenter(s): Bailey Delcamp
Pharmacology and Toxicology
Mentor(s): Brad Upham (College of Human Medicine)

Per- and polyfluoroalkyl substances (PFAS) are often praised for their surfactant capabilities, making them a valuable component of water-resistant products including paint, fire-fighting foam, and a variety of packaging materials. Despite industrial benefits, however, PFAS have been linked to several adverse prenatal, developmental and carcinogenic effects. Gap junction functioning can be used to assess toxicity of PFAS in eukaryotic cells. Gap junction intercellular communication (GJIC) has been known as an important role in the metastatic stages of cancer. This is because of GJIC's ability to act as a tumor suppressor and prevent uncontrolled cellular proliferation. We can test the effectiveness of PFAS and its ability to keep GJIC open by a technique known as "scrape loading/dye-transfer assay" (SL/DT). The same technique can be used to determine if natural compounds can be chemopreventative by preventing PFAS from closing gap junction channels. Resveratrol is a naturally occurring compound found in red wine and peanuts. Preliminary data suggests resveratrol can prevent legacy 8-carbon chain PFAS from inhibiting GJIC.

THE EFFECT OF PFAS ON BACTERIAL GROWTH
Presenter(s): Helen Oshaughnessy
Pharmacology and Toxicology
Mentor(s): Tian (Autumn) Qiu (College of Natural Science)

Per- and polyfluoroalkyl substances (PFAS) are chemicals used in many products including nonstick or waterproof products and firefighting foams. These chemicals are widely present in the environment around the world. PFAS has been detected in biological samples such as human serum and are associated with adverse biological effects in humans and other organisms. Bacteria are an important part of the ecosystem and microbiome in animals. Understanding the effect of PFAS on bacteria can help us understand the effect PFAS has on humans and the environment through the microbial communities living in and around us. The effect of PFAS on bacterial growth has not been extensively studied. In this study we investigated the effect of varying concentration of PFAS on the growth of Escherichia coli (E. coli). E. coli OP50 and BW25113 were grown in LB broth, and their growth was tracked by UV-Vis measurements (OD600). Measurements were taken manually every 1.5-2 hours for an eight-hour period. E. coli growth was measured in the presence of 0 mg/L to 100 mg/L of perfluorobutanesulfonic acid (PFBS) and perfluorooctanesulfonic acid (PFOS). We observed no significant effect of PFAS exposure on growth in LB medium. Next, we explored bacterial growth in a minimal medium of M9 supplemented with glycerol. Growth curve measurements were automated in a 16-hour kinetic run on a plate reader, aiming to increase the throughput of analysis. Further research will be done on exploring the effect of

TPPP3: A NEW TARGET TO FIGHT OVARIAN CANCER
Presenter(s): Samuel Sanderson
Pharmacology and Toxicology
Mentor(s): Adriana Ponton Almodovar (College of Human Medicine), Sachi Horibata (College of Human Medicine)

Ovarian cancer is the deadliest gynecological disease and is predicted to be the sixth leading cause of cancer-related death for women in 2024. The current standard treatment, a combination of paclitaxel and platinum-based chemotherapy, is initially effective at targeting cancerous cells. However, around 80% of ovarian cancer patients will develop chemotherapy-resistant tumors. The gene Tubulin Polymerization Promoting Protein 3 (TPPP3) is a microtubule-associated gene that increases polymerization, bundling, and stability. TPPP3 is highly upregulated in cisplatin-resistant ovarian cancer, suggesting its usage as a survival mechanism against chemotherapy. Due to the role microtubules play in cellular division, I designed and conducted a mouse xenograft study to investigate how a TPPP3 knockout affects cisplatin-resistant tumor growth. Following subcutaneous injections of cisplatin-resistant cells, either with or without TPPP3, tumor growth was measured over three weeks. Results indicated that a knockout of the TPPP3 gene alone does cause a significant reduction in the growth of chemo-resistant ovarian cancer. Currently, another study is underway to expand on these results by administering cisplatin to the mice to investigate whether the knockout of TPPP3 leads to a reduction in resistance as well.

EXAMINING THE PHENOTYPIC EFFECTS OF HUMAN SOLUBLE EPOXIDE HYDROLASE REPLACEMENT IN C. ELEGANS
Presenter(s): Ava Erickson
Pharmacology and Toxicology
Mentor(s): Kin Sing Lee (College of Osteopathic Medicine)

Research has demonstrated that soluble epoxide hydrolase (sEH) is upregulated in patients with age-associated neurodegenerative diseases such as Alzheimer's and Parkinson's disease. To study sEH in aging for neurodegeneration, Caenorhadbitis elegans (C. elegans) are proposed as they are an excellent aging model. However, I obtained novel C. elegans strains where the C. elegans epoxide hydrolase (CEEH) homologs of sEH had been replaced with human sEH, allowing me to directly study human sEH in this model. I first performed phenotypic tests on these strains to ensure no systemic effects from this replacement. For lifespan analysis, I followed a contained C. elegans population from the end of their larval stages until the entire population died. From these results I determined that all the strains followed the same decline throughout their life, and there was no statistical significance between the wildtype and humanized C. elegans. I also conducted egg production analysis where I examined progeny generation from individual C. elegans. I found that the daily number of viable progeny, the total number of viable progeny, and the percentage of viable-to-nonviable progeny throughout the life of the C. elegans showed no statistical significance between the wildtype and humanized strains, demonstrating that the replacements of CEEH with sEH had no phenotypic effects on the C. elegans. Since no phenotypic differences were observed via lifespan and egg production assays, these hum

INTERLEUKIN-5-DRIVEN EOSINOPHILIC PNEUMONIA IN DIABETIC MICE EXPOSED TO OZONE.
Presenter(s): Anna Skedel
Pharmacology and Toxicology
Mentor(s): Jack Harkema (College of Veterinary Medicine), James Wagner (College of Veterinary Medicine)

Epidemiologic studies suggest that people with type 2 diabetes (T2D) are particularly susceptible to harmful health effects of outdoor air pollutants including ozone (O3), the principal gaseous air pollutant in photochemical smog. Previously we found that KKAy mice, a strain genetically prone to T2D, develop severe eosinophilic pneumonia after inhalation exposures to O3. Pathogenic mechanisms underlying this O3-induced pulmonary inflammation are not fully known. The current study was designed to test the hypothesis that the inflammatory cytokine Interleukin-5 (IL-5) drives the massive influx of eosinophils in the lungs of O3-exposed KKAy mice, and removal of this cytokine will lessen not only eosinophilic inflammation, but also other lung histopathology caused by inhaling this airborne toxicant. Male mice were intraperitoneally injected with IgG (control) or anti-IL-5 antibody prior to and during a 2-wk inhalation exposure (4 days/wk, 4h/day) to 0 ppm (air control) or 1 ppm O3. Air control mice had no pulmonary histopathology. IgG-treated mice exposed to O3 had a marked multifocal alveolitis characterized by an inflammatory exudate composed mainly of eosinophils, fibrin(ogen), macrophages and monocytes, and lesser numbers of neutrophils. In addition, these multifocal lesions had areas of hemorrhage, interstitial fibrosis, and alveolar epithelial cell hyperplasia. In contrast, lung lesions were markedly less severe, with no eosinophilic inflammation, in O3-exposed mice treated

CHLOROPICRIN AND CELL DEATH: IN VITRO STUDY

Presenter(s): Megha Suresh

Pharmacology and Toxicology

Mentor(s): Ebenezar Okoyeocha (College of Osteopathic Medicine), Neera Tewari-Singh (College of Osteopathic Medicine)

Chloropicrin (CP), a choking agent, is a toxic chemical compound that is an agricultural fumigant and a chemical weapon with life threatening effects. The ocular effects of CP range from lacrimation, ocular irritation, injury to the cornea, conjunctiva, and blindness. There are currently no effective treatments. Using primary human corneal epithelial (HCE) cells and ex vivo rabbit cornea, our earlier studies have shown that CP caused apoptotic cell death, an increase in lipid peroxidation and oxidative DNA damage, which are markers of ferroptosis. There are no studies on assessing the effect of CP exposure on the different layers of the cornea in vivo. This current study using an in vivo mouse model, evaluates cell death in the epithelial and stromal layers of the cornea. Male Balb/C mice were randomly grouped, and the left eyes were exposed to CP vapor. At 3 and 6 hours after exposure, mice were euthanized and the number of epithelial cells and keratocytes were counted and analyzed, which revealed that at each increasing time point, the number of epithelial cells and keratocytes decreased. The mechanism of CP induced cell death is being further analyzed using ferroptosis markers in HaCAt cells. Results from our studies indicate multiple mechanisms of cell death in the cells from CP exposure. Our ongoing in vitro studies will further reveal if ferroptosis and related pathways are also involved in CP-induced cell death. These studies are novel

LUNG INJURY IN MICE FROM ACUTE CUTANEOUS EXPOSURE TO VESICATING AGENT NITROGEN MUSTARD

Presenter(s): Shruti Veluru

Pharmacology and Toxicology

Mentor(s): Neera Tewari-Singh (College of Osteopathic Medicine)

Sulfur Mustard (SM) was a chemical warfare weapon used during World War 1 with the potential to be weaponized now for terrorism. Injury to the lung, eye, and skin have been seen from exposure causing blistering and secondary infections. SM skin exposure can lead to circulation throughout the body causing injury to organs, including the lungs. In this study, we explored the role of dermal exposure to nitrogen mustard (a structural analog of SM) and the effect it has on the lungs of C57BL/6. After seeing early death of these mice with dermal exposure, we wanted to further investigate injury to the lungs. WT mice were exposed to 1 mg of nitrogen mustard (NM) dissolved in 100 µL of acetone or 100 µL of acetone as vehicle control. This was applied topically to the dorsal skin of the mice. Mice were sacrificed and tissues were collected at day 1, day 3, and day 8 post-exposure. Hematoxylin and Eosin (H&E) staining, Toluidine blue staining, and PCR were performed for further analysis. H&E staining showed lung morphology and lesions indicating inflammation. PCR results showed significant increases in expression of inflammatory cytokines, IL-1β and TNF-α. Mast cell degranulation was shown to increase in day 1 and day 8 mice when compared to the control. These novel findings show lung injury and inflammatory effects from cutaneous exposure of mice to NM. We can further analyze lung samples to better characterize progression of lung injury from multiple doses

EXPLORING MITOCHONDRIAL-TARGETED FREE RADICAL SCAVENGERS TO MITIGATE IOHEXOL-INDUCED RENAL PROXIMAL TUBULE CELLULAR INJURY: A NOVEL APPROACH USING HUMAN RENAL PROXIMAL TUBULE EPITHELIAL CELLS

Presenter(s): Donovin Thompson
Pharmacology and Toxicology
Mentor(s): Adam Lauver (College of Veterinary Medicine)

Contrast-induced acute kidney injury (CI-AKI) is a significant complication associated with contrast-enhanced cardiovascular procedures, posing a substantial burden on patient outcomes and healthcare resources. Current preventive strategies are limited, prompting the exploration of novel therapeutic interventions. This study aims to develop an in vitro model utilizing human renal proximal tubule epithelial cells (hRPTECs) to assess the viability of cells exposed to various concentrations of iohexol (Omnipaque™), a commonly used iodinated contrast agent. Additionally, we investigate the potential protective effects of mitochondrial-targeted free radical scavengers against CI-AKI. Using cultured hRPTECs, we performed a cytotoxicity assay using a range of iohexol concentrations to mimic CI-AKI conditions. Cells were incubated in the presence or absence of iohexol for either one or two hours, at which times viability was assessed using CellTiter-Fluor™ (Promega Corporation). Subsequent assays were conducted to determine the effectiveness of mitochondrial-targeted free radical scavengers, such as mitoTEMPO, in enhancing cell viability amidst oxidative stress caused by the contrast agent. Through this approach, we anticipate establishing a reliable in vitro model for studying CI-AKI pathogenesis and screening potential therapeutic agents. The findings from this research could lead to the development of adjunctive therapies aimed at reducing the incidence and severity of

Physical Sciences

POINT-CLOUD BASED MACHINE LEARNING FOR CLASSIFYING RARE EVENTS IN THE ACTIVE-TARGET TIME PROJECTION CHAMBER

Presenter(s): Poulomi Dey
Physical Sciences
Mentor(s): Man-Yee Tsang (Facility for Rare Isotope Beams)

In this work, we assess the use of machine learning to classify fission events in the Active-Target Time Projection Chamber (AT-TPC) using data from an experiment performed at the National Superconducting Cyclotron Laboratory at Michigan State University. The experiment produces an extremely large quantity of data, only 2.5% of which are fission events. Therefore, separating fission events from the background beam events is critical to an efficient analysis. A heuristic method was previously developed to classify events as Fission or Non-Fission based on hand-tuned parameters. However, this heuristic method places 5% of all events into an Unlabeled category, including 15% of all fission events. We present a PointNet model trained on the data labeled by the heuristic method. This model is used to generate labels for the events in the Unlabeled category. Using the heuristic and machine learning methods together, we can successfully identify 99% of fission events.

EXPERIMENTAL NUCLEAR STRUCTURE DATA
Presenter(s): Rylie DuBois
Physical Sciences
Mentor(s): Jun Chen (Facility for Rare Isotope Beams)

Data compilation and evaluation are important for discovering unknown nuclei and bridging data gaps found in pre-existing compilations and evaluations. Nuclear databases are all hosted at the National Nuclear Data Center (NNDC), with the most relevant nuclear structure and decay databases being the Nuclear Science References (NSR), the Experimental Unevaluated Nuclear Data List (XUNDL), and the Evaluated Nuclear Structure Data File (ENSDF). XUNDL compilations provide up-to-date and relevant information for research, and they also format this data to be uniform and standardized for ease of search, which expedites the evaluation process. ENSDF data evaluations provide recommended data that has been meticulously and comprehensively reviewed with supporting evidence from previous research and well-established theories. Methods of compiling nuclear structure and decay datasets include thorough reading of a published or (sometimes unpublished) paper on a nuclear physics experiment or discovery, scanning tables of data into an Excel file, formatting data into an ENSDF-format dataset, using Java code programs to correct any mistakes in the dataset, and submitting to the XUNDL database managers for review and for inclusion in the online XUNDL database to be accessed around the world. All datasets in the XUNDL database for each nuclide will be reviewed. Recommended information from that review will be uploaded to the ENSDF for dissemination of a more concrete reference and to be used i

TRANSIENT SEARCH WITH TEV BLAZARS AND BINARIES
Presenter(s): Dhiti Doddamreddy, Purvi Garg
Physical Sciences
Mentor(s): Mehr U Nisa (College of Natural Science)

Cosmic rays accelerated in astrophysical environments interact with matter to produce gamma rays and neutrinos. Unlike cosmic rays, gamma rays and neutrinos travel in straight lines and point back to their sources. In this work, In this research, we explore neutrino emissions from X-ray binaries and analyze the correlation across multiple wavelengths, specifically examining the relationship between gamma-ray, X-ray, and neutrino light curves.

HARVESTING PLATINUM RADIOISOTOPES THROUGH ANION EXCHANGE RESIN FOR USE IN CANCER DIAGNOSIS AND TREATMENTS
Presenter(s): Kiersten Hein
Physical Sciences
Mentor(s): Deepika Davuluri (College of Natural Science), Katharina Domnanich (Facility for Rare Isotope Beams)

Harvesting the radioisotopes 189Pt and 197Pt for use cancer diagnosis and treatment was the focus of this study. The release of auger electrons in 197Pt complements its specific beta decay properties, making it a suitable target to be used with cisplatin for radionuclide therapy. 189Pt has instantaneous positron emission capabilities that makes it suitable for diagnostic Positron Emission Tomography imaging (PET scan). Both radioisotopes hold potential for use in a radio-theragnostic approach where the same pharmaceutical could be labeled with a diagnostic or therapeutic radioisotope, which would allow for more accurate diagnosis and better treatment. The isotopes will be collected using a solid collector made from aluminum and tantalum foils, and it will be installed as an endpoint for a user beamline at the Facility for Rare Isotope Beams. To collect the isotopes, the primary beam fragments will be intercepted. To separate the harvested radioisotopes from the co-produced impurities like Al, Au, Ir, Os, Lu, Re, Ta, Yb, and W, anion exchange resin and TK200 extraction chromatography will be used. Primarily, aluminum foils will be dissolved in hydrochloric acid. To perform test separations, synthetic mixtures with standard solutions will be readied and examined by an Inductively Coupled Plasma - Optical Emission Spectroscopy (ICP - OES). Most of the aluminum will be removed by passing the resultant solution over the column. By altering the hydrochloric acid concentrations, alu

MICHIGAN UNDER THE MICROSCOPE: OUR STATE STONE VISUALIZED BY SEM
Presenter(s): Emily Minton
Physical Sciences
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

The poster will cover the topography and elemental composition of Michigan's state stone, the Petoskey stone, to determine which type of rock makes the best fossil and the stones' origins. To conduct this research, the scanning electron microscope in Michigan State University's STEM Building will be used. Electron dispersive spectroscopy will be utilized to analyze which elements Petoskey stones are composed of, and the secondary electron imaging will be used to view the topography. Inspecting the topography with the SEM will provide an in-depth look at the pattern of the fossil, which will allow connections to be drawn about which prehistoric creature created Petoskey stones. From the images taken with the SEM, further research will be done about why Petoskey stones are so prevalent in Michigan.

NEURAL NETWORK BASED APPROACH FOR SOLVING SCHRÖDINGER EQUATIONS
Presenter(s): Juan Lozano Gonzalez
Physical Sciences
Mentor(s): Xilin Zhang (Facility for Rare Isotope Beams)

My research project explores the application of neural networks (NN) from artificial intelligence (AI)/machine learning (ML) in solving the quantum mechanical Schrodinger equations. This exploration seeks to harness the power of AI/ML to compute quantum systems eventually as complex as the nuclei produced in the Facility for Rare Isotope Beams (FRIB) at the university. We start with employing an existing NN-based approach to compute properties of the lowest-energy states (i.e., ground states). The established strategy is searching for the NN-based trial wave functions that minimize the energies. Our study of a simple toy system confirms the viability of this approach. It demonstrates that NNs can generate trial wave functions with nontrivial behaviors at multiple length scales without basis design. In contrast, such basis design is needed in traditional approaches, which could be challenging because it requires knowledge of solutions. We then move on to the frontier in this area, i.e., computing higher-energy states (i.e., excited states). For this, we are exploring a particular strategy of our own, which could potentially add a new NN-based computational tool for solving the Schrödinger equations. In this presentation, I will discuss some preliminary results of this project as well as the future outlook.

EFFICIENTLY EXPLORING NUCLEAR TDDFT PARAMETER SPACE USING ML
Presenter(s): Aaron Philip
Physical Sciences
Mentor(s): Kyle Godbey (Facility for Rare Isotope Beams), Pablo Giuliani (Facility for Rare Isotope Beams)

The Facility for Rare Isotope Beams (FRIB) at MSU relies on a robust theory-experiment cycle: the process of theorists developing models to explain experimental results, which in turn informs and motivates new experiments. Clearly, calculations that take too long to generate hinder the discovery of new results. Nuclear theorists commonly use Time-Dependent Density Functional Theory (TDDFT) to model dynamical systems at high-fidelity. However, in tasks that require repeated inference such as theoretical uncertainty quantification, TDDFT is prohibitively slow. We present results of using the machine learning (ML) paradigm Neural Implicit Flow to emulate TDDFT calculations on a simple system at a fractional cost and explore a subset of TDDFT parameter space with considerably more ease. Our method is particularly appealing as it is independent of a mesh and represents a significant data compression of just the TDDFT calculations we were trying to emulate before even considering the benefit of learning continuous representations in both physical and parameter space. In addition to contributing to the FRIB mission, developing these models paves the way for people from diverse backgrounds to collaborate with our group and contribute to nuclear science, lowering the barrier to entry.

INTRODUCTION TO LATTICE QCD AND PION GLUON MOMENTS
Presenter(s): Kinza Hasan
Physical Sciences
Mentor(s): Huey-Wen Lin (College of Natural Science)

We all know that everything is made of atoms and the nucleus of atoms are made of neutrons and protons. But what lies beyond that? This is a question that can be answered with the help of Lattice QCD. This poster is aimed at providing an introduction to Lattice Quantum Chromodynamics by giving an overview of the standard model, strong force and quantum chromodynamics (QCD). After establishing an understanding of what LQCD is, the presentation includes the presenter's research done in this field by looking at a recent work done on Pion Gluon Moments. This work focuses on the first calculation of pion gluon moment from LQCD in the continuum-physical limit. Poster will shed light on why this number is important and how it is calculated. The process of calculating Ground State Matrix Element through two and three point correlators with jackknife resampling is outlined in detail and ratio plots are presented. The poster finally portrays the pion gluon moment number obtained by the presenter's research group and how that result compares to the number calculated by other LQCD groups and global fits.

ANALYZING HEAT INDUCED MICROSTRUCTURAL CHANGES IN POLYOLEFIN USING A SCANNING ELECTRON MICROSCOPE
Presenter(s): Aiden Niemiec
Physical Sciences
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Derived from simple alkenes, polyolefins are a type of thermoplastic polymer with a wide range of tunable physical properties depending on the monomer used during polymerization. The semi-crystalline structure and no crosslinking in thermoplastics allows for a property called plastic memory, referring to the ability to return to its original shape or size when heated after being expanded. This is especially useful in commercialized heat shrink tubing (HST), which is the subject of this study. Infrared spectroscopy and scanning electron microscopy are popular and widely used methods of learning more about a material's structure. Polyolefins can have many different monomer units, so an infrared spectrometer was used to find that the polyolefin in this HST is polyethylene. To learn more about the specific structure change after heating, pictures were taken of all sides of recovered and unrecovered HST using a scanning electron microscope. Analyzing the pictures after recovery, it can be observed that particles were generally closer together but there was no visible comparable pattern. This demonstrates how the semicrystalline structure of polyethylene doesn't recover exactly to its original structure despite its memory properties. Further research would be necessary to claim how closely the structure reverts to the original condition when recovering.

GEOCHEMICAL AND PETROLOGIC CHARACTERISTICS OF RIFT BASALTS IN THE SOUTHERN MAIN ETHIOPIAN RIFT

Presenter(s): Ashlin Niemiec
Physical Sciences
Mentor(s): Tyrone Rooney (College of Natural Science)

The Main Ethiopian Rift (MER) belongs to the greater East African Rift System (EARS); a developing continental rift. This system provides opportunity to gain a deeper understanding on the evolution of continental rifts. Lithospheric thinning plays an important role in the evolution of continental rifting, providing an avenue for the system to shift from continental to oceanic regimes. Recent magmatism in the Southern Main Ethiopian Rift (SMER) provides insight into lithospheric thinning and changes in magma sources over the course of 19 MA. Here we focus on the shifts in lithospheric mantle contributions and fractionation depth observed in Arba Minch samples (<.5 MA). Basalts from recent magmatic activity exhibit distinctive trace element patterns such as a Ba peak, Th-U trough and Nb-Ta peak. This belongs to a group of magmas common in the EARS associated with a more developed rift and limited contribution from the lithospheric mantle. These samples also exhibit higher CaO/Al_2O_3 at given MgO; interpreted as a plagioclase dominated fractionation trend with a shallower fractionation depth. Older samples from the Getra Kele formation (19-11 MA) exhibit trace element patterns, lower SiO_2 and elevated CaO, and lower CaO/Al_2O_3 at a given MgO. These characteristics are a mix of the first group of magmas and a magma that has significant influence from lithospheric mantle and metasomes, as well as

MARS REGOLITH ANALYSIS

Presenter(s): Henry Polderman, Kian Hemati, Sarah Raspanti
Physical Sciences
Mentor(s): Michael Velbel (College of Natural Science)

Educating ourselves on the depositional environments and the sedimentary makeup of Mars is imperative to understanding the geological history of Mars. In this study, we compare two samples, L5 and L8, that are analogous with certain Martian landscapes, in order to discern what role, if any, aeolian transport had in their formation. To do this, we compare L5 and L8 with samples with known aeolian history from the Pinetum. Analysis revealed similarities between all three samples in size distribution, grain elongation, and sphericity. Further, the subrounded nature of the grains indicates wind driven transportation to periglacial landforms. We hypothesize that these grains underwent aeolian abrasion, transforming them from angular to subrounded shapes. Based upon prepublished literature, we found correlations between our observed sediment properties and those from polygonal patterned ground, which we associate with permafrost and thermal contraction cracks. Our findings suggest that L5 and L8 were greatly shaped by aeolian transport.

AN OPTIMAL METHOD TO ISOLATE MITOCHONDRIA
Presenter(s): Tianyi Xia
Physical Sciences
Mentor(s): Jason Bazil (College of Osteopathic Medicine)

Mitochondria participate in key metabolic reactions of the cell and regulate crucial signaling pathways. In the liver, mitochondria are the main energy source in hepatocytes and play a major role in liver physiology. The project seeks to optimize a current mitochondrial isolation protocol routinely used in the lab and other labs globally. The primary metric used to determine whether isolated mitochondria are of high quality is called the respiratory control ratio (RCR). RCR is a ratio of the maximum ADP-stimulated respiration rate divided by the leak respiration rate. A high RCR indicates good function and a low RCR indicates poor function. The standard mitochondrial isolation protocol entails the homogenization of minced liver tissue using a handheld electronic homogenizer set at a speed of 18,000 rpm for 20 sec. This project tested out the following modifications: 1. Testing rotor speeds from 10,000, 14,000, and 18,000 rpm for 36, 26, and 20 sec. This kept the number of shear events equal across all conditions. 2. Testing different homogenization times of 10, 20, and 30 sec with speed of 18,000 rpm. This allows for the number of shearing events to change. Once the optimal homogenization conditions are determined, we investigated using more pure mitochondrial isolates by the Percoll density centrifugation method. The preliminary data suggest that 18,000 rpm at 30 sec resulted in higher RCR measures. Follow-up studies will examine how these various isolation methods impact me

TRACKING GEOCHEMICAL TRENDS THROUGH EARLY RIFT DEVELOPMENT WITH THE KALAKOL BASALTS OF THE EAST AFRICAN RIFT
Presenter(s): Shelbi Hughes
Physical Sciences
Mentor(s): Tyrone Rooney (College of Natural Science)

The East African Rift is a research hotspot for geoscientists studying the process of continental rifting. Within the Turkana Depression of Kenya, the Kalakol region contains an important record of Early Miocene volcanism (ca., 18 - 19 Million years ago). This period marks the commencement of a pulse of basaltic magmatism termed 'the Early Miocene Resurgence. Elsewhere in the region, this pulse lacks stratigraphic constraints that are necessary to probe magma evolution. Using new samples, we are able to present a flow-by-flow investigation of this pulse. We probed magma processes using the geochemistry of minerals obtained for 8 samples that are located throughout the stratigraphic section using laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS). Analysis of the mineral data revealed four unique chemical trends, starting at the base of the sequence moving upwards: (1) median geochemical trends with incompatible trace elements neither enriched or depleted; (2) enrichment of incompatible trace elements; (3) enrichment in nickel; and (4) depletion in incompatible trace elements. We hypothesize these observations reflect an initial magma differentiation system under equilibrium conditions, followed by a period of crustal contamination. The subsequent nickel enrichment is found in samples with large and abundant olivine crystals, which we suggest were derived from a new pulse of magmatism. We propose this pulse was followed by a period of magmatic resurgence,

AGN PHOTOMETRY: UV-IR COLOR RELATIONS & AUTOMATION
Presenter(s): Agrim Gupta
Physical Sciences
Mentor(s): Megan Donahue (College of Natural Science)

This research project involves the analysis of 27 Active Galactic Nuclei (AGN) sources with Ultraviolet (UV) data obtained from a pipeline in various filters. The primary objective was to reproduce the pipeline data using the Swift UVOT software and its diverse methods. However, discrepancies between the measured magnitudes and the original pipeline data were observed, indicating potential differences in aperture sizes. To address this issue, a Curve of Growth model was employed, where magnitudes were measured for various aperture sizes to study how the magnitude changes with aperture radius. The count rates increased with the aperture radius until reaching a plateau, signifying the inclusion of more background and less of the source beyond a certain radius. Comparison of the Curve of Growth model with the pipeline data demonstrated that the pipeline magnitude values were approached with an increase in aperture radius. The project further involved comparing the UV data with the Infrared (IR) magnitudes obtained from the Two Micron All Sky Survey for all aperture radii. This comparison provided valuable insights into the star formation rates of galaxies. The difference between the UV and IR magnitudes, along with the corresponding color, served as an indicator of star formation rates. An ultimate goal of this project was to automate the entire photometry process to streamline data analysis and ensure more consistent and reliable results. Automating the photometry process would

GENERATING SINGLE CYCLES OF LIGHT AT TERAHERTZ FREQUENCIES
Presenter(s): Austin Hayes
Physical Sciences
Mentor(s): Tyler Cocker (College of Natural Science)

Terahertz (THz) light pulses are used in many different types of experiments within the physics community, including THz scanning tunneling microscopy (THz-STM), which is a new experimental technique capable of visualizing single atom motion on their intrinsic length and time scales. MSU is home to the first THz-STM in the United States, with a second, next-generation microscope currently under development. A new source of THz radiation is needed for this system that produces pulses that are only a single oscillation cycle long with sufficient field strength to control quantum tunneling of electrons within the microscope. Such pulses may be obtained by using a nonlinear optical crystal to convert ultrafast near-infrared pulses into THz pulses. Recently, organic crystals have become available with high THz generation efficiency, but the near-infrared pulses needed for this process should be shorter than the output of our ultrafast near-infrared laser. In this project, we are addressing this challenge by using nonlinear optics to shorten the near-infrared pulses. Generally, when broadening the bandwidth of a pulse, the shorter the pulse can be, so we have used another nonlinear optical process to increase the bandwidth; then detected this change using a technique called frequency resolved optical gating. The next step is to 'compress' the pulses so all frequencies arrive at the same time, giving the shortest pulse. Synchronously, we are exploring the THz pulse generation effici

THE EFFECT OF MAGNON-PHONON COUPLING ON THERMAL TRANSPORT PROPERTIES
Presenter(s): Johnathan Kowalski
Physical Sciences
Mentor(s): Xianglin Ke (College of Natural Science)

This research investigates the phonon-magnon coupling in FeCl2 and its implications for thermal transport properties. Specifically, the study aims to establish a theoretical correlation between strong coupling between magnons and phonons at low energy levels and thermal conductivity and thermal Hall effect in FeCl2. To achieve this goal, we simulate the energy dispersions of both magnon and phonon bands with Sunny and Phonopy programs, respectively, and numerically calculate the phonon scattering rate which includes the contribution from magnon-phonon scattering. This study will shed light on the interactions between phonons and magnons and their collective impacts on thermal properties. Furthermore, the theoretical simulations on magnon and phonon bands will provide insights into future inelastic neutron scattering experiments planned by the Ke group.

FINDING HIGGS IN DIPHOTON DECAY CHANNEL AT HIGH PT
Presenter(s): Nityaansh Parekh
Physical Sciences
Mentor(s): Joey Huston (College of Natural Science)

Investigating high-transverse-momentum Higgs boson production in the diphoton decay channel using the SHERPA Monte Carlo generator. Monte Carlo generators use theoretical models, often based on the principles of quantum field theory, to simulate the initial state of colliding particles and the subsequent interactions that occur during the collision process. These models incorporate fundamental physical principles, such as conservation of energy and momentum, as well as the known properties of elementary particles. Through analysis of simulated events, the project aims to discern patterns and distributions, contributing to our understanding of Higgs boson production mechanisms. The project seeks to find Higgs in the Higgs to gamma gamma decay mode. It is in its preliminary stage but if within scope, running similar calculations for different modes of Higgs decay would be in synergy with the overarching idea and also yield insightful results.

THE IMPORTANCE OF 22NA DECAY FOLLOWING CLASSICAL NOVAE NUCLEOSYNTHESIS
Presenter(s): Chloe Ricker
Physical Sciences
Mentor(s): Christopher Wrede (College of Natural Science), Lexie Weghorn (Facility for Rare Isotope Beams), Lijie Sun (Facility for Rare Isotope Beams)

Classical novae are thermonuclear explosions on accreting white dwarf stars in binary systems. Radioactive 22Na, a target of space based gamma-ray telescopes, is expected to be produced in considerable amounts in these novae. However, these predictions depend on the unknown destruction rate of 22Na by protons to produce 23Mg. The first run of a nuclear reaction experiment was performed in December 2022 at the TRIUMF-ISAC-II user facility in Canada to deduce the lifetime of a key excited state in 23 Mg. At the time, two 3He ion-implanted gold foil targets were tested and data was obtained with the Doppler Shift Lifetimes 2 setup. One target was implanted at TRIUMF and one was implanted at Lawrence Livermore National Laboratory (LLNL). Both were made using similar procedures, but produced unique signatures in the experimental data. From preliminary analysis, the TRIUMF target was suspected to be less contaminated with elements and isotopes other that 3He and Au, while the LLNL target was thought to contain more 3He. However, more in-depth analysis must be done to choose which target will provide a more sensitive measurement. This work focuses on the analysis of charged particles and gamma rays detected during the experiment by using data taken on each target in order to better characterize the 3He content and contamination of each target.

UV-INDUCED INTERACTIONS BETWEEN PER-AND POLYFLUOROALKYL SUBSTANCES (PFAS) AND SECONDARY ORGANIC AEROSOL (SOA) MOLECULES USING MALDI-TIMS-TOF MASS SPECTROMETRY
Presenter(s): Abby Smith
Physical Sciences
Mentor(s): Aidan Reynolds (College of Natural Science), Tian (Autumn) Qiu (College of Natural Science)

Per-and polyfluoroalkyl substances (PFAS) and secondary organic aerosols (SOAs) are both pollutants that exist in the atmosphere, which may have a negative effect on both the environment and human health. For example, indole is a common SOA from biogenic and anthropogenic sources, and many of its precursors absorb in the range of UV-A radiation, which reaches the Earth's surface. Currently there is no work to explore if PFAS and SOAs interact with each other in the atmosphere under UV radiation, creating hazardous products. Many SOAs are UV-absorbing chemical species. We hypothesize that the co-existence of SOA and PFAS molecules under UV irradiation may present unique photochemical transformations of these species. In this work, we utilized MALDI-TIMS-TOF MS (matrix-assisted laser desorption/ionization trapped ion mobility spectrometry time-of-flight mass spectrometry) to explore if SOAs can be excited and ionized by UV radiation and if PFAS can undergo photochemically mediated transformation in SOAs with the UV MALDI laser (355 nm). Anthranilic acid, 5-nitroisatin, 7-nitroindole, and indigo were chosen as precursors of the SOA indole. These compounds were chosen based on previous research, predicted UV spectra, and chemical composition to explore if they would allow for the UV laser absorption and ionization of various PFAS molecules for mass spectrometry. UV spectra of the chosen SOAs were collected and confirmed that they absorbed within the range of the MALDI laser. Ongo

POSITION AND VIBRATION MONITOR TESTING FOR USE IN DUNE-PRISM
Presenter(s): Kayla Williams
Physical Sciences
Mentor(s): Kendall Mahn (College of Natural Science), Sarah Hawkins (College of Natural Science), Sophie Berkman (College of Natural Science)

In the United States, the Deep Underground Neutrino Experiment (DUNE), an experiment with an intense neutrino source focused on unlocking the mysteries of neutrinos is being built. Underneath Fermilab in Illinois two Near Detectors, a Liquid Argon Cryostat and a Multi-Purpose Detector, will be moved up to around 30.5 meters off axis in order to sample different slices of beam flux; the Precision Reaction Independent Spectrum Measurement (DUNE-PRISM). During PRISM motion a number of things need to be carefully monitored, such as the position of the detectors and the vibrations around them. We tested a laser measuring device for monitoring the position of the detectors to see if it met a precision requirement of 1 mm and would perform well under the environment's conditions. This includes vibrations from the near detector's motion, the lifespan of the DUNE-PRISM experiment (10) years, and a very small existing magnetic field. Additionally, accelerometers are being studied in order to monitor the vibrations around the detectors.

LASER SPECTROSCOPY OF RARE ISOTOPES
Presenter(s): Alex Buzzannco
Physical Sciences
Mentor(s): Alejandro Ortiz Cortes (Facility for Rare Isotope Beams), Kei Minamisono (Facility for Rare Isotope Beams)

Radionuclides have been extremely beneficial for medicine, energy, and human development. Though radionuclides are used extensively today, there is still a lack of understanding of the structure and stability of these nuclei. The Facility for Rare Isotope Beams (FRIB) at Michigan State University is dedicated to furthering the understanding of nuclear science through the study of radionuclides. The Beam Cooling and Laser Spectroscopy (BECOLA) facility at FRIB performs laser spectroscopy measurements for studies of a fundamental property, the radius, of a nucleus, and to test nuclear theories. In order to reliably measure a radius, the laser frequency must be well calibrated with high accuracy. For this purpose, a pump-probe saturation laser spectroscopy system of iodine molecules was installed to calibrate the laser frequency against one of many well-known resonance frequencies in iodine molecules. The principle of the saturation laser spectroscopy, how the apparatus works, and the achieved accuracy of calibrated laser frequency will be discussed.

IMPACTS OF CLIMATE CHANGE ON FREEZE-THAW CYCLES IN US CITIES: WESTERN AND EASTERN CITIES
Presenter(s): Curtis Chou, Sydney Ceyzyk
Physical Sciences
Mentor(s): Gerald Urquhart (Lyman Briggs College)

The susceptibility of infrastructure to damage from freeze-thaw cycles (FTCs) is well established, particularly in regions with frequent occurrences of these events. This phenomenon, driven by the expansion and contraction of water within structures, poses significant challenges and financial burdens for governments tasked with maintaining roads, buildings, and sidewalks. With climate change exerting its influence, alterations in FTC frequencies are anticipated. In this study, we examined weather station data from several cities in the continental United States to assess shifts in FTC occurrences. After manually downloading annual weather data for airports near major and minor cities, we used a Python program to quantify the number of days each winter where the temperature rose to or above 33° F and dropped to or below 32° F. The results of our study are consistent with the prediction of a warming climate. Our analysis shows different patterns of change in freeze-thaw cycles in western vs eastern cities. This research underscores the imperative for proactive infrastructure management strategies to mitigate the anticipated impacts of changing freeze-thaw dynamics. Keywords: Freeze-thaw cycles (FTCs), Infrastructure, Climate change. This research was part of a team project conducted by the authors listed above. We have divided the topic into two presentations or posters, one by Curtis Chou and one by Sydney Ceyzyk. Thus the abstracts that we worked on together are v

MODELING NUCLEAR COLLISIONS USING THE EIKONAL MODEL
Presenter(s): Daniel Shiu
Physical Sciences
Mentor(s): Chloe Hebborn (Facility for Rare Isotope Beams), Filomena Nunes (Facility for Rare Isotope Beams)

Studying reactions is valuable for understanding the physical properties of atomic nuclei and how they interact. Understanding these interactions can allow us to understand astrophysical phenomena and improve the model for nuclear physical laws. To study reactions between nuclei, theorists take a 3 body or a 2 body example of a particle collision (called reactions) and calculate cross sections (a probability density) to find the likelihood of an outcome (for example: big or small angle scattering from collision). Many of the models used for calculating cross sections for 2 body reactions use a large data set, requiring heavy computational work. My research goal is to test the validity of a model that reduces the computational time it takes to produce a cross section for a 2 body reaction; the "Eikonal model". This model keeps the final wave of a projectile equal to its initial wave before scattering, and ignores its second derivative (acceleration). I plan to use the Eikonal model to calculate absorption (neutron absorption into nuclei) cross sections for neutron particle scattering to test its validity for multiple (varying charge and mass targets) two body reactions.

USING ION TRAPS TO COLLECT HIGH-PRECISION AND ACCURATE MASS MEASURMENTS OF RARE ISOTOPES
Presenter(s): Gabriela Dykstra
Physical Sciences
Mentor(s): Ryan Ringle (Facility for Rare Isotope Beams)

The nuclear shell model describes the structure and arrangement of the components of an atomic nucleus. It models protons and neutrons in the nucleus as filling up energy levels, in which they fill the lowest energy level first. The mass of the nucleus is the sum of the masses of the protons and neutrons minus the binding energy. The binding energy is the amount of energy holding the system together and as the number of particles in an atom's nucleus increases, the binding energy increases. Since mass and binding energy are key quantities in the theoretical model, measuring them precisely is critical to evaluating the model's accuracy. Due to the delicate and unstable nature of some rarer isotopes, it is difficult to measure their mass, but methods have been established to successfully do so. The Low Energy Beam and Ion Trapping (LEBIT) group at the Facility of Rare Isotopes (FRIB) aims to collect measurements of these rare isotopes that have low production rates. This process consists of utilizing rare isotopes that are produced at FRIB, then sending them into a Penning trap. The trapped ions are excited with a range of frequencies, and then ejected to a detector. The time of flight from the Penning trap to the detector is measured, allowing for the mass to be calculated. In this presentation, I will review my data analysis of the chlorine isotope experiment and explain the process of how the results from the ion trap are translated into high-accuracy mass measurements.

INVESTIGATING HUMAN TELOMERASE VIA HIGH RESOLUTION OPTICAL FLEEZERS
Presenter(s): Ibrahim Elsadek
Physical Sciences
Mentor(s): Matthew Comstock (College of Natural Science)

Telomere maintenance by telomerase is extremely important for the production and replication of human cells, and is vital to the survival of stem cells as well as the majority of cancer cells. Telomerase repeatedly adds GGTTAG repeats of DNA to the ends of chromosomes to make up for DNA loss that occurs during DNA replication. Our previous collaboration (Patrick et al., Nature Chem Bio, 2020) demonstrated that the DNA produced by telomerase binds to an anchor site within the telomerase itself, which facilitates further DNA production. In order to gather more data and further probe the workings of telomerase catalysis, we made multiple adjustments to our previous process, both in the optical tweezers used for experiments as well as the construction of the tethers used to gather data. Tweezers adjustments were made to address the need to take measurements at low force with high accuracy and sensitivity, as well as to adjust for errors sourced from the acousto-optic device (AOD) used to direct and split the beam for the traps. Tether setup and DNA handle length were also adjusted to address a non-specific binding issue.

ANALYSIS OF SAND GRAINS FROM THE TERRESTRIAL PINETUM AND SAGINAW LOWLANDS
Presenter(s): Alexander Ngai, Ana Ivanov, Ethan Khanuja
Physical Sciences
Mentor(s): Michael Velbel (College of Natural Science)

Eolian force is the main mechanism by which smaller sand grains are carried via wind across both terrestrial and Mars landforms. Analysis of the size, shape, and texture of sand grains from the terrestrial landforms of The Pinetum sand dune and the Saginaw Lowland polygonal patterned ground, shows potential evidence of aeolian blown sand grains. In previous studies of the sand grains of the Saginaw Lowlands by Lusch, et.al., questions of the presence of aeolian moved grains were unconclusive. As the Saginaw Lowlands were formed due to glacial and permafrost activity unlike the aeolian formed Pinetum, comparison of the two landforms can give insight into the potential aeolian grains in the Lowlands. Using our own analysis of three analogs of microscopic images of sand grains from both landforms and the previous results of other researchers, conclusions around sand grain movement and origin on earthly landforms such as the Pinetum and Lowlands can be made and later be applied to similar landforms on Mars.

NUCLEAR ASTROPHYSICS: OPTIMIZING THE SOFTWARE FOR GADGET-II TO GENERATE DATA FUSED IMAGES FROM RAW DATA
Presenter(s): Bhavya Jain
Physical Sciences
Mentor(s): Christopher Wrede (College of Natural Science)

In binary systems with a neutron star and a hydrogen-rich companion, mass transfer onto the neutron star's surface can cause Type I X-ray bursts (XRBs) observable with space-based telescopes. These bursts reach temperatures of 1 to 2 billion degrees Kelvin, triggering nuclear reactions that produce elements beyond hydrogen and helium. The rate of a critical reaction, $^{15}O(\alpha,\gamma)^{19}Ne$, affects the burst's behavior, impacting light curves and element abundances. Experimental study of this reaction is crucial for accurate modeling. An experiment to measure ^{20}Mg beta decay was conducted using the GADGET II system at the FRIB user facility with the goal of resolving and identifying the proton and α-particle tracks emitted from ^{20}Na and ^{19}Ne, respectively. Raw data from the experiment is transformed into 2D images, which encapsulate the critical information required for classifying events as either single particle or dual particle, and by particle type. The classification is executed by a neural network trained on both samples and simulations. Previously, these images were generated by first converting the raw data into a 3D point cloud and projecting the point cloud into two dimensions. Point cloud generation is a lossy data reduction which reduces the computing cost of later analysis steps. Data fused images will be generated directly from the raw data for a subset of events, and classification of thes

SANDS OF MARS: A STUDY BETWEEN MSU SOIL AND THE RED PLANET'S GEOLOGICAL FORMATION
Presenter(s): Guilherme Eckert Roda, Pauline Lor, Samantha Manson, Thara Eisingerich
Physical Sciences
Mentor(s): Michael Velbel (College of Natural Science)

This research project aims to compare sand grains from Mars with those from the Pinetum-23 sample from Michigan State University terrain, particularly focusing on their source and transport mechanisms. Mars' sand grains, as reported in various studies, exhibit characteristics of transport primarily by high-impact events like explosions, supplemented by alluvial and fluvial processes. However, the origins of certain clasts remain elusive due to limitations in orbital observations. At the Phoenix (PHX) landing site, Martian sand grains, notably black particles, are tentatively identified as unweathered basaltic fragments rounded by eolian transport. Yet, questions persist regarding the origins of other particle types, such as those of red and white hues. Comparing thermal contraction polygons on Mars with periglacial polygonal patterns in Michigan's Saginaw Lowlands reveals similarities in their ice-rich permafrost origins but differs in the spatial distribution and dominance of ice-rich substrates on Mars. In the Saginaw Lowlands, sand cover origins remain unclear, with hypotheses pointing to eolian processes, coupled with thermokarst development and soil flow. However, the true origin of the sand in Michigan's Saginaw Lowlands remains uncertain. This study proposes to conduct detailed analyses of sand grains from both Mars and Michigan, employing various geological and geomorphological techniques to elucidate their source, transport mechanisms, and potential implications for

NUCLEAR VIBRATIONS
Presenter(s): Nicholas Niebel
Physical Sciences
Mentor(s): Vladimir Zelevinsky (College of Natural Science)

The goal of this research project was to investigate a correlation between quadruple and octuple oscillations of heavy nuclei along the periodic table. These oscillations are of a collective nature resulting from the coherent motion of many interacting particles. Understanding this collective motion is important for a complete picture of nuclear matter. Data for experimentally found energies of these oscillations was taken from the ENSDF database from Brookhaven National Laboratory to make graphical analyses using Excel. After analyzing the data, there is a correlation between the 2+ and 3- energy levels corresponding to matter oscillations of different symmetry.

GRAIN SHAPE ANALYSIS OF SAND-SIZE GRAINS AT PERIGLACIAL AND AEOLIAN DEPOSITS: IMPLICATIONS FOR SOURCES OF GRAINS IN TERRESTRIAL GEOMORPHIC ANALOGS OF THE REGOLITH IMAGED BY THE PHOENIX MARS LANDER AT VASTITAS BOREALIS
Presenter(s): Andrew Chen, Austin Sjaarda, Pablo Rizzo Mora
Physical Sciences
Mentor(s): Michael Velbel (College of Natural Science)

The transportation mechanism of sand-sized grains at the Phoenix landing site is unknown (Goetz et al. 2010). Samples from three terrestrial preglacial analog sites, The Pinetum (Kooiman & al. 2022), SLPPPG L5 and SLPPPG L8 (Lusch & al. 2009), underwent microscopy analysis to provide preliminary information about the transport mechanism. Grain size was determined quantitatively using (L + W)/2 (Teller 1976); the grains were on average more elongated than equant. Grain shape was qualitatively observed using the Powers roundness classification (Powers 1953); the average range was subrounded to subangular. The results suggest that the main mechanism at the analog sites is aeolian transportation. This is a preliminary indication of aeolian transportation also being responsible at the Pheonix landing site.

AUTOMATING GAMMA SPECTROSCOPY ANALYSIS WITH MACHINE LEARNING
Presenter(s): Milo Baran
Physical Sciences
Mentor(s): Sean Liddick (Facility for Rare Isotope Beams)

Gamma-ray spectroscopy can be used to investigate the decay of radioactive isotopes, but due to low detector resolution or efficiency, identifying the energy of gamma rays emitted during a decay is difficult. We use a machine learning approach to analyze gamma-ray spectroscopy data and, specifically, determine gamma ray energies. Concretely, we run a Geant4 simulation to model a 36-clover Germanium detector and collect data. 2D histograms consisting of energies deposited into all 36 clovers across many decay events are used as input for the machine learning model. This model outputs energies correlating to the ones in the decay. Ultimately, the ability to predict the energies of gamma rays from detector data offers new insights into how radioactive isotopes decay.

ORIENTATION AND SECTIONING OF CAENORHABDITIS ELEGANS FOR MASS SPECTROMETRY IMAGING
Presenter(s): Tanvi Satoor
Physical Sciences
Mentor(s): Ryutaro Jacobson (College of Natural Science)

The nematode Caenorhabditis elegans is a valuable model animal for neurobiology studies due to its rapid life cycle and well-studied anatomy, genetics, and gene homology with humans. However, there is currently a gap in our understanding of how neurochemicals are spatially distributed within C. elegans. Matrix-assisted laser desorption/ionization time of flight mass spectrometry imaging (MALDI-TOF MSI) is a tool which we can leverage to fill this gap as it enables the creation of spatially resolved ion maps of sample sections. Our goal is to develop MALDI-TOF MSI method for imaging neurochemicals in C. elegans to visualize the spatial distribution of chemicals and screen chemical contents in a high throughput manner. Initial trials used CHCA and DHB as the positive mode MALDI chemical matrix aiming to detect neurochemicals such as serotonin, histamine, epinephrine, norepinephrine, GABA, and dopamine. However, this approach did not give adequate signal at relevant concentrations. Therefore, to enhance the signal quality and achieve better results a derivatizing agent was used. This research focuses on using a derivatizing agent called (+)-FLEC, as it has been reported to effectively derivatize primary amine neurochemicals. This derivatization can then be app

MODIFYING THE LINKER OF SOLUBLE EPOXIDE HYDROLASE INHIBITORS TO IMPROVE PHYSICAL PROPERTIES AND BLOOD BRAIN BARRIER PENETRATION FOR ALZHEIMER'S DISEASE TREATMENT
Presenter(s): Megan Shuck
Physical Sciences
Mentor(s): Kin Sing Lee (College of Osteopathic Medicine)

Alzheimer's Disease (AD) is a neurodegenerative disease that greatly impairs patients' cognitive ability impacting their quality of life and putting a burden on their family. In AD patients' brains, the activity of soluble epoxide hydrolase (sEH) is higher than healthy controls. SEH breaks down beneficial epoxy fatty acids into the corresponding diols causing the formation of key biomarkers of AD, neurofibrillary tangles and amyloid beta plaques and neuroinflammation. Previous research demonstrated that using sEH inhibitors as treatment reduces neuroinflammation and blocks the formation of neurofibrillary tangles and amyloid beta plaque in an animal model of AD. However, the leading compound, TPPU, has poor blood brain barrier (BBB) penetration (12-20%) when 90% inhibition in the brain is necessary for sEH inhibitors to be biologically active. Additionally, TPPU has a high melting point, and a moderate solubility which are poor drug-like properties.

MERIDIONAL IODATE DISTRIBUTION IN THE SOUTHERN PACIFIC OCEAN
Presenter(s): Adriana Tineo
Physical Sciences
Mentor(s): Alexi Schnur (College of Natural Science), Dalton Hardisty (College of Natural Science)

The distribution of marine iodine is closely linked to the cycling of oxygen. For example, iodate is reduced to iodide in low oxygen environments and iodate is incorporated and preserved within marine carbonate minerals, thus tracing past and the present redox processes. Further, iodide (I-) accumulation at the sea surface is facilitated by microorganism and phytoplankton reduction of IO3-, which then reacts with and destroys tropospheric ozone. Understanding the processes impacting the distribution of iodine's redox species provides insight into the ability of iodine to act as a tracer of oxygen and other geochemical cycles. To gain a quantitative understanding of IO3- distribution in the Southern Pacific Ocean, we measured the IO3- concentration in samples taken as part of GEOTRACES GP17-OCE along a 60°S longitudinal transect of 15 stations from the open ocean toward the coast of Chile (3491 km total). Depth profiles at stations along this transect were measured for [IO3-] using a VWR UV-3100PC spectrophotometer. The transect crosses many oceanographic features with the potential to impact iodate distribution, including: (1) hydrothermal vents and associated plumes, (2) gradients in photosynthetic productivity and nutrient availability from offshore to nearshore, and (3) nearshore intersection of the continental shelf and coastal environment. The analysis of iodate distribution across these key gradients allows us to further understand the range of geologic and biogeoc

IODATE CONCENTRATIONS IN PLANKTONIC FORAMINIFERA
Presenter(s): Olivia Wheeler
Physical Sciences
Mentor(s): Dalton Hardisty (College of Natural Science), Janet Burke (College of Natural Science)

One of the best recorders of ancient ocean and climate biogeochemical evolution are foraminifera-i.e., single-celled organisms that have been abundant since the Cambrian Era. Foraminifera are microplankton found around the world, either floating through the water column (planktonic) or resting on the ocean floor (benthic). Foraminifera are known to incorporate elements from surrounding seawater into calcite tests, which can then be recorded in the geologic record following their eventual burial in sediments. The foraminiferal iodine-to-calcium (I/Ca) proxy is a geochemical parameter that tracks the oxygenation rates of ancient oceans, reflecting a direct relationship between seawater iodate (IO3-) and seawater redox states of the ambient waters hosting foraminiferal growth. However, the relationship between seawater iodate and foraminiferal I/Ca has never been tested experimentally. In addition to iodate incorporation experiments, we also needed to understand if varying the iodate concentrations impacts the health of the foraminifera. To do this, we monitored test specimens taken during a month-long research period on Santa Catalina Island, California in a series of planktonic tows and cultured subjects in various iodate concentrations. Their health and growth were analyzed through observations of the foraminifera species, chambers, spines, and pseudopods. The growth rate of each subject analyzed chamber additions and was recorded using a measuring software called ImageJ. The

STUDY OF FITNESS FUNCTIONS FOR IMAGE SEGMENTATION QUALITY
Presenter(s): Doruk Alp Mutlu
Physical Sciences
Mentor(s): Dirk Colbry (College of Natural Science)

There does not exist a single image segmentation algorithm that can be used universally. Machine Learning (ML) and similar methods can develop solutions with large sets of training for specific problems. However, these solutions are not feasible for small, exploratory projects. In these cases, a set of pre-selected image segmentation algorithms can be used with modification to the hyperparameters. Evaluation of the results from these image segmentation algorithms caused the development of many different metrics. For binary masks, one well-known metric is the Hamming distance introduced by American mathematician Richard Hamming in 1950. Hamming distance computes the distance between two masks by a pixel-wise comparison. Despite its applications in Information Theory, in the assessment of Image Segmentation quality, this method does not go beyond the pixel-wise comparison. Novel metrics and fitness functions put a greater emphasis on both region and boundary accuracy.The SEE-Insight research group has developed two fitness functions, LAD(Labeled Array Distance) and MADLAD(Mismatch Adjusted Difference for the Labeled Array Distance), to overcome over-segmentation and region mismatch. This work has focused on the comparison of LAD and MADLAD in contrast to some of the other fitness functions and metrics available for image segmentation problems. These fitness functions have been tested with various edge cases such as the label flip, extreme noise, and change in the boundary of se

Plant Sciences

INVESTIGATING THE GENETIC BASIS OF GRAVITROPISM IN MIMULUS GUTATTUS (THE YELLOW MONKEYFLOWER)

Presenter(s): Ritta Mouayed
Plant Sciences
Mentor(s): David Lowry (College of Natural Science), Madison Plunkert (College of Natural Science)

Gravitropism, a fundamental biological phenomenon guiding plant growth responses to gravity, holds particular significance in the study of *Mimulus guttatus* populations due to their diverse habitats and distinct growth patterns. When plant stems sense gravity, starch-filled organelles known as amyloplasts fall in the direction of gravity, eventually stimulating changing levels of the plant hormone auxin, which allows the stem to bend away from gravity. This research aims to uncover the mechanisms of gravitropism defects in lab-generated mutants of *Mimulus guttatus*. To test for variation in gravitropism, we measured plant growth angles in several lab generated mutants termed *sideways* due to their atypical sideways growth. We found that only mutant line 9 failed to respond to gravity when placed at a 90-degree angle for 12 hours. To characterize the localization of gravity sensing amyloplasts, we stained longitudinal sections of stems from all mutant lines. We found that Line 9 and TDNA Line 89 had amyloplasts all throughout the longitudinal section, while the other lines and wild type had amyloplasts restricted to a smaller region. When we applied auxin to the underside of the stem, all plants bent away from where the auxin was applied. Taken together, we conclude that line 9 is agravitropic most likely due to ectopic production of amyloplasts but it is still capable of responding to auxin.

VERIFICATION OF YOUNG FRUIT RESISTANCE TO PHYTOPHTHORA CAPSICI IN THREE CUCUMBER ACCESSIONS

Presenter(s): Mckayla Dzyngel

Plant Sciences

Mentor(s): Rebecca Grumet (College of Agriculture & Natural Resources), Ying-Chen Lin (College of Agriculture & Natural Resources)

Cucumber production in the eastern and midwestern United States is subject to severe loss due to the fruit rot disease caused by Phytophthora capsici. A core collection of 395 cucumber accessions, which represents >96% genetic variation of the cucumber collection in the United States National Plant Germplasm System (NPGS), was established. The collection was screened for young fruit resistance in 2019-2021 and three accessions showed potential resistance: PI 105340, PI 481614, and NSL 197095. Further research is needed to verify these sources of resistance and determine whether resistance is replicable across seasons and different pathogen isolates. Resistant accessions can be used to produce breeding lines in future breeding programs. To test the disease-resistant responses, the plants were grown in the field and young fruits were harvested, the fruits were then inoculated with multiple isolates of P. capsici. This allowed us to test if the resistance is replicable and collect another year of data. Based on the results we found that AM280 (NSL 197095) is the best candidate for new sources of resistance as AM280 had the lowest average disease scores across four P. capsici isolates.

USING DEPI TO ANALYZE PLASTOGLOBULE PHOTOSYNTHETIC STRESS RESPONSE IN MUTANT ARABIDOPSIS

Presenter(s): Owen Gross

Plant Sciences

Mentor(s): Shannon Donnelly (College of Natural Science)

Research into Arabidopsis' stress response is important in understanding plants adaptability to climate change. The plastoglobule is a lipid-droplet particle attached to the thylakoid within the chloroplast, which is the site of photosynthesis. Thylakoids makeup chloroplasts, aiding in its function. Since the plastoglobule is attached it can be assumed that it contributes to photosynthesis, but specifics are unclear. It's known that plastoglobules increase in size and number when a plant is introduced to stress factors like temperature, based on transmission electron microscopy imaging. This particle is important since it is a stress response mechanism, it therefore is a key component in a plant's ability to adapt to changing climate. This experiment is performed in two phases, genotyping, and large-scale phenotyping. Genotyping consists of DNA extraction, PCR, and gel electrophoresis. DNA extraction involves centrifuging and cleaning tissue samples from each plant. PCR enhances the desired gene of each mutant for visualization through gel electrophoresis. Gel electrophoresis takes PCR product which is loaded into wells in the gel with a DNA ladder for reference and an electric current is run through the gel to separate the amplified gene from any other DNA, so it can be digitally visualized. Large scale phenotyping is done through Dynamic Environmental Photosynthetic Imaging (DEPI). DEPI shows photosynthetic phenotypes of each genotyped mutant in response to stress, such as

HEAT AND TOMATOES
Presenter(s): Mae Milton
Plant Sciences
Mentor(s): Melissa Lehti-Shiu (College of Natural Science)

Tomatoes are an invaluable source of nutrition and a tool for developmental and stress biology research. A key issue facing tomato production is a lack of understanding of the heat stress (HS) pathway as it relates to climate change and expression of specific genes in the pathway. We are working to bridge the knowledge gap by developing a solid understanding of variance in expression of genes linked to the HS pathway in tomatoes to help answer the larger question: Is the HS pathway in tomato significantly different than that of the model plant Arabidopsis, for which more is known about HS response? The current understanding is that tomatoes have a comparable HS response to Arabidopsis because of similarities of HS pathway gene expression, but there has not been confirmation for specific tomato genes. Based on prior literature, we selected the following genes for study: HEAT SHOCK FACTOR A2, HEAT SHOCK PROTEIN 21, and HSP70-90 ORGANIZING PROTEIN 1, all of which control different aspects of HS response and thermotolerance but have varying amounts of information in the literature regarding expression. To investigate gene expression, 9-day-old seedlings on agarose media were incubated for three hours at different temperatures, representing varying levels of stress; tissue samples were then collected for RNA extraction. We are now performing RT-PCR to confirm the relationship between gene expression and HS response. These findin

ROOT AND SHOOT ACYLSUGAR SCREENING ACROSS THE SOLANACEAE USING LC-MS
Presenter(s): Coral Brock
Plant Sciences
Mentor(s): Rachel Kerwin (College of Natural Science)

Acylsugars are a specialized metabolite produced in leaf and stem hairs (trichomes) of Solanaceae species and deter against insect herbivory. It was recently found that acylsugars are produced in the roots of S. lycopersicum (cultivated tomato) and *S. pennellii*(wild tomato), but it is unknown if other species in the Solanaceae family produce root acylsugars. The goal of this project is to determine which species in the Solanaceae clade produce root and shoot acylsugars to better understand acylsugar evolution. I germinated seeds on 1/2 MS agar plates, collected root and shoot tissue when plants were 10-20 days old, and analyzed tissue samples using Liquid Chromatography-Mass Spectrometry. A wild potato species, *S. berthaultii*, showed evidence of root acylsugar production. Cultivated potato, *S. tuberosum*, and a wild tomato species, *S. habrochaites*, did not show evidence of root acylsugars.

CULTIVATION TECHNIQUES OF CANNABIS SATIVA
Presenter(s): Breanna Martin
Plant Sciences
Mentor(s): Tammy Long (College of Natural Science)

Cannabis sativa is a new and unique commodity under an agricultural spotlight due to multi-state recreational legalization in recent years. As usage in adults increase, the ability to deliver higher tetrahydrocannabidiol (THC) and cannabanoid (CBD) (the main psychoactive ingredients of *Cannabis sativa* content has driven the market. Technology and horticultural practices that are specific to the *Cannabis sativa* plant may help to improve the THC and CBD levels. Propagation practices for woody species decrease establishment time, casualties, and improve overall health of the plant. Applying artificial selection events to each crop can allow for only the best performers to become the final product. Utilizing generative and vegetative stress in irrigation that is specific to the life cycle of *Cannabis sativa* improve yield and biomass. Plant pruning methods such as "topping" and "defoliation" can increase yield by increasing available light to the flowering plant. Furthermore, the introduction of vertical integration during certain life stages can increase production in indoor grow operations. Crop steering methods are impactful to final product of *Cannabis sativa*, and both small and large indoor greenhouse spaces can benefit from the concept of vertical integration whether it's increasing production of a facility or yield per room.

EFFECTS OF DROUGHT TIMING ON SWITCHGRASS PHYSIOLOGY AND BIOMASS YIELD AND QUALITY USING A CONTROLLED DROUGHT SYSTEM
Presenter(s): Veronica Pargulski
Plant Sciences
Mentor(s): Berkley Walker (College of Natural Science), Binod Basyal (Research and Innovation)

Switchgrass is a perennial plant that is being researched on for its potential as a biofuel crop. Previous research has found that drought may induce chemicals that are inhibitory to the microbial fermentation1. Our aim is to investigate switchgrass response to drought at different phenological stages, including vegetative, flowering, and senescence to determine during which stage would drought be most detrimental to yield and biofuel production. Using an experimental automated irrigation system in a greenhouse, we imposed three droughts where the plants randomly selected to be droughted at that stage experienced 0.5% volumetric water content for a month. Throughout the experiment, weekly measurements were taken with LI-6800, LI-600, and MultisepQ for carbon dioxide assimilation and stomatal conductance. So far, our results have indicated that biomass is not significantly different for the treatment groups, but we have yet to complete the RNA sequencing, metabolomics, and biomass fermentation assay. The importance of this research is to improve knowledge on how drought conditions impact the physiology and biofuel performance of switchgrass as climate change makes the use of biofuels more pertinent.

THE ROLE OF THE APICAL UNBRANCHED ZONE IN COMMON BEAN FUSARIUM RESISTANCE
Presenter(s): Katie Philipps
Plant Sciences
Mentor(s): Miranda Haus (College of Agriculture & Natural Resources), Viviana Ortizlondono (College of Agriculture & Natural Resources)

Common beans (*Phaseolus vulgaris*) of Andean domestication origin dominate agriculture systems in several countries due to their large seeded quality. However, breeding progress in the Andean gene pool has lagged and almost all commercial Andean cultivars are susceptible to Fusarium root rot (FRR). This has the potential to cause devasting yield loss and impact the food security of these reliant countries. A potential aspect to breed for is root architecture, which has been shown to correlate with FRR resistance. Notably, the length of the apical unbranched zone (LAUZ) has been demonstrated to shorten upon disease stress. This prompts investigation into the LAUZ as a potential character of FRR resistance. An Andean Diversity Panel (ADP) was screened for the LAUZ by measuring seedling roots grown within germination paper rolls. To determine if this character is genetically regulated, the collected LAUZ data was used in a genome-wide association study using the GAPIT package in R. Then, to investigate a relationship with Fusarium resistance, 12 ADP accessions were selected from the six longest and six shortest average LAUZ and grown in germination pouches. The seedlings were inoculated with liquid F.brasiliense inoculum and disease scores were collected. The GWAS revealed a significant marker associated with one candidate. A significant relationship was found between LAUZ accession and disease score with long LAUZ accessions having a lower mean disease sc

DELIVERING A BACTERIAL MICROCOMPARTMENT TO CHLOROPLAST USING A TEV-TRAIN APPROACH
Presenter(s): Olivia Rhinier
Plant Sciences
Mentor(s): John Froehlich (College of Natural Science)

Bacterial microcompartments (BMCs) are composed of a proteinaceous shell that encapsulates enzymes that are involved in a variety of biochemical pathways. Consequently, BMCs are very functionally diverse depending on the enzymes they encapsulate. Regardless of this diversity, all BMC shells consist of two primary shell components, a hexamer (BMC-H) and a trimer (BMC-T), as well as a secondary pentamer (BMC-P) shell component. It has been shown that when BMC-H and BMC-T are expressed in bacteria they self-assemble to form a "wiffle ball" shell architecture, whereas, when BMC-H, BMC-T and BMC-P are expressed in bacteria they self-assemble to form a complete intact BMC shell architecture. In this investigation, we are developing methods and devising strategies to establish various types of BMC architectures within higher plant cells. To achieve this goal, we have created a unique BMC shell delivery system consisting of the Tobacco Etch Virus (TEV) protease linked to genes for each shell component that are assembled in tandem and connected by a TEV protease cleavage site (The TEV-Train Approach). These constructs will allow us to deliver multiple shell components to the chloroplasts in a single transformation event. This poster will present the progress we have made in trying to engineer a BMC within the stroma of chloroplasts. This work was supported by the Chemical Sciences, Geoscience and Biosciences Division, Office of Basic Energy Sciences, Office of Science, U.S. Department

ASSAY OF THE PSEUDOMONAS PUTIDA NAHG ENZYME ON DEGRADATION OF N-HYDROXYPIPECOLIC ACID, A NEWLY EMERGING SYSTEMIC ACQUIRED RESISTANCE ELICITOR IN PLANTS.

Presenter(s): Renee Sparpanic

Plant Sciences

Mentor(s): Yongsig Kim (College of Natural Science)

Following exposure to a pathogen, a plant undergoes a chemical immune response called systemic acquired resistance (SAR). After the induction of SAR, phytohormones such as salicylic acid (SA) accumulate in the vacuole of the cell. SA is a key hormone in establishing resistance within the plant. NahG; a salicylate hydroxylase purified from Pseudomonas putida, catalyzes the hydroxylation of SA into catechol, which then neutralizes the SA signaling pathway. In previous NahG studies, it has been observed that the sid2 mutant - unable to synthesize SA - has an increase in size when compared to the wildtype Arabidopsis thaliana. Yet, it is still smaller in comparison to NahG wildtype. Because of this, it has been suggested that another chemical may be responsible for the larger size observed in NahG wildtype plants. It has also been shown that N-hydroxy-pipecolic acid (NHP), a metabolite that primes the SA defense pathway, is similar to SA in molecular structure. With this information, researchers have come to question whether NahG can effectively use NHP in a similar manner to that of SA. Through protein purification, enzyme assays, and phytohormone extractions, we attempt to answer this question. Since NahG transgenic plants are unable to accumulate wildtype levels of SA, it allows researchers to 1.) pivot around the Agrobacterium mediated transient transformation - which triggers the plant immune responses and 2.) study plant defense mechanisms and molecular biology. Under

THE IMPACT OF INCOMPLETE RIPENING ON PHYSIOCHEMICAL QUALITY ATTRIBUTES IN NORTHERN HIGHBUSH BLUEBERRIES

Presenter(s): Cassandra Austin

Plant Sciences

Mentor(s): Josh Vanderweide (College of Agriculture & Natural Resources), Michael Gasdick (College of Agriculture & Natural Resources)

Blueberries are produced worldwide, and often have long shipping times to reach consumers. This requires berries to maintain market quality for several weeks post-harvest. Berries that are shipped long-distance are often harvested slightly underripe to ensure they maintain post-harvest texture. Berry color is representative of ripeness and quality, and consumers may find the texture and flavor of blueberries with a pink hue less desirable compared to fully blue berries. Delaying harvest, which prolongs ripening, may decrease the percentage of pink-hued berries. The objective of this research is to quantify differences in physiochemical composition in pink-hued berries versus blue berries from store-bought clamshells, and identify whether "delayed harvest" treatments can mitigate this problem. We hypothesized that berries with a pink hue will have higher acidity (more sour), and that delayed harvest will reduce the percentage of pink-hued berries. We obtained store-bought blueberries, and separated berries by color (pink-hued, blue). We analyzed berry physiochemical composition, including the total acidity (sourness) of each group of berries. We also conducted a field experiment, and subjected blueberries to delayed harvest treatments (10%, 30%, 50%, or 70% ripe). For store-bought blueberries, pink-hued berries contained higher acidity levels (more sour). Delayed harvest treatments led to organic acid degradation (lower acidity, less sour) and allowed the berries to fully ripe

CHARACTERIZATION OF BACTERIA ISOLATED FROM FERAL ALFALFA (MEDICAGO SATIVA)
Presenter(s): Maddy Quinlan
Plant Sciences
Mentor(s): Kevin Santiago-Morales (College of Natural Science), Sarah Lebeis (College of Agriculture & Natural Resources)

Plants and microbes have evolved complex, mutually beneficial relationships over millions of years. Understanding these plant-microbe interactions is useful when improving plant growth and development for applications such as food, farming, and biofuels. Feral alfalfa leaf tissues collected from the western United States served as the system of interest for our research. Elucidating interactions between bacterial isolates from these leaf tissues on the model plant system *Arabidopsis thaliana* can help us answer how these bacteria interact with plants. In this study, feral alfalfa isolates were characterized via 16S amplicon Sanger sequencing, $CaPO_4$ solubilization, and indole-3-acetic acid (IAA) phytohormone metabolism assays. Additionally, vertical plate assays (VPAs) were carried out to further understand how our isolates can directly affect plant growth. Characterization of isolates showcased a diverse set of bacterial phyla and families, including 41 bacteria across 3 phyla and 11 families resulting from 16S Sanger sequencing. IAA consumption occurred in 13 bacteria across 2 phyla and 6 families, IAA production occurred in 24 bacteria across 3 phyla, and $CaPO_4$ solubilization occurred in 21 bacteria across 3 phyla and 6 families. Furthermore, VPAs will provide direct insight into possible mutualistic or antagonistic relations between our isolates and plants. Our findings will aid in the overarching goal of studying plant-microbe interactions, a

EFFECT OF AGROBACTERIA INFILTRATION ON N. TABACUM PHOTOSYNTHESIS
Presenter(s): Sarah Davis
Plant Sciences
Mentor(s): Berkley Walker (College of Natural Science), Maxwell Harman (College of Natural Science)

A significant challenge in studying in-vivo plant photosynthesis is the time required to grow stable transformation lines of plants. One solution to this problem is transient transformation using Agrobacterium tumefaciens, in which a suspension of agrobacteria containing a gene of interest is infiltrated directly into the leaves of mature plants, producing robust transient ectopic gene expression. However, it is unknown whether leaf-level photosynthetic activity is impacted by the infiltration process, rather than target genes of interest. Thus, in this experiment, we compared gas exchange of non-infiltrated N. tabacum leaves to leaves infiltrated with expression vector-deficient agrobacteria suspended in solution, as well as transformed agrobacteria suspended in solution to determine how infiltration affects photosynthetic activity. This work represents an important step forward in validating transient transformation as a valuable tool for reverse genetics in the study of photosynthesis. The results of this experiment suggest that the infiltration process itself has a significant effect on photosynthetic activity, but it is likely that the age of N. tabacum leaves used influenced the results found.

SOIL NUTRIENT ADDITION AND ITS EFFECTS ON HERBIVORY

Presenter(s): Evan Marvin
Plant Sciences
Mentor(s): Mia Howard (University of Michigan)

Plants are the organisms that make up one of the most important aspects of an ecosystem. Nutrient transfer to higher trophic levels happens through herbivores eating plants. Without essential nutrients for plants, an ecosystem can collapse. In this experiment we examined the effects of soil nutrient addition on herbivory. We hypothesized that nutrient fertilization will make plants better food for herbivores due to plants producing tissue with higher nutrient content (i.e. quality food) and reducing their expression of defenses which would increase herbivory. We also predict sites that have been fertilized for longer will have more nutrient buildup thus being better food for herbivores. We tested these hypotheses by surveying for herbivory at three different nutrient addition experiment at Kellogg Biological Station that have been fertilized for different numbers of years with three primary nutrients. These nutrients being nitrogen, phosphorus, and potassium. At the different sites theses nutrients were all by themselves at some plots, or they were a mix of all three in others (NPK). We measured elements including height and; visually assessed the presence of different types of herbivory evidence such as chewing; and leaf mining, as well as leaf greenness and size. We found that herbivory was more abundant early in the growth season in the plots amended with NPK fertilizer. This suggests that more nutrient-rich plants provide a better food source to herbivores than plants wit

ABSORPTION, TRANSLOCATION, METABOLISM, AND LIVERWORT

Presenter(s): Evelyn Mongeon
Plant Sciences
Mentor(s): Debalina Saha (College of Agriculture & Natural Resources), Manjot Sidhu (College of Agriculture & Natural Resources)

This research aims to analyze absorption, translocation, and metabolism of herbicides 2,4-D and Indaziflam within liverwort plant assays.

BUILDING A BACTERIAL MICROCOMPARTMENT IN HIGHER PLANTS ONE SHELL PROTEIN AT A TIME

Presenter(s): Sebastian Velazquez-Solis

Plant Sciences

Mentor(s): John Froehlich (College of Natural Science)

Bacterial Microcompartments (BMCs) are widely conserved bacterial "organelles" comprised of large, selectively-permeable protein shells enclosing enzymatic cores of varied activity. BMC shells have been shown to consist of two primary shell components, a hexamer (BMC-H) and a trimer (BMC-T), as well as, a secondary pentamer (BMC-P) shell component. When a hexamer and trimer are expressed in bacteria they self-assemble to form a "wiffle ball" shell architecture, whereas, when hexamer , trimer and pentamer are expressed in bacteria they self-assemble to form a complete BMC shell architecture. Currently, we are investigating the ability for BMC shell components (BMC-H, BMC-T, and BMC-P) to be expressed and localized for assembly within plant cells. We have generated a library of constructs for the stable and transient production of BMC shell proteins within Arabidopsis thaliana and Nicotiana tabacum which are currently being analyzed. Our long-term goal is to produce all three shell components in a single Arabidopsis cell line to observe BMC shell structures within the stroma of chloroplasts. We have also created unique constructs in which the genes for each shell component are assembled in tandem (Train Approach). These constructs will allow us to deliver multiple shell components to the chloroplasts in a single transformation event. This poster will present the progress we have made in trying to engineer a BMC within the stroma of chloroplasts. This work was supported by

QUANTIFYING INSECT HERBIVORY OF ARABIDOPSIS THALIANA MUTANTS WITH ALTERED PHYTOHORMONE PROFILES

Presenter(s): Kiara Chalker

Plant Sciences

Mentor(s): Peter Lundquist (College of Natural Science), Shannon Donnelly (College of Natural Science)

This research is intended to determine if there is a phytohormone imbalance in abc1k6 or abc1k7 mutants of Arabidopsis thaliana that leads to a change in herbivory feeding. We plan to perform three experiments, amass spectrometry phytohormone analysis, a feeding assay using caterpillars (Spotoptera littoralis), and the characterization of an abc1k6/abc1k7 double mutant. We will perform the phytohormone analysis by taking samples from wild type, abc1k6, abc1k7, and abc1k6/abc1k7 mutants and comparing phytohormone quantification for jasmonic acid, jasmonic acid-isoleucine, salicylic acid, abscisic acid, and ethylene via mass spectrometry. Jasmonic acid is a defense hormone that regulates plant response to environmental stress, and by measuring multiple phytohormones we can get a better idea of the energy trade-offs within the plant and draw hypotheses about how abc1k6 and abc1k7 affect the expression of hormones related to defense against herbivory. The feeding assay will allow us to make a connection between the abc1k6 and abc1k7 genes, hormone expression, and phenotypic responses in relation to insect herbivory by measuring caterpillar weight before and after a period of undisturbed feeding. The abc1k6/abc1k7 double mutant has never been made, so our characterization of it will create a background on the mutant for further research and hopefully br

Psychology

DOES TEMPORAL PERSPECTIVE AFFECT SPATIAL JUDGEMENTS?
Presenter(s): Amelie Bayer, Casey Tate, Lucas Lothschutz, Ventong Ya
Psychology
Mentor(s): J McAuley (College of Social Science)

Suppose you are told that next Wednesday's meeting has been moved forward two days. What day is the meeting now that it has been rescheduled? The answer to this question is ambiguous, with individuals responding 'Monday' or 'Friday.' Boroditsky et al. (2002) showed that spatial primes alter individuals' temporal judgments about meeting day. In one condition, participants were shown a picture where they were to imagine themselves standing holding a rope tied to a chair and pulling the chair towards them. In the other condition, participants were asked to imagine themselves sitting in the chair and moving themselves across the room. As hypothesized, imagining pulling the chair led to more Monday responses, while moving themselves across the room in the chair led to more Friday responses. The current study examined how different temporal primes affect an individual's spatial judgments. Participants were shown a picture depicting a top-down view of a person standing in front of a table. They were instructed to imagine themselves as the person in the room moving the table forward and to draw an arrow indicating which way is forward. In one temporal prime condition, participants were asked this question at the start of a class, which was hypothesized to lead to participants judging that forward is towards them, whereas in the other temporal prime condition, participants were asked this question at the end of the class, which was hypothesized to lead to participants judging that for

HOW DO WE PROCESS MUSIC? THE ROLE OF INSTRUMENT IDENTIFICATION IN DETERMINING THEMATIC RESPONSES TO MUSIC PIECES
Presenter(s): Gracie Rudolfi, Marine Avequin, Sydney Logsdon
Psychology
Mentor(s): Natalie Phillips (College of Arts & Letters)

This presentation discusses a new experiment in a multidisciplinary study conducted at the Digital Humanities and Literary Cognition Lab and Timing, Attention, and Perception Lab at MSU titled "The Role of Narrative Listening in Music Perception." The original experiment explores whether participants imagine stories while listening to musical stimuli. Participants from the U.S. and Dimen, China listened to instrumental music and were asked to describe any narratives they perceived. A surprising number of people "heard" stories and many patterns in how these participants responded emerged. Based on the largely single-instrument Chinese music chosen for listeners, we were inspired to design a "single instrument" study. Each music excerpt in this new study featured one instrument-ten Western instruments and one traditional Chinese instrument. Our presentation will discuss this study with a focus on participant identification of instruments both in their narratives and at the end of the survey. We will explore the relationship between prominent themes within instrument groups and how these relate to correct-and incorrect-instrument identification. Each narrative and memory response has been analyzed for a range of metadata categories, such as setting, themes, characters, and pop culture references. This helps us distinguish whether themes are inherent to the music or if they are more directly linked to participant perception of the instr

ROMANTIC PARTNERS' CO-DEVELOPMENT IN PERSONALITY ATTRIBUTES
Presenter(s): Connor Yee, Grace Yancho, Lisa Stuckman, Siya Vesikar
Psychology
Mentor(s): Andrew Rakhshani (College of Social Science), Brent Donnellan (College of Social Science), Lindsay Ackerman (College of Social Science), Rebekka Weidmann (College of Social Science), Richard Lucas (College of Social Science)

A large body of research has shown that people's personality attributes change over time. However, the question of how individuals in romantic relationships change together with respect to personality remains unanswered. In the present study, we will test whether and how diverse personality attributes of romantic partners change in tandem over a long duration of time. Addressing this topic is crucial for gaining insights for future research that could be done regarding mutual influencing factors. We will use 15 waves of personality traits, optimism, and self-esteem data from couples who participated in the Longitudinal Internet Studies for the Social Sciences in the Netherlands (N couples ~ 1,000) and run the dyadic stable trait autoregressive trait and state (STARTS) model. Specifically, we will analyze the correlations between the autoregressive traits of both partners to test how strongly partners co-develop in their personality attributes. This study will contribute to the line of literature on understanding how much development is shared in close relationships and how important relationships are for co-development between partners. Additionally, it can pave the way to further examine which shared factors among couples are linked to co-development in personality attributes.

THE IMPACT OF FOREGROUNDING ON AESTHETIC EXPERIENCE: AN ANALYSIS OF REAL-TIME RESPONSES TO SONNETS
Presenter(s): Evelyn Inman, Gracie Rudolfi, Natalie Liliensiek
Psychology
Mentor(s): Natalie Phillips (College of Arts & Letters)

The Digital Humanities and Literary Cognition Lab (DHLC) at Michigan State University is conducting an interdisciplinary study of sonnets that examines the similarities and differences in the aesthetic pleasure that English majors and non-English majors experience while reading poetry. In the study, participants were tasked with highlighting moments they found aesthetically pleasing in green and aesthetically displeasing in red. The lab compiled and graphed qualitative data to visualize the cumulative highlighting patterns of both participant groups (English and non-English majors) and then compared them. When analyzing the graphs, we found that the trends between the two groups were more similar than initially hypothesized. Our presentation will discuss the study with a focus on the moments where foregrounding devices were prevalent and how these affected the aesthetic responses of our participants. Foregrounding theory argues that certain literary devices, such as metaphor and imagery, are "foregrounded"-in a sense, the expression and effect of the text is prioritized over its literal meaning, thereby capturing reader attention. Our study aims to recognize why people are attracted to foregrounding devices, specifically in terms of a positive response. This poster examines multiple moments that prompted frequent aesthetic pleasure highlighting across both groups and attempts to explain why moments of foregrounding are closely tied to an aesthetic response. Devices such as me

HOW DO DEPRESSION AND ALCOHOL USE AFFECT DIGITAL AGGRESSION IN MALES AND FEMALES
Presenter(s): Aanika Sanghvi, Affan Ahmed, Sam Poorman, Zara Ahmed
Psychology
Mentor(s): Alex Burt (College of Social Science), Sarah Carroll (College of Social Science)

Increased use of digital media in recent years has been accompanied by an increase in reports of digital aggression, or cyberbullying, particularly among young people. Both alcohol use and negative affect have been linked to perpetration of digital aggression. In addition, some studies have found that men are more likely than women to engage in digital aggression. However, it is unknown whether the effects of problematic alcohol use and negative affect on digital aggression differ as a function of sex. The purpose of our study was to examine the relationship between alcohol use, negative affect, and cyber aggression in both males and females. Participants were drawn from the Digital Behavior Study (N=1069; 69% female, mean age = 19.23), a sample of students from a large midwestern university. Alcohol use was measured using the Alcohol Use Disorders Identification Test, and negative affect was measured using the Positive and Negative Affect Schedule. Participants reported on their engagement in digital aggression on the Cyberbullying Questionnaire. We conducted a linear regression analysis examining alcohol use, negative affect, and sex as predictors of digital aggression. Based on previous studies, we hypothesized that alcohol use and negative affect would both predict digital aggression, and that the associations would be stronger for men than for women.

CHILD EXTERNALIZING SYMPTOMS MEDIATE THE RELATIONSHIP BETWEEN PRENATAL EXPOSURE TO INTIMATE PARTNER VIOLENCE AND DECREASED MATERNAL COMMUNICATION
Presenter(s): Tanvi Karkare
Psychology
Mentor(s): Alytia Levendosky (College of Social Science), Matthew Marvin (College of Social Science)

Intimate partner violence (IPV) takes numerous forms including physical and sexual violence, stalking, and psychological abuse. In the United States, IPV disproportionately affects women, specifically ethnically minoritized women (Stockman et al., 2014). Overall, around 25% of pregnant women are exposed to IPV globally (Román-Gálvez et al., 2021). IPV exposure can lead to chronic activation of the mother's regulatory systems and lead to chronic stress (Murray et al., 2020). This leaves mothers with less cognitive resources to devote to sensitive caregiving. Maternal IPV exposure is in fact linked to decreased maternal sensitivity (Schechter et al., 2015). This effect of IPV on parenting is one explanation for the link between IPV and increased child externalizing behavior (Silvia et al., 2018). Additionally, prenatal IPV exposure can lead to an influx of stress hormones in the womb, which can impact the developing Hypothalamic-Pituitary-Adrenal Axis (HPA-Axis) of the fetus and lead to dysregulated stress responses in the child (Martinez-Torteya et al., 2016). Wang et al. (2013) noted an increase in normative child externalizing behaviors is associated with a decrease in maternal sensitivity towards their children. This suggests that the relation between parenting and child externalizing behavior could be bidirectional. The current study examines if the relation between pregnancy IPV exposure and maternal sensitive communication at child age 7 is mediated by child externalizin

CULTURAL REPRESENTATIONS OF CRITICISM AND SHAME IN CHILDREN'S LITERATURE AND MEDIA
Presenter(s): Arundhati Bhagwat
Psychology
Mentor(s): Tejashree Kolhe

Children's media and literature exert significant influence on their biopsychology and overall cognitive development. Shame and criticism play a critical role in child development and is often a reinforcement strategy or learnt, similar to most traits developed during early childhood. This research examines the portrayal of criticism and shame in children's literature, television shows, and other media, investigating their impact on children's beliefs, attitudes, and coping strategies. Employing parental and educator surveys, alongside content analysis of diverse media sources and leveraging prior experimental studies, this study aims to elucidate the influence of media representations on children's development.

MENTAL HEALTH CARE IN MICHIGAN FEDERALLY QUALIFIED HEALTH CENTERS
Presenter(s): A'nya Burks
Psychology
Mentor(s): Ann Annis (College of Nursing)

Integrated behavioral health refers to patient-centered, holistic care provided for patients by a practice team of primary care and behavioral health professionals who collaborate with patients and families through a methodical and economical strategy to improve delivery of high-quality care. By addressing prevalent, debilitating, and expensive behavioral health issues, we can better accomplish the triple purpose of improved patient outcomes and satisfaction at a lower cost by attending to the mental and physical needs of children, adolescents, and adults. Federally Qualified Health Centers provide critical primary and behavioral health care to underserved communities. In 2022, 39 FQHCs, representing 399 clinical sites, provided services to 650,916 individuals in Michigan. We aimed to describe mental health care services among FQHCs in Michigan. We used a federal dataset to identify Michigan FQHCs and describe key features, including geographic location, rural and urban status, and the use of telehealth. We examined patient characteristics and calculated outpatient visit rates for depression and anxiety. FQHCs with at least 50 services in 2022 are included. We found that Rural FQHCs had higher visit rates of both depression and anxiety. The upper peninsula of MI has few FQHC resources. FQHCs serve communities that have reduced access to mental health care, often in areas of limited provider resources. It is important that we better understand factors influencing mental health

CULTURAL VARIATION IN AGE AND GENDER DIFFERENCES IN NARCISSISM
Presenter(s): Macy Miscikowski
Psychology
Mentor(s): Rebekka Weidmann (College of Social Science), William Chopik (College of Social Science)

Demographic differences in narcissism are well documented. Older adults are less narcissistic (than younger adults), men are more narcissistic (compared to women), and people who perceive themselves to be of higher status report more narcissism (compared to those reporting lower status). However, most of this knowledge comes from participants from either the U.S., Australia, or western Europe. Some preliminary research suggests that psychological characteristics, like narcissism, vary across contexts and demographic differences might depend on these cultural characteristics. The current examines demographic differences in narcissism across 53 different countries in a sample of over 45,000 people. Older adults were less narcissistic than younger adults; men were more narcissistic than women. These patterns were seen across cultures.

ARE CENTRAL ATTITUDES HARDER TO CHANGE THAN PERIPHERAL ATTITUDES WHEN USING MORAL REFRAMING?
Presenter(s): Aymin Triki, Hope Hesseltine, Hussain Basrai, Jayden Vann, Jolie Kretzschmar, Minaleah Koffron, Shub Ranjan
Psychology
Mentor(s): Abigail Cassario (College of Social Science), Mark Brandt (College of Social Science), Shree Vallabha (College of Social Science)

What makes an attitude hard or easier to change? We are testing the idea that attitudes that are more highly connected to other attitudes (central) will be harder to change than attitudes that are more weakly connected to other attitudes (peripheral). Past research from our lab did not find evidence for this, which was unexpected because many theories make this prediction. Therefore, we conducted a follow-up experiment in a large sample of US Americans that aims to find out if central and peripheral attitudes differ in other ways. For example, perhaps people general more persuasion-relevant thoughts or experience stronger emotions for central vs peripheral attitudes. In our poster, we will summarize initial results of this experiment.

THE EFFECT OF SLEEP ON FALSE MEMORY FROM MISINFORMATION
Presenter(s): Jasnoor Kaur, Julia Jankowski
Psychology
Mentor(s): Kimberly Fenn (College of Social Science)

False memory can have serious implications to the fairness of the criminal justice system. Although it is well-established that memory is consolidated during sleep, little is known about consolidation of false memory. In the current study, we investigated the consolidation of false memory through misinformation (MI). The experiment consisted of three phases: encoding, misinformation, and test. In the encoding phase, participants watched a mock crime video and in the misinformation phase, participants were presented with false information regarding the video. In the test phase, participants completed a recognition test and had to decide whether or not individual items appeared in the video. A warning was given prior to the test to inform participants that some of the information they encountered was not accurate. The test phase occurred 12 hours after encoding. For the Wake group, encoding was in the morning and test was in the evening, after a waking day. For the Sleep group, encoding was in the evening and the test was the following morning, after a night of sleep. The timing of the MI also varied. In each Wake/Sleep group, half of the participants received the MI after encoding, before the retention interval and the other half received MI after the retention interval, prior to the test. We predict an interaction such that the Sleep group will show higher false memory than Wake when MI is encountered prior to sleep but lower false memory when MI is presented after

THE IMPACT OF EARLY EXPOSURE TO INTIMATE PARTNER VIOLENCE ON LATER ADOLESCENT DATING VIOLENCE
Presenter(s): Natalie Hollis
Psychology
Mentor(s): Emily Rolan (College of Social Science)

Witnessing intimate partner violence (IPV) during childhood holds significant implications for an individual's future romantic relationships. Prior research also suggests that the gender of the perpetrating parent may influence the strength of the association between early exposure to IPV and later dating violence experience (Temple et al., 2013; Gibson et al., 2014). This thesis explores the association between early exposure to IPV and involvement in adolescent dating violence (ADV), specifically examining the impacts of maternal and paternal IPV on ADV outcomes. This research employs a quantitative approach to analyzing Princeton University's Future of Families & Child Well-Being Study data. Statistical regression analysis conducted in IBM SPSS Statistic 29 will examine the association between early exposure to IPV and ADV and parental IPV reports on ADV outcomes. This study anticipates a positive association between early parental IPV exposure and adolescent ADV involvement. We hypothesize a moderating effect, where witnessing a father victim of IPV holds a stronger association with later ADV compared to witnessing a mother victim. This potential difference warrants exploration of factors like traditional masculinity, same-sex aggression dynamics, and gender-specific help-seeking barriers. These findings could inform the development of tailored prevention and intervention programs addressing both conventional and evolving gender roles while raising awareness about the

DON'T LOOK AT ME: EXAMINING FEATURE-BASED SUPPRESSION
Presenter(s): Derrek Montalvo, Lauren Broersma, Maxwell Mccort, Mila Vucelic
Psychology
Mentor(s): Mark Becker (College of Social Science)

Foreknowledge of a behaviorally relevant feature (color) increases the attentional gain of items with this color, allowing attention to be efficiently directed to relevant items. What is more controversial is whether knowing the feature of irrelevant stimuli produces suppression of attention to objects with that feature. In particular, there is debate whether suppression can occur proactively (prior to attention ever being directed to distractors) or only retroactively (attention is initially allocated to distractors but can be rapidly shifted away from them). To investigate this issue, we had subjects search displays for a left or right-facing Landolt C among a set of top or bottom-facing C's. Each "C" appeared in a colored square, and trials were preceded by a color cue that indicated that the target would never appear in a square of that color. In "suppression" trials, the cue matched three boxes - if attention was suppressed to them, only 9 items would need to be searched. In "neutral" trials, the cue did not match any of the boxes, so all 12 items needed to be searched. In a "reduced" condition, the cue did not match any of the boxes, but only 9 items appeared. In addition, we varied whether the boxes appeared simultaneously with (to test the proactive account) or 1.2 seconds before (to test the retroactive account) the C's. Initial results suggest that proactive suppression is possible and complete (search was

ASSOCIATIONS BETWEEN PERSONALITY AND SEXUAL FANTASIES
Presenter(s): Emily Cannoot
Psychology
Mentor(s): William Chopik (College of Social Science)

Sexual fantasies are common, healthy, and contribute to well-being. However, previous research is mixed regarding which personality traits are associated with the frequency and variety of sexual fantasies. We revisit this question in a much larger sample of 5,206 adults across the lifespan. We also examined associations between sexual fantasies and personality facets. The personality trait most likely to fantasize the most across all 5 levels of fantasizing were individuals who identified themselves as struggling with depression. The current study is useful in providing a more complete account of who is mostly to fantasize about and about what.

UNDERSTANDING THE ROLE OF PROSOCIAL PEER AFFILIATION IN THE RELATIONSHIP BETWEEN PARENT-CHILD CONFLICT AND ACADEMIC ACHIEVEMENT

Presenter(s): Carol Massey, Cole Parker, Madeline Walther, Rayyan Hassan
Psychology
Mentor(s): Alexandra Vazquez (College of Social Science)

Exposure to high levels of parent-child conflict has been shown to adversely affect the academic achievement of adolescents. Indeed, youth who have a parent-child relationship characterized by frequent conflict have, on average, reduced academic success. It has also been demonstrated that adolescents who have a prosocial and supportive peer network show enhanced academic engagement and higher levels of achievement. Remarkably, researchers have yet to explore how prosocial peer engagement may modulate the relationship between parent-child conflict, and academic outcomes. The proposed study aims to fill these critical gaps in the literature. We will employ a sample of 458 youth (51.2% female; 48.8% male) assessed in middle childhood (mean age = 8.02, SD=1.49) and early adolescence (mean age = 14.25, SD = 2.22). The majority of participants identified as White (82.6%), 9.6% as African American, 1.1% as Native American, 7% as 'Other.' Preliminary analyses were performed in SPSS version 27 and path analyses will be conducted using Mplus version 8. We expect to find that parent-child conflict in middle childhood predicts lower levels of academic achievement in adolescence. In addition, we expect that prosocial peer affiliation will moderate the relationship between parent-child conflict and academic achievement, such that greater positive prosocial peer affiliation would mitigate the negative effects of parent-child conflict and ultimately foster better academic outcomes. Our findi

LOST IN TRANSLATION: DO LOVE LANGUAGES PREDICT RELATIONSHIP OUTCOMES?

Presenter(s): Anna Parcells, Claire Christin, Danielle Carr, Hannah Bechinski, Kaitlyn Hartl, Renee LeBlanc, Siying Rao
Psychology
Mentor(s): William Chopik (College of Social Science)

Five love languages are hypothesized to lead to relationship success. Love languages are a popular way of thinking about relationships. However, there has been a relative lack of research formally testing whether matching on love languages is associated with relationship satisfaction. In this study, we examined whether matching love languages was associated with relationship satisfaction among 959 romantic couples. Across analytic approaches, matching on love languages was not reliably associated with relationship satisfaction. Sources of why people are happy in relationships will be discussed.

FEATURE-BASED SUPPRESSION IN VISUAL SEARCH
Presenter(s): Derrek Montalvo, Morgan Dodd, Paige Abraham, Tristan Janisse
Psychology
Mentor(s): Mark Becker (College of Social Science)

Feature-based attention is the ability to selectively attend to a specific feature (i.e., color, shape, size) while ignoring irrelevant features. This attentional mechanism involves two processes: feature-based gain (upweighting a target stimulus feature, leading to enhanced perceptual processing of that feature) and feature-based suppression (downweighing an irrelevant stimulus feature). While previous research found robust evidence for gain, evidence for suppression is less complete and more controversial. We conducted several experiments to find evidence for feature-based suppression. Participants performed a dot filtering task where they were instructed to actively ignore one set of colored dots (suppression) to detect the number of changes in luminance in a different set of colored dots (gain). On a random 25% of trials, the filtering task was interrupted by a visual search task. Search arrays consisted of a clock face with 12 letters, six of which appeared in a single color and the other six appeared in six different colors. Consistent with gain, our results show fast reaction times (RTs) when the target letter appeared in the attended color and slower RTs when half of the distractor letters appeared in the attended color. However, we found no evidence for active suppression; targets were not detected more quickly when half the distractors matched the ignored color and RTs were not slower for targets that matched the ignored color. Furthermore, the possibility of effect

EXAMINING HOW ATTENTION IMPROVES COLOR WORKING MEMORY
Presenter(s): Abby Cheng, Brianna Klopp
Psychology
Mentor(s): Susan Ravizza (College of Social Science), Taosheng Liu (College of Social Science)

Working memory underlies many everyday abilities like doing math or remembering a shopping list. Its limited capacity, however, means that it has to be used wisely. This study investigates how top-down and bottom-up attention prioritize items in working memory using an electroencephalogram (EEG). We hypothesize that top-down attention improves memory by keeping the item active until recall while the benefit of bottom-up attention to memory is from a transient capture of attention. Participants saw two colors and were then asked to recall one of them by selecting its color on a color wheel. Before the colors appeared, a cue appeared in either: 1) the center of the display and pointed to the color that was more likely to be tested (top-down condition) or 2) one of the possible color locations and was not predictive of recall (bottom-up condition). Accuracy was calculated as the degree of error on the color wheel between the remembered color and the actual color. In both conditions, error was lower for cued colors than uncued colors. EEG pattern analysis was used to decode the contents of working memory while participants were keeping the colors in mind. Preliminary data indicate that the cued color could be decoded during the delay interval in the top-down attention condition but not in the bottom-up condition. The findings suggest that top-down and bottom-up attention prioritize items in working memory in different ways. Top-down attention keeps items active in memory until re

THE ROLE OF TARGET SPEECH RHYTHM IN SPEECH RECOGNITION IN ZOOM-LIKE CONDITIONS
Presenter(s): Kyle Oliver
Psychology
Mentor(s): J McAuley (College of Social Science), Toni Smith (College of Social Science)

Over the last decade, more of our social encounters have transitioned to online spaces. The ubiquity of these spaces (Zoom, FaceTime, etc.) raises an important question: What factors impact people's ability to understand speech when using these technologies? One previously established factor is speech rhythm (McAuley, Shen, Dec, & Kidd, 2020). According to Dynamic Attending Theory (DAT), it is an important factor because attention is entrained (synchronized) by natural speech rhythm and then directed to rhythmically expected time points in the stimulus (Jones and Boltz, 1989). The DAT-based Selective Entrainment Hypothesis (SEH) proposes that speech perception is facilitated by temporal expectations formed by natural speech rhythm (McAuley, Shen, Dec, & Kidd, 2020). The present experiment extends the SEH to the context of an audiovisual (AV) online environment and examines how altering the rhythm of to-be-attended-to target speech affects people's ability to understand speech-in-noise. Participants listened to sentences with the grammatical structure, Name + Verb + Number + Adjective + Noun, and selected one of ten possible options heard for each word. For all conditions there was both audio and an accompanying video on screen for a to-be-attended-to target talker and a competing background talker. We varied conditions by AV target speech rhythm (intact or altered) and by the onset of the target audio relative to the target video (early, in-sync, or late).

MORAL JUDGMENT AT THE NEXUS OF EMOTION AND REASON: CONCEPTUAL REPLICATIONS AND EXTENSIONS WITHIN A DUAL-PROCESS FRAMEWORK
Presenter(s): Josh Pierce
Psychology
Mentor(s): C. David Navarrete (College of Social Science)

This study examines the interplay among emotion, reason, and religiosity in the process of decision-making in moral dilemmas (N = 259). Drawing on predictions from dual process theory, we conceptually replicate earlier work on the roles that dilemma type (impersonal and personal), reaction time, religiosity, and emotional arousal play in moral decision making. We found that utilitarian moral judgments were more often favored over deontological judgements when the dilemma type was impersonal, emotional response was low, reaction time was high, and religiosity was low. Using multi-level modeling, we affirmed the links between utilitarian judgment, reaction time, and dilemma type, and extended the findings to include both moderation and mediation of the links between emotion and utilitarian choice. This study sheds light on the complex relationship between personal involvement, emotional responses, and moral judgments, elucidating the role of moderated mediation pathways in the framing of moral dilemmas and utilitarian choices.

ARE YOU A FIBBING FRIEND? : SELF AND FRIEND PERCEPTIONS OF HONESTY
Presenter(s): Anna Marks, Fei Lin, Isabella Stephanoff, Kalan Patel, Olivia Kimbrough, Olivia Szarowicz
Psychology
Mentor(s): Hyewon Yang (College of Social Science), William Chopik (College of Social Science)

Honesty that can be conducive to relationships, organizations, and societies (Miller et al., 2021) has been measured in multiple ways, such as via self-report, video coding, and other ratings. However, it has relied heavily on self-reports that can be affected by heuristics such as self-serving bias. Instead, other (e.g., friends) ratings are suggested to be accurate in capturing lowly observable but evaluative traits (Self-Other Knowledge Asymmetry model; Vazire, 2010). Therefore, we examined whether 1) friends agree upon who is more honest than others, 2) we have accuracy in perceiving our honesty compared to the friends' ratings, and 3) relationship factors (e.g., relationship duration, satisfaction) matter in the friend's judgment on honesty. We collected 200 quads of friends in a round-robin design (N = 800), who anonymously rated the honesty of themselves and other friends in a group using multiple questionnaires on honesty. We will employ the social relations model (SRM) to partition the variance of perceived honesty into the perceiver, target, and relationship components. We expect results to show significant target variance (i.e., meaningful consensus upon who is an honest person) and self-other correlation (i.e., self-report and friends' report can overlap). We will also run bivariate SRM to see if friends' perceptions vary by relationship factors. Implications will be discussed in the context of honesty and social network studies, highlighting friends' ratings to m

ANALYZING THE REACH AND EXTENT OF CO-PRODUCTION IN PSYCHOSIS RESEARCH ACROSS THE GLOBE
Presenter(s): Sophia Futo, Sumaiya Imad
Psychology
Mentor(s): John Waller (College of Social Science), Katharine Thakkar (College of Social Science)

Tragically little progress has been made in several decades of research into the causes, nature, and treatment of psychoses. In light of the disappointing yield of the traditional scientific approach, in which academic researchers are positioned at a distance from the object of study, a new way of conducting psychosis research is gaining credibility. Called 'coproduction', it involves the direct involvement of people with 'lived experience' of severe mental illness in the design, execution, and dissemination of research. The core idea is to harness the knowledge, practical expertise, wisdom, and compassion which those with deep, personal experience of psychosis can provide. Over the past several months, we have been working with Professor Katy Thakkar (Department of Psychology) to measure the progress of this promising and overdue means of studying mental illnesses. We will be presenting our results based on extensive reviews of recent literature. Our presentation shows: (a) in which parts of the world coproduction is being practiced and why; (b) the proportion of research on psychosis which entails any level of coproduction with people who are 'experts by experience'; (c) the extent to which those with lived experience are incorporated into the development of studies; and (d) the nature of the studies in which coproduction is either common or rare. In this way, we hope to contribute to the development of a coproduction research center here at MSU and inform applications for

DOES PERSONALITY CONDITION THE RELATIONSHIP BETWEEN THREAT AND POLITICAL CONSERVATISM?

Presenter(s): Aymin Triki, Shub Ranjan
Psychology
Mentor(s): Abigail Cassario (College of Social Science), Mark Brandt (College of Social Science)

Prominent theories in political psychology suggest that when people are threatened, they should shift their political beliefs to the right (Jost et al., 2003). Recent research examining the effects of threat on ideology have failed to uncover this conservative shift effect, but have revealed considerable individual differences in ideological responses to threat. We test whether these individual differences are systematic, and predicted by political personality theories which suggest that individuals high in openness (threat constraint model, Sibley et al., 2012) or low in openness and high in conscientiousness (negativity bias; Hibbing et al., 2014) should be particularly likely to display conservative shifts in response to threat. We test these expectations in two experiments fielded in the fall of 2023, one in a student subject pool, and one in a nationally representative panel study. Results will be presented and discussed.

THE IMPACT OF RUNNING ON DEPRESSION, ANXIETY AND STRESS

Presenter(s): Joey Gallagher
Psychology
Mentor(s): Brooke Ingersoll (College of Social Science)

This study examines the impacts of running on depression, anxiety and stress to answer the research question: does running reduce symptoms of depression, anxiety and stress? Exercise is known to improve physical health, but it is also important to research the impact of exercise on mental health. One of the most attainable forms of exercise is running. To study the impact of exercise, specifically running, on depression, anxiety and stress, 18 participants completed the Depression, Anxiety and Stress Scales (DASS-42), prior to running a mile every day for 7 days. The DASS-42 is a 42-prompt 4-point scale for severity/frequency divided into 16 subsections for specific symptoms. For depression the subcategories were: dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, inertia. For anxiety the subcategories were: autonomic arousal, skeletal musculature effect, situational anxiety, subjective experience of anxious affect. For stress the subcategories were: difficulty relaxing, nervous arousal, easily upset/agitated, irritable/over-reactive, impatient. After the 7 days, they took the survey again and the results were compared via paired sample t-test. The results showed a significant decrease in depression symptoms such as dysphoria ($t(17)=1.871$, $p=0.039$) and anhedonia ($t(17)=2.204$, $p=0.021$), anxiety symptom of situational anxiety ($t(17)=2.335$, $p=0.016$) and stress symptoms such as nervous arousal ($t(17)=2.012$, $p=0.030$), eas

FEEDBACK OR FREQUENCY? INVESTIGATING THE INFLUENCE OF PROBES ON SPECIFIC SEARCH MECHANISMS DURING VISUAL SEARCH
Presenter(s): Al Rajala, Derrek Montalvo, Megan Swan, Michele Lleshi, Sarah Miller
Psychology
Mentor(s): Mark Becker (College of Social Science)

The Low Prevalence Effect (LPE), in which rare targets in a visual search task are likely to be missed when they do appear, impacts real-life searches. This effect can have negative implications for vital real-world searches, including radiology and baggage screenings, where targets are rare and misses are costly. Previous research attempting to mitigate the LPE has shown that including a set of "probe trials", fake trials which have a target and provide post-response feedback circling the target, can increase rare target detection. Here we investigated the extent to which this "probe benefit" results from the feedback and/or the fact that the inclusion of the probe trials changes the perceived prevalence rate of a target. Participants searched for one of two targets (T or O) in a control block and block with probe trials, with 80% of the probe trials having one of the targets and 20% the other target. For half the participants, the probe trials included feedback and for half they did not. Eye movements were also tracked to provide insight into how feedback and perceived prevalence rates influence specific search mechanisms (e.g., quitting thresholds, top-down guidance, and item-by-item identification criteria). If the critical factor behind the probe benefit is the post-response feedback, performance and search dynamics should differ between those who received feedback and those who did not. If changes in perceived prevalence is critical, the two feedback conditions should p

ACADEMIC ACHIEVEMENT IN THE College of Engineering: IMPORTANCE OF BELONGING AND REPRESENTATION
Presenter(s): Madison Gailey, Mikang Moon, Natalia Salman
Psychology
Mentor(s): Sharlyn Ferguson-Johnson (College of Education)

Research has found that Engineering students tend to have varying perceptions of belonging within Engineering. Academic achievement appears to significantly influence Engineering students' sense of belonging in their major. Do Engineering students with higher grades feel a greater sense of belonging than other Engineering students? Our study surveyed 2,029 undergraduate students in the College of Engineering from Michigan State University beginning their freshman year and followed them until senior year. We also recorded their graduating GPA and perceptions of belonging each year. Predictors in this study were Engineering students' belongingness in the College of Engineering, belongingness with classmates/peers, and belongingness with professors. Our results indicate Engineering students who feel a greater sense of belonging within the College of Engineering had higher cumulative GPAs at the end of their undergraduate careers. Sophomores' and juniors' higher sense of belonging was also predictive of higher achievement. Among Engineering students, a higher sense of belonging within the College of Engineering consistently predicted higher cumulative GPAs at the end of their undergraduate years. Engineering students' sense of belongingness with classmates/peers was not predictive at any time point of subsequent academic success. Belongingness with professors at the end of their first year of college was negatively associated with their later academic achievement. Under-represent

FRAMING BLUE-LIGHT IN A NEW LIGHT: A NOVEL APPROACH TO COMBAT COGNITIVE DEFICITS FROM SLEEP DEPRIVATION

Presenter(s): Claudio Nuhaj, Manvir Bamrah

Psychology

Mentor(s): Kimberly Fenn (College of Social Science)

Despite a recommended 7+ hours of sleep each night, almost a third of adults fall short. Prioritizing quality sleep is essential for optimal performance and well-being. Sleep-deprivation significantly impairs vigilant attention and placekeeping performance. Broadly, vigilant attention is the ability to maintain focus on a task, while placekeeping is the ability to accurately follow steps in a task sequence, without repeating or omitting a step. Sleep-deprivation increases lapses in attention and errors in placekeeping. Our previous research explored strategies such as napping and caffeine to mitigate these cognitive deficits following deprivation, but both were largely ineffective. In this study, we investigated blue-light, as it has been shown to boost alertness and enhance cognitive function. Participants arrived in the evening and completed tasks of vigilant attention (Psychomotor Vigilance Task [PVT]) and placekeeping (UNRAVEL). They were then randomly assigned to either remain awake for the night in the laboratory (Deprivation) or return to their habitual sleeping environment and come back in the morning (Sleep). During the morning session, all participants wore blue-light emitting glasses for 30 minutes, with half receiving the blue light and the other half sham control. After light exposure (or control) participants completed PVT and UNRAVEL again. Data collection is ongoing, but we predict that sleep-deprived participants will exhibit poorer performance on both tasks.

PERCEPTIONS OF NARCISSISM AND FRIENDSHIP QUALITY

Presenter(s): Alyssa Marzullo, Kaitlyn Sims, Pooja Rajakumar

Psychology

Mentor(s): Rebekka Weidmann (College of Social Science), William Chopik (College of Social Science)

This study examines narcissism perceptions among friends and how these perceptions are linked to relationship quality. Specifically, is being viewed as more or less narcissistic linked to how people perceive themselves, and how do narcissism perceptions affect friendships? Addressing these research questions is important because it can help us better understand friendship perceptions and how they are associated with friendship quality. We used data from 197 groups of four friends (N = 788) who rated each other on narcissism and provided information regarding their friendship quality (e.g., satisfaction, trust, closeness) and duration. We will analyze the data with a social relations and multilevel model framework to understand perceptual biases and their link to relationship quality in friendships. This study can result in more information on narcissism which can positively influence the lack of awareness that is present on this issue. Narcissism in friendships is spoken about less. Therefore this information can be used for its clinical impact in helping people in the community maneuver their interpersonal relationships.

THE CLEAN CONSCIOUS INITIATIVE

Presenter(s): Denis Selyuzhitsky, Kayla Tracey, Shrishti Jalan

Psychology

Mentor(s): John Waller (College of Social Science), Maria Lapinski-LaFaive (College of Communication Arts Sciences), Nathan Moore (College of Social Science)

Our work aims to understand what could motivate college students to be more environmentally conscious in their shower usage. Previous work has demonstrated an irrefutable link between water usage and carbon dioxide emissions; shower usage is among the highest contributor to water usage. High levels of hot water usage are extremely problematic in large institutions as hot water is mainly heated by fossil 121 fuels. Thus, we designed a study to find out if we could encourage students to take shorter showers, with the hope of achieving a measurable reduction in our carbon footprint. Step One was to install water meters in the Mason-Abbott dorm showers to measure a quantitative baseline of water usage. Step Two involved trying to understand what motivates college students' shower lengths intending to use this knowledge to promote shorter showers. We created a preliminary survey to gauge current knowledge and concerns about water use. We then developed experimental social norm messages in an attempt to motivate a reduction in shower length. In some showers, we also installed digital timers to help students monitor their water usage. We then collected quantitative data from the meters installed in the bathrooms after exposing the test groups to different messaging interventions. The project is ongoing and we will continue to collect more data across the next academic school year. Ultimately, we hope to extend the methods used in this study to other institutions and universities to

UTILIZING PUPILLOMETRY TO EXPLORE EXISTING CATEGORIZATIONS OF PSYCHOSIS RISK

Presenter(s): Payton Cooper

Psychology

Mentor(s): Christophe Delay (College of Social Science), Katharine Thakkar (College of Social Science)

Psychotic-like experiences (PLEs) are unusual perceptual experiences present in the general population (5-8%) characterized by distorted thoughts/beliefs (e.g. attenuated delusions) and/or hallucinations. Higher quantity of and distress associated with PLEs is associated with a 5 to 16 fold increased likelihood to transition to schizophrenia-spectrum disorders. However, heterogeneity in the definition of these experiences paired with individual variation in symptom presentation remain limiting factors to the establishment of thresholds for the transition to schizophrenia. As such, objective measures of risk of transition to schizophrenia in PLEs are still needed. Recent research into the mechanisms of psychotic symptoms has revealed alterations in the stress response indexed by the autonomic nervous system (ANS) associated with increased psychotic symptom severity in individuals with schizophrenia. Investigating ANS alterations in individuals with PLEs may provide objective support for categorizing individuals into "low" and "high" risk groups. The current study uses pupillometry, an easy to use and objective measure of the ANS, to investigate group differences in pupillary parameters in high (high symptom distress) and low (low symptom distress) PLE individuals measured using the Prodromal Questionnaire (PQ-B). Using independent samples t-tests, we anticipate that high PLE individuals (n = 31) will show greater ANS deficits than low PLE individuals (n = 28). In addition, we

DOES REPETITION CAUSE PEOPLE TO SEE SOCIAL MEDIA HEADLINES AS MORE ACCURATE?
Presenter(s): Hussain Basrai, Jayden Vann, Jolie Kretzschmar
Psychology
Mentor(s): Abigail Cassario (College of Social Science), Mark Brandt (College of Social Science), Shree Vallabha (College of Social Science)

Why do people think that fake news headlines are accurate? One factor may be how often people see the headline. Past work has shown that prior exposure to information increases liking and the perception that something is true. Pennycook et al (2018) tested this idea in the context of fake news and misinformation. They found that prior exposure increased the accuracy ratings of social media headlines, including fake headlines, even when the headlines were previously presented with a tag indicating that they were fake. We replicated this study in a sample of university students. In our poster, we will present the results of this replication attempt and compare it to the original study.

RELIGION AND MORAL JUDGEMENT
Presenter(s): Hannah Greenspan
Psychology
Mentor(s): C. David Navarrete (College of Social Science)

This study examines the interplay between religiosity and moral judgment in sacrificial moral dilemmas. Drawing on insights from various theoretical perspectives we extend previous work on the roles of religious values and practice in generating deontological moral judgments. In this study, we explore the effects of the centrality of religiosity as described in the subcontext of religious intellect, ideology, public practice, private practice, and religious experience on moral judgment. Preliminary analysis reveals promising effects for public and private practice, religious ideology, and religious experience in predicting deontological moral judgments in moral dilemmas. These findings have implications regarding the importance of religion in moral decision-making and may contribute to societal discussion and public policy.

ARE DISORGANIZED SYMPTOMS OF SCHIZOPHRENIA RELATED TO INTERVAL TIMING DEFICITS?

Presenter(s): Ryan Holland
Psychology
Mentor(s): Dom Roberts (College of Social Science), Katharine Thakkar (College of Social Science)

Schizophrenia is a chronic psychological disorder characterized by delusions, hallucinations, negative symptoms and disorganized or impoverished thought. Disorganized symptoms occur in 50-70% of cases of schizophrenia and are considered some of the most striking symptoms of schizophrenia as they predict poorer quality of life, reduced functional outcomes, and worse treatment outcomes. Difficulty in treating disorganized symptoms could be due to a poor understanding of the causes of these symptoms. Examples of disorganized symptoms include derailment, or transitions in speech to obliquely related subjects, illogicality and difficulty using grammar. These symptoms may result from sequencing deficits that make it difficult to discern grammatical dependencies or compare the propositions of sentences. Sequencing relies on activity in the inferior frontal gyrus. This region also supports the ability to quantify and compare durations of time, abilities which persons with schizophrenia report difficulties with. Therefore, it is possible that deficits in temporal perception - specifically interval timing - could relate to disorganized symptoms of psychosis. In this study, we used a peak interval task to measure the interval timing ability of a sample of undergraduate students. We predicted that disorganized symptoms generally, and odd speech specifically, would be significantly related to participants' accuracy and precision in the peak interval procedure. Independent sample t-tests

SLEEP CYCLE DURING REPRODUCTIVE CYCLE IN FEMALE RATS

Presenter(s): Meena Kannan
Psychology
Mentor(s): Lili Yan (College of Social Science)

Women endure disturbances in their sleep throughout pregnancy and postpartum. Sleep is regulated by the circadian system or a brain clock that coordinate the daily rhythms in behaviors, physiological and mental functions. The circadian system is synchronized to the daily light/dark cycle and is influenced by ovarian hormones. To explore the impact of fluctuating ovarian hormones on sleep during pregnancy, the current study monitored daily locomotor activity and sleep in female Long Evans (LE) rats at different reproductive stages across pregnancy. 10 female virgin LE rats were used in the study. Animals were singly housed for ~ two weeks, during which vaginal cytology was monitored to determine the phase of their estrous cycle, prior to mating with a male on the day of proestrus. Male was removed after 24 hr of co-housing. Successful mating was confirmed by sperm presence in vaginal smear, the day of which is defined as pregnancy day 0 (P0). The female was kept in her home cage until P 20 or postpartum day 10. Their locomotor activity and sleep/wake were monitored using a motion sensor and an PiezoSleep system (Signal Solutions), respectively, throughout the study. Sleep disturbances, i.e., increased locomotor activity and wakefulness especially during light phase (inactive phase for nocturnal rats, equivalent to nighttime in diurnal humans) are expected in late pregnancy as observed in pregnant women. The results from this experiment will help guide future studies to elucida

WE ALL HAVE STRESS, BUT HOW IS IT COPED WITH?
Presenter(s): Maya Marina
Psychology
Mentor(s): Autumn Ashley (College of Nursing), Jiying Ling (College of Nursing)

Approximately 74% of the population experiences high-level stress. A common risk factor for high levels of stress is low socioeconomic status, due to stress centered around income and employment. Although coping strategies play an integral role in managing daily stress, there is a literature gap on the various coping strategies applied by low-income parents. Therefore, this study aimed to investigate the coping strategies employed by low-income parents with varying degrees of stress. A secondary data analysis, including descriptive statistics and ANOVAs, was performed with data from two experimental studies among 192 parents recruited from Head Start programs in Michigan. Parents completed self-report surveys measuring perceived stress and coping. Stress levels were classified into three categories, including high, medium, and low. Fourteen coping strategies were organized into two categories, maladaptive (e.g., denial, substance use) and adaptive (e.g., positive reframing, social support). The sample consisted of 93.6% women, 53% with an income below $20,000, and 44.6% being unemployed. As parents' perceived stress increased, their reported use of a maladaptive coping strategy also increased. Significant group differences among low, medium, and high stressed parents were found in applying the following coping strategies, including self-distraction, denial, substance use, instrumental support, behavioral disengagement, venting, planning, humor, and self-blame. Based on these

ASSOCIATIONS BETWEEN EATING DISORDERS AND GASTROINTESTINAL DISEASE IN A LARGE, POPULATION-BASED SAMPLE OF ADULT WOMEN AND MEN
Presenter(s): Laura Pascoe
Psychology
Mentor(s): Kelly Klump (College of Social Science)

Some research suggests higher rates of gastrointestinal disease (e.g., GERD, IBDs) in individuals with eating disorders (EDs). However, studies are scarce and limited to small, clinical samples that may not represent all people with these conditions. Studies also have not examined potential sex differences that could highlight etiologic factors involved in shared risk. This will be the first study to examine how EDs/dimensional ED symptoms (e.g., body dissatisfaction, binge eating) relate to gastrointestinal disease in a large, population-based sample of women (N = 2,980) and men (N = 2,903). Given past literature, I hypothesize that I will find significant, positive associations between the presence of gastrointestinal disease and ED diagnoses/dimensional ED symptoms. Participants ages 18-65 (M age = 36.57, SD = 8.04) will be drawn from the Michigan Twins Project (MTP). The presence/absence of gastrointestinal disease will be individually coded by two raters based on participant responses to questions regarding chronic illness/medications on the MTP health checklist. Participants self-reported the presence/absence of EDs on the health checklist and provided dimensional ratings of ED symptoms on the MTP-ED. Multi-level models (MLMs) will be used to examine associations between gastrointestinal disease, EDs, and ED symptoms controlling for sex, BMI, and sociodemographic variables. MLMs will also be used to explore sex differences in observed associations. Findings are li

SOCIAL SUPPORT AND MENTAL HEALTH OUTCOMES IN UNDERGRADUATE STUDENTS
Presenter(s): Abhinav Patelu, Shreeya Belagali
Psychology
Mentor(s): Katharine Thakkar (College of Social Science), Matthew Lehet (College of Social Science)

Resilience-based models of psychosis have proposed the role of social support in buffering the impact of risk factors associated with schizophrenia onset. While receiving social support has consistently been associated with positive mental health outcomes, the benefits of giving social support are less clear. Prior research identifies benefits associated with stress coping that might arise from the human tendency to nurture others. However, whether giving social support confers resilience to an individual may depend on factors such as the type of support and to whom the support is given to. This project investigated the relationship between various types of social support and mental health outcomes in late-adolescent undergraduates with either a high or low degree of schizotypal traits. Four mental health outcomes were observed: loneliness, depression/anxiety, social anxiety, and psychological well-being. Subscores distinguishing giving/receiving and total reported social support were calculated. Stress's role as a potential mediator between social support and mental health outcomes was also analyzed. Correlations investigated the link between giving, receiving, and total social support with mental health outcomes split across risk status. Results indicated that total social support significantly improved psychological well-being in the high risk group only and significantly decreased reported loneliness in both groups. Past stress was found to mediate the relations

HUMOR STYLES AND FRIENDSHIP: AN SRM ANALYSIS
Presenter(s): Amalia Rosenblum, Isabella Soave, Ishu Kudapa, Joseph Romanelli, Logan Gibson, Ruby Lewis
Psychology
Mentor(s): Kenya Mulwa (College of Social Science), Mariah Purol (College of Social Science), William Chopik (College of Social Science)

Are you and your friends actually funny? Humor has been determined to play a critical role in romantic relationships, self-esteem, and friendships. However, there are many underlying social processes that influence perception of humor. The current study investigates how social, self-enhancing, self-deprecating, and aggressive humor styles are perceived among individuals and their close friends. Friend groups of four were surveyed about their thoughts on their own, as well as their friends' use of different kinds of humor (N= 202 groups). The results were compiled to determine how friends may perceive each other's humor. The Social Relations Model (SRM). a statistical model used to explain complex social relations, was used to analyze data from the surveys. The findings suggest that the perception of humor is primarily dictated by unique, dyadic relationships. Additionally, self-deprecating and self-enhancing humor styles were also moderated by unique, dyadic relationships. In contrast, aggressive and social humor styles were regulated by the general, judgmental bias of the individual towards others.

OBSERVING THE RELATIONSHIP BETWEEN EXCESSIVE EXERCISE BEHAVIORS AND DISORDERED EATING

Presenter(s): Sarah Sweers

Psychology

Mentor(s): Carolina Anaya (College of Social Science), Kelly Klump (College of Social Science)

With increasing pressures from the media, there is a rising prevalence in excessive exercise in the pursuit of health and fitness. Disordered eating and increased levels of body image concerns may be related to engagement in excessive exercise. Previous research has found that disordered eating levels increase significantly during adolescence; however, studies regarding excessive exercise have focused primarily on adults. Additionally, males and females typically engage in different forms of exercise for different purposes, and associations may differ due to sex. This study investigated sex differences in associations between excessive exercise and disordered eating among 1,266 pre-adolescent and adolescent females and males ages 10-19 from the Michigan State University Twin Registry. The main effects of excessive exercise in this study found that greater levels of excessive exercise were significantly associated with overall disordered eating, binge eating, dietary restraint, and body image concerns. Main effects of sex indicated that females score higher on overall disordered eating and body image concerns than males. However, associations between excessive exercise and disordered eating did not differ by sex. Associations remained significant after controlling for puberty, age, or BMI. Ultimately, males and females may have approximately an equal probability of being more likely to engage in excessive exercise if they also engage in a range of disordered eating behaviors o

PROTECTIVE NEIGHBORHOOD SOCIAL PROCESSES BUFFER THE NEGATIVE EFFECTS OF NEUROTICISM ON WELL-BEING

Presenter(s): Jessy Boughner, Veronica Van Rossen

Psychology

Mentor(s): Alex Burt (College of Social Science)

Low levels of neuroticism, high levels of conscientiousness, and high levels of extraversion all demonstrate robust associations with well-being across the lifespan. Frequently these associations are present regardless of the social context, personXenvironment theory suggests that neighborhood characteristics may be differentially protective across residents (Eccles & Midgley, 1989; Eccles et al., 1993). The current study aims to test this possibility, evaluating how individual personality traits might interact with neighborhood social processes to predict well-being in under-resourced neighborhoods. We examined a sample of 3,210 participants (63% female, 15.7% identifying with a racialized identity) residing in 567 neighborhoods with an average of 7.4 participants per neighborhood (range 1-18). Well-being was assessed using the Satisfaction with Life Scale (Diener et. Al, 1985). Analyses consisted of multilevel regression models, with participants as the lower-level unit and the neighborhoods as upper-level unit. After computing the neighborhood-level variance in well-being, we evaluated the extent to which this neighborhood-level similarity in well-being was accounted for by individual personality (assessed by the International Personality Item Pool; Goldberg et. Al, 2006) and neighborhood social characteristics (assessed via the Neighborhood Matters Survey; Henry et. Al, 2014). Results revealed 6-8% of the variance in individual well-being was accounted for by the neig

EXPLORING THE ASSOCIATION BETWEEN THE BIG 5 PERSONALITY TRAITS AND INDIVIDUAL ADAPTABILITY

Presenter(s): McKenna Bausman
Psychology
Mentor(s): Caton Weinberger (College of Social Science), Dorothy Carter (College of Social Science)

Due to the dynamic nature of modern work, individual adaptability is an increasingly desirable characteristic of employees. This research will examine a hypothesized relationship between personality traits and individual adaptability. Prior studies have provided evidence for an association between three of the Big 5 personality traits (i.e., consciousness, openness to experience, and neuroticism) and individual adaptability (Bartone, 2018; Murphy, 2015; Wang, 2012). My study will add to this literature by using a multiple linear regression model to estimate the unique contribution of each of the Big 5 personality traits to individual adaptability. Data was gathered from 608 undergraduate participants in the context of an ongoing study on team composition. A survey collected prior to subjects' participation in the study included measures on personality and individual adaptability. Individual adaptability, which refers to one's ability to respond to and interpret different situations, was measured utilizing the I-ADAPT-M, a comprehensive self-report (Ployhart & Bliese, 2006). Scale items were included for four facets of individual adaptability, including the ability to learn new tasks and procedures, solve problems creatively, and deal with unpredictable work situations, as well as interpersonal adaptability, Participants' personality was measured using the IPIP-NEO-60 assessment (Maples-Keller et al., 2017). A unique strength of this study is its large sample size relative

DOES MOVEMENT IMPROVE TIMING JUDGEMENTS? EFFECTS OF MUSIC AND DANCE TRAINING.

Presenter(s): Olivia Berke, Parker Major, Regan McGivern, Vu Song Thuy Nguyen
Psychology
Mentor(s): J McAuley (College of Social Science)

Previous studies (Manning and Schutz, 2013) have suggested that moving or tapping to a beat can objectively enhance timing judgements. However, our research questions the claim of objective improvement caused by movement, instead we propose that a fine-tuning strategy could be at play. This raises the hypothesis that those with formal music training (FMT) or formal dance training (FDT) will be better at utilizing this proposed strategy, and thus will have a greater degree of movement advantage. To test this hypothesis, participants were assigned to a separate room equipped with a motion-tracking device and a computer. The participants were asked to judge if the final tone in a particular series was "offbeat" compared to the preceding three tones under two conditions: 1) movement (tapping), and 2) refraining from any movement. Demographic data, including their formal music and dance training, was also recorded. Statistical analysis was then conducted to see if there was a difference in movement advantage between those with and without FMT and then separately for FDT. Tentative data shows no significant difference between those with music training and those without, however we did find a significant decrease in accurate responses under the movement condition for those with FDT. This does not provide evidence for our hypothesis that a strategy of fine-tuning movement is used for timing judgements, and looking at FDT specifically it contrasts with it. The lack of improvement in t

THE INFLUENCE OF PARENTING STRESS ON ATTENDANCE AND HOMEWORK COMPLETION IN EARLY AUTISM INTERVENTION

Presenter(s): Olivia Bowman
Psychology
Mentor(s): Brooke Ingersoll (College of Social Science), Hannah Tokish (College of Social Science), Jessie Greatorex (College of Social Science)

Previous research has shown that parents of children diagnosed with autism experience higher stress compared to parents of typically developing children (Crnic et al., 2005, Davis & Carter, 2008, Hayes & Watson, 2012, Barroso et al., 2017). This stress has been associated with reduced parent engagement in child psychotherapy (Rovane et al., 2020), defined primarily by session attendance and homework completion. However, few studies have examined the impact of parental stress levels on their engagement in autism-specific intervention. Methods: Parents were recruited from an ongoing NIMH-funded randomized controlled trial on the effectiveness of a parent-mediated intervention (PMI) for children 18-36 months old with early signs of autism. At intake, parents completed the Parenting Stress Index-4 Short Form (PSI) as a measure of stress related to parenting. Parent intervention session attendance was collected, and parents reported on their frequency of intervention strategy practice at home, which will be used as a proxy for homework completion. A linear regression will be conducted to determine whether parent stress levels predict their intervention attendance and frequency of practice at home. Hypotheses: We expect to find that higher parenting stress will predict lower session attendance and lower frequency of intervention strategy practice at home. Discussion: Preliminary findings will contribute to greater understanding of how parent stress impacts participation in

THE EFFECT OF CONFIDENCE, DECISION STRATEGY, AND MEMORY STRENGTH ON EYEWITNESS IDENTIFICATION
Presenter(s): Julia Burgess, Maria Faraj, Sahithy Oruganti
Psychology
Mentor(s): Kimberly Fenn (College of Social Science)

Eyewitness identification provides compelling evidence to juries but is susceptible to errors and biases due to flaws in human memory. There are many factors that impact eyewitness identification, such as cross-racial identification, leading questions, and stress. We previously investigated whether subjective decision-making strategy, objective decision-making strategy (using eye tracking), and memory strength affected accurate eyewitness identification. Ultimately, subjective decision making was the only strong predictor of accuracy, although memory strength predicted correct rejections when the lineup did not contain the perpetrator. In this study, we examined the same factors except objective decision-making and varied the delay between witnessing a crime and performing an identification to understand how time and memory strength affect identification accuracy. The experiment was online and consisted of two sessions. In the first session, participants were presented with a mock crime video and in the second session, they were randomly assigned to either a target-present or target-absent lineup and were asked to identify the culprit The target-present lineup contained the perpetrator and 5 fillers while the target-absent lineup contained 6 fillers. Session 2 was administered either 24-hours or 48-hours after Session 1 to ensure variability in memory performance. Data collection on 704 participants has been completed, and data analysis is ongoing. We predict that memory qual

COMPARING EFFORT-RELATED PUPIL RESPONSES BETWEEN DIFFERENT TASKS
Presenter(s): Brooke DuRussel, Gabriel Gampala, Tanvi Karkare
Psychology
Mentor(s): Jan Brascamp (College of Social Science)

Effortful mental activities such as reasoning and memorizing cause the pupil to dilate. Such dilations are thought to reflect activation of the sympathetic nervous system, associated with task preparation. Internal sympathetic activation can be measured externally through pupillometry. In this study, we sought to determine whether stimuli that differed in the amount of cognitive effort required and in sensory properties, resulted in different pupil responses. In two effortful tasks, participants judged the orientation of a tilted line or the change in tone pitch, respectively. These two tasks were matched in difficulty, so the amount of effort involved was similar. In two non-effortful tasks, participants viewed a horizontal line or heard a beep, respectively, without any stimulus-related task. These latter two tasks, although different from the former two in terms of cognitive effort, were designed to match the former two in sensory properties. Findings revealed that the effortful tasks caused large pupil dilations, with a significant peak in pupil size at approximately 1.3 seconds after stimulus onset. In contrast, the non-effortful tasks caused significantly smaller and less pronounced pupil dilations. These results indicate that it is cognitive effort, rather than sensory processing, that is primarily responsible for stimulus-related pupil dilations in our conditions, consistent with the idea that these dilations are associated with sympathetic signals that help pre

DOES MOVING TO THE BEAT IMPROVE TIMING JUDGMENTS?
Presenter(s): Meghana Gogineni, Rachael Farquharson, Tanmay Shekhar
Psychology
Mentor(s): J McAuley (College of Social Science), Toni Smith (College of Social Science)

Manning and Schutz (2013) found that tapping to the beat of auditory sequences improved listeners' judgments about sequence timing. Participants heard isochronous tone sequences and listened (no move) or tapped along (move), then were asked to make 'on-time' vs. 'off-time' judgments about the timing of a final probe tone. Sequences consisted of a high tone preceding three low tones, repeated three times, before a three-beat silent interval, ending with a (high) probe tone. The low tones always occurred on 400ms intervals, and the high tones on 1600ms intervals, except for the probe tone which varied in time. The move condition produced better judgments than the no move condition, leading the authors to conclude that movement 'objectively improves timing perception'. An alternative explanation is that tapping encouraged mental subdivision of the silent interval, which improved judgments. To test this hypothesis, we devised three experiments based on the Manning and Schutz paradigm. In experiment 1, the probe tone was offset by 15-30%, early or late, of the 400ms interval, while in experiment 2, the probe tone was offset by 15-30% of the 1600ms interval. In experiment 1, a movement advantage was found for judging late tones. In experiment 2, we hypothesize there will be no movement advantage. In experiment 3, participants will either listen to tone sequences and be instructed to mentally subdivide or just listen. We predict better performance during the mental subdivision porti

THE EFFECTS OF EXOGENOUS MELATONIN ON SLEEP AND MORNING COGNITION IN YOUNG ADULTS
Presenter(s): Branch Nietling, Lauren Mendians, Maddy Nomer
Psychology
Mentor(s): Kimberly Fenn (College of Social Science)

Melatonin is a hormone that helps control circadian rhythms. Supplementary melatonin reduces sleep onset latency and can reduce awakenings during the night in individuals affected by insomnia and circadian rhythm disorders. Increasing melatonin levels can help people achieve adequate sleep, which is important for cognition. Even though melatonin is considered beneficial, some research suggests that it can have a negative effect on cognition and decrease performance on attention tasks when administered during the day. The current study investigated the impact of melatonin on sleep and cognitive performance after an eight-hour sleep opportunity. In the evening, participants performed a vigilant attention task (Psychomotor Vigilance Task) and a placekeeping task (UNRAVEL). Following this, we collected saliva to measure melatonin levels at night. Participants then consumed a capsule that contained either 2 mg of melatonin or placebo, under double-blind conditions, and slept in the laboratory from midnight to 08:00 with partial polysomnography to objectively measure sleep.

At 08:00, we woke participants and collected a second saliva sample to measure melatonin. Participants then performed the same cognitive assessments from the evening. Data collection is ongoing, but we predict melatonin will have no effect on sleep and will decrease cognitive performance in the morning, replicating earlier results. If obtained, these results will contribute to our understanding of th

THE RELATIONSHIP BETWEEN INDIVIDUAL DIFFERENCES IN COGNITIVE ABILITY AND SONAR MONITORING PERFORMANCE

Presenter(s): Imani Rinke, Nathan Park
Psychology
Mentor(s): Kimberly Fenn (College of Social Science)

Sonar operators on Naval submarines detect, locate, and track other ships in the ocean using sensitive audio-detecting devices. Their quick and accurate identification of signals is critical for the safety of the submarine crew. The ability to maintain vigilant attention is reduced with time on task and Sonar operators must maintain focus for 8-hour shifts. The present study aims to assess the decrease in vigilant attention in the context of sonar monitoring and determine the extent to which individual differences in cognitive ability affect this vigilance decrement. MSU students completed two experimental sessions. In the first session, participants completed a series of tasks that measure their overall cognitive ability. They also completed a measure of placekeeping ability, or the ability to perform tasks in a specific order without repeating or omitting steps, and completed the Armed Forces Qualification Test (AFQT), which is a test used for selection of Naval officers. In the second session, participants performed a sonar monitoring task in which they identified and classified audio signals. Response time and accuracy was recorded across the four-hour session. Data collection is ongoing but we predict that vigilant attention will decrease across time, and that our measures of cognitive ability, placekeeping ability, and AFQT performance will be related to performance such that higher scores will be related to a reduced vigilance decrement. This work can lead to a better

ANGER ON WHEELS: PERSONALITY AND SEX DIFFERENCES IN DANGEROUS DRIVING

Presenter(s): Josh Pierce, Lucas Ring
Psychology
Mentor(s): C. David Navarrete (College of Social Science)

In recent years, over 12,000 injuries and over 200 murders have been attributed to road rage in the U.S. with 37% of aggressive driving incidents involving a firearm. In this study, we investigate the effects of the presence of firearms, frustration, sex, and personality on the frequency of dangerous driving in a simulated driving task. Research participants (N=189) completed a battery of personality questionnaires followed by a simulated city driving task using a driving simulator with surround screens or in virtual reality. We found that the presence of a replica firearm did not directly increase dangerous driving, however, the number of frustrating events that occurred in the simulation was linked to an increase in dangerous driving, and the presence of a replica firearm impacted the relationship between frustrating events and aggressive driving. In addition, dangerous driving was linked to individual differences in aggression among men, and sociosexuality among women. Our findings demonstrate important differences in how people respond to frustration and the presence of a firearm while driving, helping us to better understand dangerous driving within our society.

GROUP VS. INDIVIDUAL DECISION-MAKING AMONG POLICE RECRUITS IN AN IMMERSIVE DEADLY-FORCE SIMULATOR.

Presenter(s): Elif Yazgan, Eva Miranda Valverde, Nikhita Sharma

Psychology

Mentor(s): Joseph Cesario (College of Social Science)

This research studies the effects of group decision-making on police officers' decisions to use deadly force. Police recruits from a large Midwestern city completed a shooting simulator either by themselves or with two other recruits. Recruits were tasked with responding to various violent simulations and used a modified handgun to make deadly force decisions. The shooting behavior of the recruitments were analyzed and differences in shooting decisions in the alone versus group conditions were explored. Differences explored included frequency of shooting, response times for shooting, and racial bias in errors (shooting unarmed citizens). Hypotheses were that the recruitments are less likely to shoot and less likely to make errors when completing the simulation alone rather than when they are with other recruitments. The study explored these hypotheses in two sessions. Session 1 and Session 2 each had two conditions which focused on the race of the subject (Black or White) and whether the object that the subject was carrying was a gun or not (Gun or Non Gun). Each condition had 40 videos and 160 videos in total were used. Utilizing recorded video footage from the recruits, we also explored the behavior of recruits in the videos, including the time to unholster their weapon within a given scenario. The results contribute to our understanding of how group dynamics may influence the decision-making and shooting behavior of recruit police officers in simulated situations.

AUTONOMIC NERVOUS SYSTEM ACTIVITY IN RESPONSE TO EMOTIONALLY CHARGED IMAGES AND WORDS

Presenter(s): Hannah Smith, Mary Cottone

Psychology

Mentor(s): Jan Brascamp (College of Social Science)

The autonomic nervous system is a subcortical part of the nervous system that regulates bodily functions in response to environmental stimulation. There is a prominent distinction within the autonomic nervous system between the sympathetic division, and the parasympathetic division. The former is engaged in environments that require action, while the latter is associated with rest. In this study, we focused our attention on using emotionally charged stimuli to compare and contrast significant activation of each division of the autonomic nervous system. We presented participants with visual and auditory stimuli that varied in their emotional content - in the form of images and spoken words - ranked with a high or low level of emotional arousal. Simultaneously, we measured two external indices of autonomic nervous system activity: pupil size and skin conductance. In particular, activation of the sympathetic system is signaled by pupil dilation and increased skin conductance. Analysis of pupil and skin responses following the different stimuli showed that high arousal words and images led to a strong pupil dilation and increase in skin conductance, indicating activation of the sympathetic nervous system. Low arousal words and images, in turn, resulted in less pupil dilation and a lower level of skin conductance. This suggests more of a balance between the sympathetic and parasympathetic systems, with a higher level of arousal resulting in stronger activation. Eventually, we hope

TATTOOED TRAITS: A CLOSER LOOK AT INK AND IDENTITY

Presenter(s): Avery Bell, Brooke Soulliere, Rishika Paruthi
Psychology
Mentor(s): Alejandro Carrillo (College of Social Science), William Chopik (College of Social Science)

Recent shifts in societal attitudes have transformed tattoos from symbols associated with specific subcultures to mainstream expressions of individuality. Despite their growing acceptance, debates persist about what tattoos reveal about an individual's personality. Our study investigates these perceptions by examining the relationship between tattoos and personality traits. To answer these questions, participants were recruited from tattoo parlors in Athens, GA. Each participant completed a questionnaire that detailed the attributes of their tattoos and assessed their personality traits. Subsequently, a separate group of observers rated the tattoos based on specific characteristics and attempted to infer the personality traits of the tattoo owners. By applying Sam Gosling's Lens Model, this analysis seeks to compare self-assessments with observer evaluations, aiming to assess the accuracy of inferring personality from tattoos. The goal is to shed light on the intricate relationship between one's physical appearance and perceived personality. This investigation not only questions the validity of tattoos as markers of personality but also contributes to the broader discourse on appearance-based personality assumptions.

DECODING QUEER WOMEN OF COLOR PERSPECTIVES: WELL-BEING AND SEXUAL HEALTH

Presenter(s): Acacia Meyer
Psychology
Mentor(s): Lauren Wiklund (Division of Student Life and Engagement), Nicole Buchanan (College of Social Science)

Although some research has studied sexual well-being among heterosexual populations, there remains a lack of research in understanding sexual well-being for queer women of color(QWOC). My goal for this research study is to examine the correlation between queer women of color who define sexual well-being as physical health and safety and their sexual well-being. I hypothesize that the QWOC, which defines sexual well-being as physical health and safety, will likely report better overall physical health and be younger. The study compares two groups: queer women of color who defined sexual well-being as physical health and queer women of color who do not use physical health in their description of sexual well-being. Data analysis includes the SF-36 questionnaire, focusing on the general health section within the Sexual Well-Being Among QWOC Survey to analyze participants' physical health. The findings indicate the importance of decoding queer women of color's understanding of their sexual well-being and showing the connection between sexual well-being and physical health. This study aims to address the research gap, commit to positive approaches for sexuality, and advocate for further research conducted for the sexual well-being of queer women of color.

Science, Technology, Engineering, & Mathematics

PURIFICATION OF LARE PROTEIN FROM THERMOANAEROBACTERIUM THERMOSACCHAROLYTICUM USING NI-NTA AFFINITY CHROMATOGRAPHY: METHODOLOGY AND PROTEIN ANALYSIS
Presenter(s): Yogit Goyal
Science Technology Engineering Mathematics
Mentor(s): Kevin Chen (College of Engineering)

This study focused on the purification of the LarE protein derived from Thermoanaerobacterium thermosaccharolyticum (LarE-Tt) utilizing Ni-NTA affinity chromatography. The experiment began with the growth of Escherichia coli containing the LarE-Tt gene, followed by cell lysis and subsequent purification of the LarE protein. The purification process involved the use of Ni-NTA resin, which exhibited affinity for polyhistidine-tagged proteins such as LarE. After passing through the column, various buffers were used to elute the protein fractions. Observations revealed distinct changes in the color of the Ni-NTA resin throughout the purification process, indicating successful binding and subsequent release of the LarE protein. Sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) was employed to analyze the protein fractions, confirming the presence of LarE-Tt protein (~32 kDa) in the elution buffer fractions. Additionally, the gel electrophoresis demonstrated the purity and molecular weight of the LarE protein. The results highlight the efficacy of Ni-NTA affinity chromatography in purifying LarE protein from the bacterial lysate. The successful purification and identification of LarE-Tt protein lay the groundwork for further biochemical and functional studies. This study contributes to the understanding of protein purification techniques and paves the way for potential applications of LarE protein in various fields, including biotechnology and biochemis

EXPLORING CARPET FIBERS USING SCANNING ELECTRON MICROSCOPY
Presenter(s): Lily Reinke
Science Technology Engineering Mathematics
Mentor(s): Carl Boehlert (College of Engineering)

Using scanning electron microscopy (SEM), I was able to research different carpet fibers with different purposes such as commercial, residential, stain resistant, durability, and fiber lengths.

SEM and energy dispersion spectroscopy (EDX) allowed me to discover the different microstructures that make up the different carpet fibers. This showed how differently some carpet types are manufactured based on purpose and wear. These physical properties such as tensile strength are important to understanding how to manufacture which fibers should be used. The SEM analysis of carpet fibers helped gain a better understanding and visual of the microstructure of carpet fibers and how their different purposes affect their makeup.

METEORITES: LOOKING AT THE PRESENT TO DETERMINE THE PAST
Presenter(s): Julia Preservati
Science Technology Engineering Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Michael Velbel (College of Natural Science), Per Askeland (College of Engineering)

I have conducted my research on an iron meteorite from my father's rock and mineral collection through the use of a Scanning Electron Microscope (SEM). I have utilized features of the microscope such as backscatter imaging, secondary electron imaging and Energy-Dispersive X-Ray Spectroscopy (EDS) in order to properly analyze all aspects of my sample. Upon meeting with Dr. Askeland and working with the sample, I discovered a region of my sample that had a different chemical composition than the rest of my meteorite sample. This difference in chemical makeup is something I examined in terms of location and time of formation within the sample. I was also eager to understand what causes such large differences in chemical makeup within the same iron meteorite sample. I am looking forward to using the compositional data to try and determine not only what the sample is made from, but possibly where and when it was formed before reaching our planet.

PROVIDING APPROPRIATE THERAPEUTIC CARE TO LGBTQ+ OLDER ADULTS IN MICHIGAN NURSING HOMES
Presenter(s): Alexis Karpenko
Science Technology Engineering Mathematics
Mentor(s): Linda Keilman (College of Nursing)

Long-term care (LTC) health care professionals (HCPs) and direct care staff need information about delivering competent care to LGBTQ+ older adults. HCPs and staff who are not educated in care of older adults can inadvertently provide biased care. Our research identified preferences for education among individuals providing LTC services in Michigan (MI). In this descriptive cross-sectional study, we used an online survey to collect data from MI facilities (n = 429). Survey items included facility characteristics, diversity training history, perceived need for training on LGBTQ+ older adults, barriers to training, interest in additional training on LGBTQ+ older adults in LTC, and training preferences. Results were obtained from 71 facilities. Thirty-seven percent of responses came from direct care staff; 63% from administrators. There was good support for diversity training, with 24% stating diversity training was "somewhat important" and 74% stating it was "very important". A majority (63%) had had some diversity training in the past year. Most (72%) endorsed the need and desire for more training on LGBTQ+ aging. More content on transgender older adults and concerns such as room assignments, dementia, and use of pronouns were identified. Barriers to training included: cost, availability of trainers with the appropriate expertise, ability to reach large numbers of employees, staff turnover, bias among staff and residents, and the need to provide rationale for this type of trai

SEXUAL DIMORPHISM IN LUPUS MEDIATED BY XIST RNA
Presenter(s): Aria Muchhal
Science Technology Engineering Mathematics
Mentor(s): Yun Liang (College of Osteopathic Medicine)

Sexual dimorphism in immune regulation causes incredible differences in lupus incidence rates between men and women, with women suffering from 8 in 9 cases. Through some transcriptomic research, it has been ascertained that there is some impact of RP11 and XIST RNA on inflammation. We study 4 classes: control female mouse keratinocytes treated with nothing, control female keratinocytes treated with TNF-alpha+(an inflammatory factor), female keratinocytes with an XIST knockdown and treated with nothing, and female keratinocytes with XIST knockdown and treated with TNF-alpha+. Analysis of mRNA from these keratinocytes using qPCR and proteins using immunostaining points to the mechanism by which XIST modulates inflammation.

DETERMINING THE SIGNIFICANCE OF TRAFFICKING AND METABOLIC MACROPHAGE PATHWAYS IN RESISTING MYCOBACTERIUM ABSCESSUS WHILE IN THE PRESENCE OF ANTIBIOTICS
Presenter(s): Olivia Beckman
Science Technology Engineering Mathematics
Mentor(s): Haleigh Gilliland (College of Natural Science)

The emerging pathogen Mycobacterium abscessus (Mab) is a rapidly growing non-tuberculosis mycobacterium (NTM) that is associated with patients who have underlying lung conditions including Cystic Fibrosis and COPD (Chronic Obstructive Pulmonary Disease). Mab presents challenges clinically due to its extreme resistance to antibiotic treatment, thus creating the critical need for new strategies that target and kill this pathogen. One limitation in drug development is our lack of understanding in how macrophages contribute to antibiotic mediated control of intracellular pathogens. Here, we used a forward genetic screen in macrophages to identify host genes that alter intracellular Mab survival in the face of treatment with the important antibiotic Bedaquiline. Our screen identified intracellular trafficking and metabolic pathways that when lost resulted in enhanced Mab intracellular survival. We are now validating this screen by generating knockout macrophages in candidate pathways and determining their role in Mab growth and their contribution to antibiotic-mediated control. Future work will combine these studies with Mab clinical isolates to identify host pathways that broadly enhance antibiotic killing of intracellular Mab. These findings will identify new potential targets for therapeutic interventions to prevent this important lung infection.

THE POTENTIAL OF HONEY AROMAS AS BITTERNESS-SUPPRESSORS
Presenter(s): Corrina Beecher
Science Technology Engineering Mathematics
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources), Hannah Mulheron (College of Agriculture & Natural Resources)

The Mediterranean diet is known to have greater health benefits than the Western diet, however many of the foods in this diet are bitter. Sugar used to increase palatability of bitter foods, but consuming excessive sugar may compromise the health benefits of this diet. This study investigates the use of honey aromas to suppress bitterness. Moderately trained subjects ($n \geq 60$) rated the bitterness and sweetness intensity of each randomized test solution (x2) using the global sensory intensity scale (GSIS). The solutions included bitter tastants with either water (control), sugar (125 mM), a single aroma (nonanal 5ppm, decanal 1ppm, linalool 1ppm, vanillin 10ppm), a single aroma and sugar, or honey. Bitter tastants used were QHCL (0.5 mM) and Caffeine (5.6 mM). Subjects were instructed to swish the sample in their mouth for 10 seconds before giving their intensity ratings with a 90 second water (37ºC) and cracker rinse between samples. An ANOVA and a post-hoc means separation test was used to identify the bitter solutions that were suppressed by the different stimuli. It is hypothesized that adding honey to the bitter solutions will yield a more pronounced suppression of bitterness compared to the single aroma and sugar mixture. This is attributed to the more complex composition of honey. These results will provide insight with ways to increase Westerners' interest in the Mediterranean diet.

THE SOCIAL IMPACT OF HIV: AN EXPLORATION OF SERUM FATTY ACID LEVELS ASSOCIATED WITH SOCIAL IMPACTS OF PERINATAL HIV EXPOSURE/INFECTION AMONG UGANDAN ADOLESCENTS
Presenter(s): Evan Nagy, Isaac Abraham
Science Technology Engineering Mathematics
Mentor(s): Amara Ezeamama (College of Osteopathic Medicine), Jenifer Fenton (College of Agriculture & Natural Resources), Vanessa Cardino (College of Agriculture & Natural Resources)

The lack of dietary polyunsaturated fatty acids (PUFAs) in the Ugandan diet may be associated with negative social experience among adolescents. However, this association in relation to perinatal HIV exposure/infection remains understudied. The objective of this study is to determine associations between serum fatty acid (FA) levels and the social experience of Ugandan adolescents and how they differ by perinatal HIV status. We hypothesize that low PUFA levels is associated with higher levels of self-reported anxiety, depression, and social stress; such, there may be a stronger association among HIV exposed/infected adolescents. 383 Ugandan adolescents aged 11-18 years were defined perinatally HIV infected (PHIV), HIV exposed/uninfected (HEU) and (HIV) unexposed/uninfected (HUU). Baseline serum FA levels were analyzed by gas-chromatography mass-spectrometry. The social experience of the adolescents was self-reported over four time points under an adapted model of the Behavioral Assessment System for Children Third Addition (BASC-3). Overall, lower T:T ratios were associated with higher levels of depression (ß=-3.705), anxiety (ß=-6.15), and social stress (ß=-

4.00). However, this association was driven by HUU. Total n-6 PUFAs were associated with high anxiety in HEU. Low Mead acid, T:T ratio and high total n-6 were associated with high anxiety in HUU. Conversely, among HEU, high n-6 exhibits an inverse association with self-reported anxiety (all $P < 0.05$). As

PROXIMAL HUMAN MILK FEEDING PRACTICES ARE ASSOCIATED WITH 3-MONTH-OLD INFANT GUT MICROBIAL DIVERSITY
Presenter(s): Nikita Nel
Science Technology Engineering Mathematics
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Breastmilk consumption plays a critical role in an infant's growth and development. In addition to meeting the infant's direct nutritional needs, breastmilk can promote the growth of beneficial bacteria in the gut and may also have beneficial effects on their development. This study aimed to investigate the relationship between breastfeeding patterns and infant gut microbiota among exclusively breastmilk-fed infants at 3 months of age. An additional aim was to compare gut microbes in infants of exclusively human milk fed groups to those in infants fed at least some formula. Infant stool samples and feeding information were collected when the infants were at 3 months of age, fecal microbial communities were assessed, and data was analyzed using R software. Bottle-fed infants had numerically lower alpha diversity of the gut microbiota than breast- and mixed-fed infants, but it was not statistically significant. Breast-fed infants had different gut microbial membership compared to bottle-fed and mixed-fed infants as measured by Sorensen dissimilarity matrix. Breast-fed infants had a lower abundance of *Bifidobacterium* but a higher abundance of *Enterobacteriaceae* unclassified compared to bottle- and mixed-fed infants. Infants in the groups fed some human milk had a higher abundance of *Lacticaseibacillus* compared to infants fed formula. These results suggest that breastfeeding patterns may play a role in shaping the composition and diversity of the gut mi

ENGINEERING EXTRACELLULAR VESICLES AS GENE DELIVERY CARRIERS FOR TYPE 1 DIABETES
Presenter(s): Vasudha Nimmagadda
Science Technology Engineering Mathematics
Mentor(s): Masako Harada (College of Engineering)

Extracellular vesicles (EVs) are small, membrane-bound structures that are released by cells into the extracellular space. EVs play a vital role in mediating intercellular communication. The specific composition of EV cargo depends on their source cell, thereby providing opportunities for engineering EVs by manipulating the source cell. The therapeutic potential of engineered EVs as a means of delivery stems from their remarkable ability to transport cargo effectively, safeguarding it during the delivery process. This project focuses on harnessing this engineering potential to show targeting specificity in the context of Type 1 Diabetes (T1D). T1D is an autoimmune condition in which the body attacks pancreatic beta cells leading to the insufficient production of insulin. Currently, there is no enduring treatment option for T1D apart from the daily administration of insulin or the use of insulin pumps. Ultimately, our research seeks to develop a targeted delivery system for therapeutic to pancreatic β cells, offering a potential regenerative treatment for T1D patients. To generate β cell-targeting EVs, a single chain variable fragment (scFV) specific to β cells will be displayed on the EV surface by EV-surface display technology. These EVs will then be tested on a pancreatic β cell line, NIT-1, to assess their capacity to target β cells. Once targeting capabilities have been demonstrated, these engineered EVs will be loaded with insulin-like growth fac

FIBER INTAKE OF TODDLERS AND PRESCHOOL AGE CHILDREN IN A MICHIGAN COHORT
Presenter(s): Kennedy Zarembski
Science Technology Engineering Mathematics
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Fiber is a key nutrient that plays a major role within the gastrointestinal tract. This nutrient prevents constipation, regulates blood sugar and overall keeps the digestive system healthy. Fiber is emphasized as a nutrient that toddlers and preschool aged children need to consume, but not every child's diet reflects that. The goal of this study is to determine if toddlers and preschool children in a Michigan Cohort aged 12 months to 5 years are consuming adequate amounts of fiber per recommendations. A questionnaire is collected that contains information about the child's diet. This information is then used to follow the PhenX Fiber Intake protocol. The serving sizes from the protocol had to be adjusted to fit a child's diet. The information for the adjusted serving sizes was obtained from NHANES data from 2017-2020 (pre-pandemic). This data had to be organized and averaged to fit the food and age groups for the serving size chart. The PhenX Fiber Intake protocol will be followed to estimate the fiber intake of these children. Results from this research will determine if children are consuming enough fiber or if recommended food products need to be revisited to improve fiber intake for this population.

NEUROLOGICAL VS. VASCULAR DEMENTIA:
Presenter(s): Victoria Aliko
Science Technology Engineering Mathematics
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

In this presentation I will be discussing the differences in neurological versus vascular dementia and how imaging techniques and new tests are being used to lessen the effects of these neurological disorders and make them easier to pinpoint and diagnose.

Showcase

ADVANCING WRITING ASSESSMENT: UNVEILING INSIGHTS THROUGH PAIRED COMPARISON METHODOLOGY
Presenter(s): Thomas Toaz
Showcase
Mentor(s): Adrea Truckenmiller (Facility for Rare Isotope Beams)

From an early age, students embark on a journey of writing, guided by educators who play a pivotal role in shaping their future writing endeavors, from job applications to scholarly publications.. Writing is most often measured and guided by the use of rubrics, which can be easily adjusted to fit the specific goals of different genres of writing and are fairly intuitive to use, but are also open to bias. Oftentimes graders are unconsciously influenced by aspects of writing unrelated to the dimension defined in the rubric and have low interrater agreement. To facilitate more research and address some of these issues, a paired comparison method was proposed that would pair all essays and present them to the rater, allowing them to select which essay communicates more effectively from the pair. Interrater reliability for this method is very high (r =.94), and the differentiation between students creates an ideal scale as an outcome for research studies. The method was also found to have stable reliability with comparing only 40% of the pairs, helping to manage time consumption. This method does not change the level of systematic bias but does facilitate research to identify sources of systematic bias. The goal of this project is to create an open-source digital scoring tool to facilitate equitable research on writing, automating the pairing, presentation, and storage of essays.

TEAM AMETHYST X THE POETRY ROOM
Presenter(s): Ahmarea Covington, Grace Cyporyn, Junga Kwon, Nia Kalinovic, Niranjan Anantharaman, Phuc Nguyen, Sami Beauchamp, Victoria Case
Showcase
Mentor(s): JeanaDee Allen (College of Communication Arts Sciences)

Throughout the fall 2023 and spring 2024 semesters, our team of students from the MSU Street Teams is working with The Poetry Room. We are achieving a list of deliverables determined by a creative brief created by our team. Street Teams is an organization that partners student-led teams of creative students with local Lansing non-profits. We assist non-profits with marketing, creative advertising, branding, and more. The Poetry Room is a non-profit focused on cultivating a community to foster creative expression through poetry in Lansing. Our team is currently working to create an illustrated poetry book featuring local Poetry Room members. We also are planning a video series featuring the leader of The Poetry Room. In our exhibit presentation, we will demonstrate the work we created for our non-profit and the communication skills we learned.

TEAM DELPHINIUM X DLI/REUTTER PARK
Presenter(s): Amare Lipscomb, Gabrielle Clark, Jane Tran, Jordyn Miller, Juniper Favenyesi, Nicoline Bradford, Ridhima Kodali, Vision Shinde
Showcase
Mentor(s): JeanaDee Allen (College of Communication Arts Sciences)

MSU Street Team "Delphinium" partnered with DLI and Reutter Park. Street Teams are student-run, creative collaborations within ComArtSci. Interdisciplinary groups of students partner with nonprofit organizations and assist them with media projects. They have real-world learning opportunities while giving back to the community. With the help of graduate research assistants providing insights on community behavior within the park in Lansing, the team is creating an integrated marketing communications campaign.

A BOREAL BALANCE: GAMIFIED LEARNING AT THE MSU MUSEUM
Presenter(s): Emily Paterson, Rachel Tiv, Sean Hughes
Showcase
Mentor(s): Caroline White (University Arts & Collections)

"A Boreal Balance" is an interactive mobile game designed to enhance the learning experience of the traveling Smithsonian exhibition "Knowing Nature: Stories of the Boreal Forest." Premiering Fall 2023 at the MSU Museum, this game encourages visitors to take a closer look at the exhibition panels and in-game virtual environments in order to make informed choices for the good of the boreal ecosystem. Players must balance the needs of humans, animals, and plants as they decide what is best for all inhabitants. Navigating through complex scenarios, involving dams, forest fires, and logging, players will discover that not everything is as simple as it seems. With no easy solution to these problems, visitors will learn to reflect on their own daily behaviors as important pieces of the puzzle.

WE'RE LOSING THE RECIPES: A COLLECTION OF WRITINGS, POEMS, VISUAL ART, AND PHOTOS HIGHLIGHTING BLACK WOMEN AND THEIR ONTOLOGIES IN KITCHEN SPACES
Presenter(s): Mike Martin
Showcase
Mentor(s): Chamara Kwakye (College of Arts & Letters), David Sheridan (Residential College in Arts & Humanities)

We're Losing the Recipes, a collection of palm readings, visual art, and photos highlighting Black women's ontologies and kitchen spaces, is a photo voice project that centers on Black women and femmes. This artistic approach to research highlights the modalities in which Black women find love, community, education, and care in their Kitchens. Based on Audre Lord and Barbra Smith's The Kitchen Table Press, the book and art exhibition We're Losing the Recipes aims to praise Black women and the lessons given and received in Kitchen Spaces.

Social Science, Arts, & Humanities

MODELING THE PAST: PHOTOGRAMMETRY AND ANCIENT MAYA ARTIFACTS IN BELIZE
Presenter(s): Sasha Franklin
Social Science Arts Humanities
Mentor(s): Gabriel Wrobel (College of Social Science)

At the intersection of the past and the future lies digital archaeology. With applications from the scientific to the educational, digital cultural heritage is an incredibly valuable resource. Using tools like photogrammetry, researchers have been able to measure, replicate, and recreate the original forms of artifacts and remains. Photogrammetry is a 3D modeling process that utilizes photos taken at different heights and angles to build a cloud of point intersections, which can then be connected and overlaid with imagery. These models can be put to the scientific uses stated above, but they can also be used to create 3D-printed replicas of artifacts and to share digital versions of sites and artifacts with the community. This applied research in archaeology, performed through the MSU Bioarchaeology Lab, includes the creation of 3D models of Ancient Maya artifacts from the Belize Institute of Archaeology and the Museum of Belize. The models, made with the program RealityCapture, are posted to the website SketchFab, where they are available for public viewing. Next year, this project aims to continue with the design of an ArcGIS StoryMap that utilizes photogrammetry and geographic information systems data for community education.

TOWARDS EQUITABLE PROSPERITY: INTEGRATING DIVERSITY, EQUITY, AND INCLUSION IN SUSTAINABLE STOCK INVESTMENT
Presenter(s): Rachael Kim, Samantha Killingbeck, Urvi Jalan
Social Science Arts Humanities
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

Sustainable stock investment is an investment decision that considers the environmental, social, and governance (ESG) factors of an economic activity or project. As sustainable businesses adapt to a changing global landscape, it is important to incorporate diversity, equity, and inclusion (DEI) and ESG principles into overall business strategies and operations. We focused a stock portfolio based on sustainable companies' diversity and inclusion reports. While a published DEI report may not make a company sustainable, these reports offer transparency and accountability giving stakeholders an insight of the company's efforts towards DEI. Recognizing the growing importance of DEI in various spheres, our study explores how companies' inclusive practices impact their performance on the stock market. We built the portfolio after an 8-week collaboration with students from Setsunan University (Japan) and NHH (Norway) where we identified DEI related programs and policies such as gender and ethnic diversity, and company policies fostering inclusivity. We collected daily portfolio values from November 2023 to April 2024. Using the S&P 500 as a benchmark representing more traditional average portfolios, we measured and compared market risk, average daily return, and risk/return ratio. Our goal was to evaluate the implications of fostering diversity and inclusion initiatives within stock investment decisions and their impacts on stock market p

THE MEDIA AND INDIGENT DEFENSE
Presenter(s): Adeline Meyers
Social Science Arts Humanities
Mentor(s): Marty Jordan (College of Social Science)

This research project is intended to discover if there is a connection between the amount of media attention and laws regarding indigent defense being changed in states. The news media is a necessary check on government institutions and processes, including indigent defense. Although public defense is not usually considered a hot-button media topic, it is an equally important component of calls for criminal justice reform. A causal link cannot be established either way, due to the many factors going towards policy creation such as interest groups, overall state budget, ideology of elected officials and the electorate, and many more, but I am looking for the potential for correlation. To answer this question, I plan to tabulate the total number of articles written by a select representative sample of U.S. state's state newspapers about their public defender systems from 1970 to 2023. Articles could include stories or op-eds about wrongful convictions, exonerations, or public defender policies. I will assess the correlation between the amount of media attention on this issue within a state and changes to a state's public defender system, potentially including changes in a state's budget allocation for public defense, a centralization of public defense from county systems, and standards for caseloads or attorney pay, among others. I will interrogate the link between news media attention on a key policy topic and policy change. Evidence of this link will shore up support fo

GUIDANCE DOCUMENTS TO SUPPORT SPECIAL EDUCATION SERVICES: A REVIEW OF STATE DEPARTMENTS FOR EDUCATION WEBSITES
Presenter(s): Emma Bullock
Social Science Arts Humanities
Mentor(s): Sarah Cox (Facility for Rare Isotope Beams)

Federal law mandates that all students who qualify for special education services receive a free and appropriate education. Each state, however, is responsible for interpreting the federal law to create state policies. State laws must be in accordance with federal requirements, while fitting the context of education in that state. These policies and procedures are then communicated to districts who pass the information to schools and teachers. The purpose of this review is to explore the ways these policies and procedures are shared through state departments for education and special education agencies. Specifically, we are looking at guidance documents to support the creation and implementation of special education programs. The types of documents, ease of access of these documents, and adherence to federal law will be evaluated within and between states.

UNVEILING DIVERSITY ON THE BALLOT: DEMOGRAPHIC ANALYSIS OF STATE LEGISLATIVE CANDIDATES
Presenter(s): Heba Awamleh
Social Science Arts Humanities
Mentor(s): Eric Juenke (College of Social Science)

The project "Who Wins? Who Runs? The Role of Candidate Recruitment and Support in the Growth of American Representation," delves into the complexities of diversity within the United States' state legislatures in different states. Aimed at describing the demographic characteristics of candidates in state legislative elections, this research focuses on analyzing their racial, ethnic, and gender identities. This research is critical, as the representation of minority and gender groups within legislative bodies plays a vital role in shaping policy and fostering a more inclusive democracy. In collaboration with scholars from Rutgers and Emory Universities, I address a significant gap in political science research by gathering comprehensive demographic data on candidates, including those who are unsuccessful in their electoral bids. Given the ephemeral nature of such information post-election, the timely collection of these data is of the essence in describing not just who wins, but also who runs to represent the American public in the states.

Social Science General

THE EFFECTS OF BEHAVIORAL SKILLS TRAINING ON RESEARCH ASSISTANT ADMINISTRATION OF LITERACY ASSESSMENTS
Presenter(s): Ashley Riggs, Ellianna Girard, Michelle Chen
Social Science General
Mentor(s): Sarah Dunkel-Jackson (College of Social Science)

Training is important for research assistants to help collect, organize, and store crucial data necessary to conduct research studies. Specifically, behavioral skills training (BST) methods can contribute to efficient and effective data collection, which helps ensure valid and reliable data. BST includes four components: instructions, modeling, rehearsal, and feedback. There are also additional training components that can be implemented, as needed (e.g., coaching, prompts). The current study examined the effect of BST on research assistants' administration of literacy assessments as measured by a performance evaluation checklist. Using a multiple baseline across research assistants design, it is expected that when BST is implemented each research assistant will administer the literacy assessment at criteria. Results of a survey of research assistants on the types of training they preferred and/or found effective will also be presented. Recommendations for efficient, effective, and preferred research assistant training components will be discussed.

SEX, TOLERANCE, & MICHIGAN
Presenter(s): Portia Chana
Social Science General
Mentor(s): Aminda Smith (International Studies & Program), Pat Arnold (International Studies & Program)

After studying abroad in Amsterdam, Netherlands for a month, this project is a creative, accessible way to look at policy. While a scrapbook that highlights my time spent in Amsterdam, embedded in this book are two journal entries of how my perspective of gender, sex, and politics shifted over the course of four weeks and a policy suggestion for the state of Michigan. This policy recommendation encourages Michigan policymakers to adopt a Dutch tolerance way of thinking when viewing sex education, moving away from promoting abstinence to helping young people understand the many layers and relationships to sex.

UTILIZATION AND SUPPORT OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICTS) IN LONG-TERM CARE (LTC) SETTINGS
Presenter(s): Breanne Sandstrom
Social Science General
Mentor(s): Paul Freddolino (College of Social Science)

Considerable research shows that Information and Communication Technologies (ICTs) play a significant role in social emotional relationships for older adults. Less clear is if using ICTs has the same impact for individuals living in long-term care (LTC) settings, and whether the use of ICTs by LTC residents is related to perceived quality of care and actual health outcomes. There is little research into the availability and use of ICTs by residents and staff in LTC settings or on the ICT training and support they receive. Using the cognitive interview approach to refine questions, a 30-minute interview was developed to explore these issues. Interviews were conducted in person or by Zoom with 10 nursing and social work staff with direct resident contact in skilled nursing facilities, assisted living, and independent living communities. Interviews were conducted in Lansing and Muskegon. This small sample of ten respondents revealed wide variability in resident technology access and use; support and training for residents and staff in using technology; and use of technology to support resident contact with friends and family and for telehealth. Analysis of the interview data will guide the preparation of a self-administered online survey for the next phase of the research which will include a larger sample of Michigan LTC settings.

BALANCING WORK AND FAMILY CARE IN THE AFTERMATH OF COVID-19:? THE LIVED EXPERIENCES OF WOMEN OF COLOR AND IMMIGRANT WOMEN IN DETROIT?
Presenter(s): Jasmine Zavala Gonzalez, Yasmen Alsuraimi
Social Science General
Mentor(s): Abigail Perrien (College of Social Science), Anna Santiago (College of Social Science), Courtney Jones (College of Social Science)

Over the past three years, the COVID-19 pandemic posed significant barriers to families by increasing financial instability, isolation, and caregiving stress. These challenges led families to pursue various social and economic strategies to utilize community resources. These adversities further amplified pre-existing economic hardships and stressors, specifically impacting women of color and immigrant women and their families in Detroit. This study examines the effects of the pandemic on women's labor force participation, their access to and use of child care and elder care services, and how neighborhood organizations have supported their family care needs. We use data gathered from individual and focus group interviews with women in seven ethnically and racially diverse Detroit neighborhoods: Southwest Detroit/Springwells, Warrendale/ Warren Avenue, Brightmoor, North Campau/Banglatown, Livernois, North End, and East Village. The two overarching research questions that shape the proposed work are: (1) How do women of color and immigrant women make decisions about labor force participation during periods of ongoing economic distress?; and (2) How do women of color and immigrant women integrate workforce participation and family care responsibilities during a period of lingering social and economic crisis that severely limits access to family care resources? Using thematic analysis of interview transcripts, we present preliminary findings on the lived experiences of women of co

HOOKUP CULTURE: ANALYSIS OF MSU STUDENT PERSPECTIVES
Presenter(s): Emma Huizenga, Lauren Golden, Matayia Newbern
Social Science General
Mentor(s): Sarah Prior (College of Social Science)

This research seeks to understand how students at Michigan State University view the sexual culture on MSU's campus, focusing specifically on understandings of sexual consent and hookup culture. Media and the popular imaginary would have us believe that college campuses are rampant with hookups and other casual sexual encounters. Utilizing qualitative journal data, we hope to uncover whether this is the case for students at MSU. To explore students' perspectives, we analyzed students' responses to written questionnaires about their experiences and perceptions of MSU's sexual climate. These responses were then coded into thematically based categories. Our research resulted in three overarching thematic categories representing the responses of students. The first category found there was a subsection of students who felt they were positively impacted by hookup culture on their campus. This was then subjected to ideas of freedom from parental and authoritative figures, a sense of belonging and fitting in, and feelings of achievement. However, there were also responses detailing negative implications as a result of the hookup culture on campus. These negative implications were more specifically split into themes of emotional association and behaviors that interact with hookup culture. In regard to negative emotional implications, this theme was subdivided into sections relating to self-esteem, feelings of emptiness, disgust and shame, and how students' value of sex impacts their

BREAKING BARRIERS: A HOLISTIC STUDY OF ACCESSIBILITY AND ACCOMMODATIONS FOR DEAF AND HARD OF HEARING MEDICAL PROFESSIONALS
Presenter(s): Surabhi Gangadkar
Social Science General
Mentor(s): John Waller (College of Social Science)

This research delves into the accessibility of accommodations and satisfaction levels among Deaf and Hard of Hearing (DHoH) medical professionals within healthcare and educational settings. Addressing a critical gap in existing literature, the study explores central questions related to the awareness of DHoH professionals' roles and the levels of understanding they receive from various stakeholders. The motivation for this research stems from the unanimous perception among DHoH professionals of insufficient awareness about their roles in healthcare, highlighting the need for a more comprehensive understanding of their experiences. Utilizing a survey approach integrated with qualitative insights, the study offers a nuanced exploration of DHoH professionals' challenges and successes. Findings reveal a correlation between accommodation satisfaction levels and career success, thus emphasizing the transformative impact of inclusive policies on healthcare institutions. The significance of this research lies in its potential to contribute to ongoing efforts to create a diverse and inclusive healthcare landscape. Future research directions are proposed to deepen comprehension, explore decision-making processes, and incorporate regional variations, ensuring a holistic examination of this critical issue. This study serves as a crucial step toward creating a healthcare environment that acknowledges, accommodates, and supports the diverse needs of DHoH professionals, promoting inclusivit

RESEARCH INSTITUTE FOR STRUCTURAL CHANGE: INTERSECTIONAL FEMINISM AND THE ECONOMY
Presenter(s): Saanvi Dadwal
Social Science General
Mentor(s): Elena Ruiz (College of Arts & Letters), Nerli Paredesruvalcaba (College of Arts & Letters), Taylor Mills (College of Arts & Letters)

RISC transforms research into action through bold, inclusive frameworks rooted in structural justice. The institute's mission is underwritten by a reparative mandate, emphasizing transformational change and resource transfers to underserved communities. RISC provides free state-of-the-field research services to nonprofits and grassroots organizations through grants, philanthropy, and partnerships with higher learning institutions. The institute supports diverse researchers and activists, offering opportunity development for community advocates. RISC addresses global challenges using an innovative systems-change approach, combining high-quality research with community activism and grassroots power.

TIK TOK INFLUENCERS AND COUNTERFEITS
Presenter(s): Amaiya Jones
Social Science General
Mentor(s): Kari Kammel (College of Social Science)

I looked at the Tik Tok Shop and how they sell counterfeits, specifically Stanley cups, and how influencers have an impact on their viewers when it comes to purchasing goods.

MENTAL HEALTH OF DISPLACED SYRIANS
Presenter(s): Arthur McCarthy
Social Science General
Mentor(s): Camelia Suleiman (College of Arts & Letters)

My presentation is concerning the mental health and well-being of displaced Syrians. I went into depth between different groups of displaced Syrian's mental health: those that were forcibly displaced from their homes in Syria and moved out of the country and those who forcibly displaced from their homes and stayed in Syria. It was found that depression and anxiety was higher in externally displaced Syrians and PTSD was more prevalent within the internally displaced Syrians. However this doesn't mean that both population only experienced these disorders. It was common for both populations to experience any of the mental disorders mentioned. My presentation aims to first outline the importance of mental health because it is something to be concerned about that can affect physical things like work productivity, relationships, and just being a functioning human being. I aim to offer up different solutions on how we can better address the need for support regarding mental health in the Middle East and beyond. One solution I offer is wider accessibility to mental health care and implementation of mental health care into widely prevalent everyday things like schools, or work facilities so that it can be easily accessible as well as available. People's lives and how they live them and what they are able to achieve can often be hindered by mental health problems and lack of treatment so I believe it is important that people receive the h

THE MENTAL HEALTH CRISIS OF DISPLACED SYRIANS
Presenter(s): Taylor Florczak
Social Science General
Mentor(s): Camelia Suleiman (College of Arts & Letters)

Mental health struggles have continued to arise in displaced persons. In this presentation I will cover the mental health crisis and how it has worsened due to lack of resources and the continuation of war in the middle eastern world. I will discuss available resources, potential sources that can help, and what we can do to help make a change.

INTERNSHIP EXPERIENCES: EFFECTS OF MANAGER COMMUNICATION ON INTERNS' PERCEPTIONS OF ORGANIZATIONAL FIT
Presenter(s): Taya Van Heest
Social Science General
Mentor(s): Scott Shank (College of Communication Arts Sciences)

Internships can be a important mechanism for organizations to recruit and socialize college students as new potential members. Interns may be motivated to proactively contribute as new members of the organization, however, existing members, such as the supervising manager, may be more or less receptive to interns' ideas. This project investigates internship experiences regarding interns' proactive behavior and supervisors' receptivity to their sharing of ideas. It is hypothesized that proactive interns are more likely to report positive working relationships with their supervisors and that this effect depends in part on the interns' perceptions of how receptive the manager is to their ideas. Positive working relationship with a supervisor is also hypothesized to correlate with the interns' perceive fit with the organization. Internships are an important aspect of college students socialization into their future careers. This study sheds insight into how the communication interns' experience contributes to their understanding of the type of organization they want to work for or avoid.

ARE STUDIES ON E-BIKES GAINING TRACTION?
Presenter(s): Ally McCurdy
Social Science General
Mentor(s): Elizabeth Perry (College of Agriculture & Natural Resources)

In recent years, e-bikes, a type of bicycle that has an attached electric motor, have soared in popularity (Glusac, 2021). E-biking is alluring for its physical, environmental, and financial benefits, as well as the ability to travel farther, faster, and easier than an analog (traditional) bicycle. E-bikes can also be controversial, especially in places where analogue bicycles have been allowed but e-bikes represent a "slippery slope" of technology permissions and/or in situations where e-bikes may increase safety concerns (Baechle & Kressler, 2020). Despite this increase in use and conversation about use, academic literature focused on its social aspects remains sparse, and what does exist is disparate across fields. Analyzing literature on social inquiries about e-bikes is crucial considering its popularity and the potential effects of adoption on access, inclusion, recreation, and sustainability (Sun et al., 2023). It is important to understand what topics characterize the existing literature, and in recreation-focused studies in particular, to ascertain where cross and interdisciplinary studies may lend insight toward aims of sustainable and inclusive access and related policy considerations. Thus, we focused on two research questions: 1. What topics characterize e-bikes peer reviewed literature? and 2. For recreation focused studies within this, how are topics discussed across disciplines? Using a systematic literature review approach, we examined thousands of p

WHERE AND WHEN DO VISITORS USE AN URBAN-PROXIMATE STATE GAME AREA? THE SPATIAL-TEMPORAL STORY TOLD BY 17,000 IMAGES

Presenter(s): Shelby Marocco

Social Science General

Mentor(s): Elizabeth Perry (College of Agriculture & Natural Resources)

For urban-proximate state game areas (SGA), recreational uses may extend beyond wildlife-related ones, and the patterns of all recreation may be more pronounced due to population proximity. Rose Lake SGA is an urban-adjacent SGA in mid-Michigan, with forests, a water body, many road access points, and an established but unmaintained trail system. Providing visitors with a variety of recreational opportunities year-round (e.g., common trail uses), although it is intended for predominantly wildlife-related recreation (e.g., hunting, fishing, wildlife viewing) (Casola et al., 2023). The MDNR sought descriptive data on visitor use by installing human behavior cameras in presumed high-use parking lots for one year. Unlike most visitor use studies that often make extrapolations and decisions based on samples (Peterson et al., 2021), this study collected a census of information that was then analyzed. MDNR cameras captured use continuously, March 2019 to March 2020. Cameras were installed at eight access points. The strategic placements across the SGA captured both visitor use and vehicle entry, exit, and use, totaling ≥200,000 images. Of these, ≥17,000 contained discrete evidence of human use. Following the initial analysis, I was granted an undergraduate research fellowship through Michigan State University for fall 2023, to further explore the comparative statistics present within the dataset. Thus, this continuation granted us the opportunity to go beyond the general patte

GENDER AND INFORMAL NETWORKS IN THE US BUREAUCRACY RESPONSIBLE FOR THE ECONOMY: THE US FEDERAL RESERVE, THE COUNCIL OF ECONOMIC ADVISERS, AND THE OFFICE OF MANAGEMENT AND BUDGET

Presenter(s): John Monaghan

Social Science General

Mentor(s): Ana Bodea (College of Social Science)

Women are under-represented in the "top" jobs in economic policymaking - in central banks and in ministries of finance. For example, only two women--Janet Yellen and Christine Lagarde--have ever been head of a G7 central bank or served as a G7 finance minister. Women's absence from these positions matters. It is a failure to achieve widely held normative goals around gender equity, and it impacts the sort of policies that are made, and the segments of society whose interests are best represented in those policies. It is also puzzling. Women have made greater gains in other "male"-coded areas, as well as in behind-the-scenes positions at many of the institutions that chronically lack women in public facing roles. Perhaps most puzzlingly, many countries with unimpressive records of appointing women to these positions have otherwise exemplary records in gender equity. This research project asks: Why are there so few women in public-facing positions in economic policymaking?

PATIENT-CENTERED STROKE SUPPORT
Presenter(s): Chris Marcum
Social Science General
Mentor(s): Amanda Woodward (College of Social Science), Cristina Rodas (College of Social Science), Emmanuel Chima (College of Arts & Letters), Jen Hirsch (College of Social Science), Linda Zhang (College of Social Science)

The Michigan Stroke Transitions Trial (MISTT) Study, conducted from January 2016 through November 2017, tested the efficacy of a social work case management intervention aimed to help stroke patients and their caregivers throughout the transition from hospital to home. Patients were randomly assigned to intervention groups (vs usual care). Social workers documented their work with participants through detailed case notes which were coded and analyzed by our research team using qualitative thematic analysis. The notes taken by the social workers highlight the many stressors that can impact stroke patients throughout their recovery process. Along with advocating for participants' immediate care needs to be met, social workers provided stroke information, emotional support, and facilitated communication between the various care teams assisting the participant. This presentation shares results related to caregiver support and facilitating self management and discusses the benefits of social work case management for stroke patients more broadly.

LUXURY CONSUMPTION VALUES AND BRAND ENGAGEMENT IN THE HOTEL INDUSTRY: CROSS-CULTURAL PERSPECTIVES OF YOUNG NEW LUXURY CONSUMERS
Presenter(s): Kiet Tran
Social Science General
Mentor(s): Seung Kim (Eli Broad College of Business)

Luxury is no longer confined to limited consumption by select groups; instead, mass prestige (masstige) consumption has emerged as a new luxury concept. This study aims to investigate the role of new luxury consumption values and their effects on customer engagement within the context of masstige hotel brands. Furthermore, it explores how these relationships differ across cultural groups, specifically Western versus Eastern culture. An online survey will be conducted targeting young new luxury consumers.

EXPRESSING GENDER: THE EFFECT OF SITUATIONAL COMFORT ON (ING) PRONUNCIATION IN TRANSGENDER SPEECH
Presenter(s): Gage Landeryou
Social Science General
Mentor(s): Betsy Sneller (College of Arts & Letters)

This study explores sociolinguistic variation in the speech of binary transgender individuals. My main goal is to investigate how a speaker's comfort with their own gender expression impacts how much they style shift in their pronunciation of (ING) (e.g., pronouncing "running" either as running or runnin') between queer-friendly settings (like their home) versus public settings. Following the methodology of Gratton (2016), who found nonbinary individuals style shifting between private and public settings to avoid the threat of misgendering, I conducted sociolinguistic interviews with 4 binary trans individuals. Each person was interviewed first in their home, and then in a public and not explicitly queer-friendly environment (like a coffee shop). Interviews were transcribed and time aligned, and auditorily coded for pronunciation of (ING). The primary research question was: do trans speakers use their pronunciation of (ING) in public settings to mitigate the threat of being misgendered, in the same way that the nonbinary speakers in Gratton (2016) do?

ANALYZING FOOD WASTE SYSTEMS AND TECHNOLOGIES IN THE RESTAURANT INDUSTRY
Presenter(s): Abigail Peck, Liliana Warnica
Social Science General
Mentor(s): JaeMin Cha (Eli Broad College of Business)

The growing focus on managing food waste effectively is capturing the attention among people. Increasingly, numerous restaurant companies have embraced and put into practice a variety of food waste management systems and processes. Innovations in technology, such as artificial intelligence and machine learning, have led to new ways to analyze, control, and manage food waste more efficiently. However, smaller restaurants often find it challenging to adopt these technologies due to budget constraints. Our systematic review has highlighted key themes in food waste research within foodservice operations. Although our analysis of systematic review focuses on large restaurant operations, our study goal is to provide practical, cost-effective food waste management systems for smaller establishments.

Visual & Performing Arts

SUSTAINABILITY IN COSTUME DESIGN
Presenter(s): Emily Rosolowski
Visual and Performing Arts
Mentor(s): Karen Kangas Preston (College of Arts & Letters)

No matter the size of the theatre, sustainability should be integral to costume design. Fast fashion companies sell accessible and cheap clothing options for designers. These companies fuel wasteful consumption of goods that fall apart during the run of a show and need to be replaced. This cycle means designers add pounds of fabric into landfills instead of storing for reuse. For the Department of Theater's production of *Much Ado About Nothing*, director Deric McNish's vision for the play was set in a "M.A.S.H unit with 70s counterculture flavor" to "focus on the capacity for healing and change within an oppressive structure that encourages mistreatment of others." As costume designer, I created military uniforms for the fictional world of Messina, combining aspects of uniforms from around the world. I intentionally pulled most items from storage, used deadstock and secondhand websites, and visited military surplus where I got uniform clothing and boots. This allowed us to avoid buying cheaper alternatives. Additionally, use of military surplus meant uniforms had realistic weathering and distressing, which supported the lived-in feel of a M.A.S.H unit. The fabric for constructed costumes came from a local fabric store specializing in natural fibers and vintage fabric from MSU storage. The next step is creating a database of information with sustainable clothing and fabric options for MSU costume designers to use when shopping for shows. This will provide the cost

THE THANKSGIVING PLAY
Presenter(s): Matthew Peterson
Visual and Performing Arts
Mentor(s): Kirk Domer (College of Arts & Letters)

The Thanksgiving Play by Larissa FastHorse exposes the absurdity of well-intentioned attempts to address cultural sensitivity and diversity. Matty Peterson served as the assistant scenic designer for Professor Kirk Domer. In residence for eight days during the tech/dress process at the 4th Wall Theatre Company in Houston, TX, Mr. Peterson worked alongside industry professionals in creating the world of the play. Having been involved in design and production meetings with professional theatre artists from across the country throughout the entire creative process (nearly three months), he gained insight into how the design process works in the professional world compared to academic theatre.

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