25th

Anniversary

UURAF

University Undergraduate Research and Arts Forum

April 14th, 2023

ACKNOWLEDGEMENTS

The 25th University Undergraduate Research and Arts Forum (UURAF) at Michigan State University was held on April 14, 2023. This program book recognizes the outstanding research and creative endeavors by nearly 900 undergraduate students. These students represent 14 different colleges and were mentored by more than 500 faculty, staff, post-doctoral fellows, graduate students, and industry partners.

UURAF is sponsored by the Office of Undergraduate Education and the Honors College.

Behind the Scenes

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

- Our undergraduate and part-time staff: Anapaola Almaguer-Morales, Maddie Cantrell, Binitha Chandrasena, Marena Haidar, and Martina Yen
- Casie Chunko, Administrative Assistant for Academic Initiatives
- Heather Dover, Coordinator for Undergraduate Research and lead UURAF organizer
- Mordecai Harvey, Assistant Director for Undergraduate Research
- Vanessa McCaffrey, Associate Director for Undergraduate Research
- Korine Wawrzynski, Assistant Dean, Academic Initiatives & Director, Undergraduate Research

We appreciate the work of numerous MSU assistant and associate 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.

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 2022-23 Undergraduate Research Ambassadors include:

Calista Busch
Ky Chimrak
Marissa Cortright
Emily England
Jessie Greatorex
Lydia Kapeller
Andrew Kearney
George Khamis
Josie Kleve
Olivia LeBlanc
Isabelle McKinney
Lexi Nadolsky
Nikita Nel
Morgan Roegner
Jacob Rutkowski

About the Cover

The cover art was designed by Grace Houdek, ‘22 BFA in Graphic Design from the College of Arts & Letters, Department of Art, Art History, and Design.

<u>Artist Statement</u>
For this design, I chose to focus on the connectivity between the different colleges coming together, as well as the research phase that the students' projects revolve around, mainly shown through the treatment of the UURAF title. The large, overlapping letters are positioned to connect at certain points, while being slightly transparent so the connections can be visible to the viewer. These intentional intersections demonstrate the connectivity of different colleges coming together and interacting with each other. Simultaneously, I wanted to emphasize the importance of 2023 marking the 25^{th} anniversary of UURAF in a similar design style. Therefore, I decided to position the numbers 2 and 5 to overlap and appear translucent as well. The grid lines on the letters resemble pencil-like lines that line up with the intersections and edges of the letters in the UURAF title and the 25. These lines are to represent the sketching, brainstorming, and research phase every student went through while working on their projects. Given that these pencil lines represent active thought, the layered circles around the 25^{th} anniversary seal is to represent someone circling information they won't want to forget. Finally, the grainy paper texture in the background makes the design look as though it is a piece of information or research that a student was working on. This allows the viewer to further acknowledge and appreciate the research and effort these students put into their projects.

Undergraduate Research
MICHIGAN STATE UNIVERSITY

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AGRICULTURE & ANIMAL SCIENCE

CORRELATIONS OF NR3C1 GENE EXPRESSION WITH PORK QUALITY AND CARCASS CHARACTERISTICS

Presenter(s): Grace Schmidt
Agriculture & Animal Science
Mentor(s): Andrea Luttman (College of Agriculture & Natural Resources), Catherine Ernst (College of Agriculture & Natural Resources)

Genetic control of carcass and meat quality traits is of great interest to the pork industry, and Hypothalamic-Pituitary-Adrenal (HPA) activation has been reported to have an inverse relationship with lean carcass growth traits in swine. The objective of this study was to determine if transcript abundance of the glucocorticoid receptor 1 (NR3C1) gene in liver, adipose, and longissimus dorsi (LD) tissue of pigs is associated with meat quality or carcass trait variation. We hypothesized that NR3C1 expression levels are associated with differences in meat quality and carcass traits. For 18 gilts (avg. 127 kg, 164 d), we quantified liver, adipose, and LD NR3C1 transcript abundance using a TaqMan Gene Expression assay with ACTB and HPRT1 as controls. Pearson correlations were calculated between standard carcass and meat quality traits and tissue-specific NR3C1 transcript abundance. P-values were adjusted for multiple testing using FDR correction. Liver NR3C1 transcript abundance was found to have a significant positive correlation with dressing percentage ($r=0.61$, $t=3.05$, $p=0.008$, $q=0.170$). Adipose tissue NR3C1 demonstrated significant positive correlations with marbling score ($r= 0.53$ $t=2.48$, $p=0.024$, $q= 0.351$), subjective color score ($r=0.51$, $t=2.38$, $p=0.030$, $q=0.374$), 45-min pH ($r=0.57$, $t=2.79$, $p=0.013$, $q=0.046$) and pH decline ($r=0.67$, $t=3.58$, $p=0.002$, $q=0.183$). In conclusion, tissue-specific transcript abundance of NR3C1 appears to be associated with meat quality and carcass trait variation. Further investigation into tissue-specific expression of NR3C1 may reveal the molecular mechanisms underlying the reported associations between HPA activation and differences in pork quality and carcass traits.

WEEKLY SURVEY OF INSECTS PRESENT IN INDUSTRIAL HEMP UNDER FOUR WEED CONTROL TRIALS

Presenter(s): Natalie Michelson
Agriculture & Animal Science
Mentor(s): Christina Difonzo (College of Agriculture & Natural Resources)

A weekly survey of insects in hemp was done which included checking 32 pitfall traps, and conducting sweep samples. I will analyze the timing of when insects show up as well as the major species that are present. There are 4 different weed control plots and 4 repetitions of each.

THE EFFECTS OF INTRA-ARTICULAR STEROID ADMINISTRATION ON THE METABOLIC PROFILE OF NORMAL HORSES

Presenter(s): Allie Fricano, Lydia Kapeller, Maya Salamey
Agriculture & Animal Science
Mentor(s): Jane Manfredi (College of Veterinary Medicine)

Corticosteroids are a commonly used, inexpensive intra-articular treatment for osteoarthritis which may increase the risk of steroid-induced laminitis in horses. Humans with metabolic syndrome experience increases in insulin and glucose post-injection, but responses in horses are not known. The objective of this study was to determine the effect of intra-articular steroids on systemic insulin and glucose values. We hypothesized corticosteroid injections would result in significant increases in glucose and insulin levels in all observed horses. We injected the middle carpal joint of nine metabolically normal horses with 18 mg of triamcinolone acetonide, a common corticosteroid and serially evaluated insulin and glucose concentrations post-administration. Statistics included repeated measures ANOVAs (significant at $P<0.05$). Peak insulin concentration was 28+/-12.9 uIU/mL at 48 hours with significantly increased concentrations from baseline at 6hr ($p=0.03$), 24hr ($p<0.01$) and 48 hr ($p=0.04$) post steroid administration. Peak glucose concentration was 128+/-11.9 mg/dL at 24 hours with significantly increased concentrations from baseline at 6 hr ($p<0.01$), 8hr ($p<0.01$), 24 hr ($p<0.01$), 48 hr ($p<0.01$) and 72 hr ($p<0.01$) post steroid administration. These values are within the range reported during regularly performed diagnostic endocrine tests in metabolically normal horses. Our clinical take home is that intra-articular steroids do not appear to cause insulin spikes consistent with inducing laminitis in normal horses and therefore can be used safely.

ANIMAL SCIENCE AND WELFARE: STUDENT EXPERIENCE DATA

Presenter(s): Allisyn Baker
Agriculture & Animal Science
Mentor(s): Janice Siegford (College of Agriculture & Natural Resources)

In the Animal science discipline, hands-on experience is a practical way for students to learn methods of husbandry and welfare analysis. To assess student responses to hands-on experiences with animals, weekly surveys were conducted in an animal behavior lab class. Data were used to analyze students' relationships to lab material to understand how animal science students perceived learning when given practical application. Students rated their session enjoyment, welfare of animals, data quality, and quality of help from instructional personnel. Ratings were on a scale of 1-10 (1 = lowest, 10 = highest). Animals involved included cattle, sheep, and pigs. The cattle portion of class involved several groups of weaned calves in different conditions. Students were each assigned a calf group and tasked with taking data of behaviors indicative of stress levels. The module involving sheep was the most hands-on of the three and focused upon different methods and styles of handling with an aim toward minimizing stress. The final module of the three focused on pigs and gave students an opportunity to create enrichment and study the reaction of various pigs to enrichment in both a farm and zoo setting. Surveys found students enjoyed the module involving the sheep the most, (Avg=9.52). Questions involving student

perceptions of animal welfare gave insight into student perspectives of different livestock and zoo animal management programs, with the module involving pigs having the lowest rating (Avg= 9.00). These findings can be used to further enhance student learning in hands-on animal science courses.

THE EFFECT OF MULTI-SENSORY/MULTI-ACCESS ENRICHMENT ON CURBING AGGRESSIVE BEHAVIOR IN PIGLETS

Presenter(s): Hailey Shah
Agriculture & Animal Science
Mentor(s): Janice Siegford (College of Agriculture & Natural Resources)

Studies indicate that while enrichment has a positive effect on pig welfare, stimuli appealing to a single sense are often ineffective. Additionally, pigs exhibit a high level of intelligence and might need more complex enrichment for mental stimulation. I hypothesized that piglets would interact more with multi-sensory enrichment that was accessible to more pigs simultaneously (versus enrichment that appealed to only one or two senses and to which access is limited). I predicted that such enrichment would also reduce levels of aggression. I utilized two test groups exposed sequentially to either multi-sensory/multi-access enrichment (E2) or to single (minimal sense) / limited access enrichment (E1) separated by a period of no enrichment (W). Following creation of an ethogram and video decoding collected over a three-week period, resulting data indicated more engagement with enrichment when test subjects were exposed to E2 compared to E1. The data also suggests that pigs given E2 showed less aggression than pigs given E1. Other forms of social contact were lower initially in pigs with E2 compared to pigs given E1. The study may also prompt enrichment tool manufacturers to provide a more effective product. The results of this study can assist the agricultural world in that complex enrichment available to more pigs could reduce expense related to aggressive behavior (e.g., tail-biting, injuries resulting in veterinary bills, etc.). Most importantly, multi-sensory/multi-access enrichment has potential to positively impact the physical, psychological, and emotional wellbeing of pigs and reduce disease-causing stress.

SPOTTED-WING DROSOPHILA FEMALES EXHIBIT OVIPOSITIONAL PREFERENCES

Presenter(s): Marion Parshall
Agriculture & Animal Science
Mentor(s): Juan Huang (College of Agriculture & Natural Resources), Julianna Wilson (College of Agriculture & Natural Resources)

Spotted wing drosophila (SWD), Drosophila suzukii, is a devastating insect pest whose ability to infest intact fruit has had significant negative impacts on cherry and berry yields globally. Abiotic and biotic factors can be indicators for SWD to alter their decisions about where and if they should lay their eggs. Therefore, the modification of the ovipositional behavior of SWD based on its surrounding environment and the accessibility of preferable conditions was explored. The first factor investigated was the impact of the number of tart cherries available for oviposition, where the number of tart cherries given to each SWD pair varied from 1 to 8. When more cherries were offered, the SWD female did display a preference for dispersing her eggs amongst available cherries. The second factor examined was to see if an SWD female exhibited ovipositional preference in cherries with no previous egg infestation. Each SWD pair was given one previously infested cherry with SWD eggs and 0 to 7 clean cherries without eggs in a container. When 1 infested and 1 un-infested cherry was offered to the pair, females laid more eggs in un-infested cherries than the previously infested ones. Knowledge about the ovipositional behavior of SWD can be integrated into the current understanding of this invasive species and utilized to improve current pest management strategies for SWD.

ASSESSING REPRODUCTIVE HEALTH IN CAPTIVE GAZELLES (GAZELLA, EUDORCAS, AND NANGER SPP.): IDENTIFYING DISEASE AND ABNORMALITIES

Presenter(s): Giuseppe Cavaliere
Agriculture & Animal Science
Mentor(s): Dalen Agnew (College of Veterinary Medicine)

Gazelles are a ruminant taxa commonly threatened or endangered; thus, captive populations are kept as insurance populations. However, reproductive disease and abnormalities can negatively impact the viability of these populations. Such reproductive issues include uterine hydrometra, lesions, hyalinization of blood vessels, ovarian cysts, and even smooth muscle hyperplasia. There is limited research on the reproductive health in gazelles; therefore, it is important to get a better understanding of what reproductive issues are present in gazelles for population management efforts. This investigation aimed to assess the reproductive health of 22 previously captive gazelles of the genera Gazella, Nanger, and Eudorcas by identifying disease and abnormalities, or lack thereof. This was done by viewing H&E-stained slides containing ovarian and uterine cross sections under a microscope to evaluate reproductive health. To understand the risk factors for reproductive issues, individual historical information such as age, parity, and contraceptive use were collected. Correlations between reproductive lesions and risk factors were examined. The results revealed that reproductive abnormalities such as uterine hydrometra, lesions, hyalinization of blood vessels, ovarian cysts, and smooth muscle hyperplasia were present in some animals. The study highlights the need for a better understanding of reproductive issues in gazelles for proper population management. These findings will be useful for developing strategies to minimize the risk of reproductive diseases and abnormalities in captive gazelles and help safeguard this species.

THROW OUT THE HONEY, BRING OUT THE CATFISH: EXAMINING THE EFFECTIVENESS OF CALLIPHORIDAE (DIPTERA) BAIT

Presenter(s): Paige Alexander
Agriculture & Animal Science
Mentor(s): Mackenzie Tietjen (College of Agriculture & Natural Resources)

There is significant variation in the distribution of Diptera (true flies) that contribute to decomposition and are of forensic importance. In an effort to study this distribution, it is necessary to attract these species of dipteran via an artificial

trapping method. However, there is no definitive answer to the bait that should be used to collect the greatest quantity of Diptera of forensic importance or the richest diversity. To understand the differences in baits for Diptera traps three butterfly traps were placed in three different areas of the USDA-ARS property in Kerrville, Texas. Traps were set in the morning and were baited with the same bait. They were then collected at the end of the day. The contents of the traps were then frozen and later identified. The specific baits used were beef liver and catfish filets. Diptera were collected off of road kill, and compared. This was done three times a week for six weeks in June through July. Eight calliphoridae species were collected, including Cochiomyia macellaria, Lucilia mexicana, and Chrysomya rufifacies. In total, 729 dipterans were collected, 620 from fish-baited traps, nine from liver-baited traps, and 100 from roadkill.

THE MICHIGAN STATE STUDENT ORGANIC FARM

Presenter(s): Julianna Adams
Agriculture & Animal Science
Mentor(s): Darby Anderson (College of Agriculture & Natural Resources)

According to the USDA, the average age of farmers is nearly 60 years old. Young producers- age 35 or younger- account for only nine percent of farmers. The Michigan State Student Organic Farm (SOF) works to fulfill its mission of cultivating human knowledge and capacity in organic and sustainable agriculture for students, farmers and educators. The SOF creates a practical and immersive farm education for the next generation of farmers. The SOF works to achieve education through the undergraduate student crew, the organic farmer training program, undergraduate engagement, and farmer field school. This past year, I completed an internship as an undergraduate student crew member. The crew is involved in all aspects of production: seeding, planting, cultivating, harvesting and marketing. The SOF also provides undergraduate engagement opportunities throughout the year including hosting events, volunteers, tours, and class collaborations. The SOF also offers an organic farmer training program that teaches aspiring farmers in a mix of hands-on learning, field trips, and interactive online learning. The produce is grown for the community-supported agriculture (CSA) shares and for the Michigan State dining halls. During my internship at the SOF, I took on the leadership and project management of our weekly CSA. This internship was fulfilling on a personal and professional level because I got to see the impact I made working in a small-scale food system. I have gained experience working in food systems and expanded my knowledge on sustainable practices in agriculture.

A SURVEY OF POTATO PROTEIN CONTENT IN COMMERCIAL CULTIVARS AND MSU POTATO BREEDING PROGRAM MATERIAL AND COMPARISON BETWEEN PLANTING YEARS AND LOCATION

Presenter(s): Anna Zarka
Agriculture & Animal Science
Mentor(s): David Douches (College of Agriculture & Natural Resources)

In the United States, the nutrition label on a bag of potatoes purchased by a consumer states that in an average serving size, there are 3 grams of protein per

148g fresh weight potato (USDA Food Data Central). The belief that potatoes are unhealthy contradicts the fact that the average potato is a nutritionally dense vegetable containing complex carbohydrates, and is a good source of vitamin C, vitamin B6, potassium, fiber, and protein. The range of protein concentrations can depend on potato variety and growing conditions and is known to vary significantly. This suggests that there is genetic potential to increase the protein content in potatoes. The goal of this research project was to develop a rapid and inexpensive assay to survey current MSU potato breeding germplasm and commercial cultivars to help identify high protein-content potato varieties. Using a 96-well plate-based Bradford assay, we were able to screen hundreds of samples per day and identify individual potato varieties that contained higher protein levels. Individual MSU potato breeding germplasm was identified that contained protein levels higher than current commercial cultivars. As expected, there was a wide range of protein concentrations between different MSU breeding program germplasm and between different commercial cultivars. There was also variation identified in the same varieties sampled across planting years and across planting locations. Using this simple assay to survey for protein content will help identify high protein-content potatoes that may be useful in future breeding or marketing efforts.

ESTABLISHMENT OF A MOUSE HIGH FAT AND HIGH SUGAR PERICONCEPTION DIET MODEL FOR INVESTIGATION OF THE ETIOLOGY OF PEDIATRIC NON-ALCOHOLIC FATTY LIVER DISEASE

Presenter(s): Skylar Mack
Agriculture & Animal Science
Mentor(s): Chad Driscoll (College of Natural Science), Jason Knott (College of Agriculture & Natural Resources)

Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver disease in humans. More recent studies in humans and animal models indicate that maternal diet and nutritional status is strongly associated with development of pediatric NAFLD in offspring. Consumption of a high fat and high sugar (HF/HS) diet is associated with maternal obesity and type II diabetes, and offspring may exhibit higher rates of NAFLD. However, the precise window of pregnancy when offspring become predisposed to NAFLD is unknown. We hypothesize that female mice fed a HF/HS diet during the period of periconception (i.e., before and immediately following conception) will have offspring predisposed to NAFLD. To address this, we fed females either a control or a HF/HS diet during the period of periconception and then transferred their embryos into healthy mothers. Prior to transfer, body weight and glucose tolerance tests were performed to confirm the mothers were obese and diabetic. After birth and weaning, offspring were fed either a normal or HF/HS diet. Weight gain was monitored throughout the experiment. After 3 months on the diets adult offspring were euthanized and liver samples were collected to assess NAFLD. Body weights of periconception males versus control males were higher throughout the experiment ($P<0.05$). The liver weight ratios were higher in the periconception males compared to controls ($P<0.05$). Liver free fatty acid levels from periconception males were elevated compared to control males but were not statistically significant. Ongoing experiments are evaluating liver triacylglycerols and liver gene expression.

EVALUATING THE EFFECTS OF ORGANIC AND INORGANIC FERTILIZERS ON FORAGE QUALITY OF BERSEEM CLOVER (TRIFOLIUM ALEXANDRINUM L.)

Presenter(s): Aaron Widener
Agriculture & Animal Science
Mentor(s): Joseph Paling (College of Agriculture & Natural Resources), Kimberly Cassida (College of Agriculture & Natural Resources)

Forage quality measures a forage crop's ability to initiate an animal response and is influenced by a variety of factors. One such factor that has the potential to positively impact aspects of forage quality is fertilization treatments. Experimental tests on forage crops with a focus on forage quality improvements through fertilization are widely operated in agronomic settings. Here, the effects of organic and inorganic phosphorus fertilizer treatments were assessed independently on their ability to increase forage quality of berseem clover (Trifolium Alexandrinum L.). Berseem clover treatment plots were planted in early September at the MSU Agronomy Farm in East Lansing, Michigan. Fertilizer treatments were applied through the topsoil from pre-weighed bags three weeks after plant date. Organic treatment used was Seabird Guano (0-11-0) and the chemical treatment was Triple Super Phosphate (0-46-0) with a control receiving no fertilizer. Once grown, the plots were harvested with hand clippers from a desired area, sorted and dried to determine dry weight, ground to powder through a 1mm screen, and analyzed through the use of Near Infrared Spectroscopy (NIRS). The findings show a negligible difference in forage quality and yield among treatments across multiple aspects of forage quality.

THE NEXT GENERATION OF TRACTOR CABIN SEATING

Presenter(s): Joshua France
Agriculture & Animal Science
Mentor(s): Tamara Bush (College of Engineering)

Tractor operators often spend anywhere from eight to sixteen hours per day sitting in their tractors. With so many hours in the cabin, comfort, and functionality are a necessity. In order to learn about the ergonomic needs of tractor cabs, we conducted a survey of large-scale tractor operators and driving brands such as Case IH, John Deere, and Magnum. Our surveys discussed their views of the operator seat, instructional seat, and the overall cabin layout. Eight tractor operators, seven male and one female, were interviewed in depth on their thoughts on seating, interior space, and other features of the cab. Many operators consistently found themselves adjusting their seats throughout the day for better comfort and were dissatisfied with the swiveling capabilities of the operator seat. They often felt that visibility out of a rear window was limited, which inconvenienced them while working with a towable implement. Operators also expressed that the instructional seat should serve a dual purpose as a fold-away space for tables or cupholders, as the seating functions are not often utilized. The results gathered from these interviews will be able to better inform design decisions to create a more comfortable interior for the next generation of tractor cabin interiors.

ROOT EXUDATES IMPACT ATTRACTION OF THE ROOT LESION NEMATODE, PRATYLENCHUS PENETRANS, TO NON-HOST PLANTS

Presenter(s): Saniya Henderson
Agriculture & Animal Science
Mentor(s): Ellie Darling (College of Agriculture & Natural Resources)

Pratylenchus penetrans is a root lesion nematode that feeds on healthy cells within carrot taproots. Pratylenchus penetrans has a wide host range so farmers have a hard time finding proper resistance (Collins, 2016). Cover crops can be a way for growers to lower populations during offseason, also provides other benefits to soil fertility. Cover crops should be non-hosts to root lesion to prevent population growth of the pest. In this study, we aim to determine how nematodes respond to oilseed radish root exudates. Determining if root lesion nematodes are attracted to, unreactive, or repulsed by oilseed radish root exudates can help us understand how these crops can be used for management. Previous research from the Applied Nematology Laboratory indicates that some varieties ofoilseed radishes are poor or non-hosts to root lesion nematode (Darling et al., pending). Investigating how nematodes respond to root exudates can help determine if plant-parasitic nematodes are initially attracted to nonhosts or repulsed by them. We examined four treatments, a positive control - Carrot, and three oil seed radish varieties Select, Concorde and Defender. The trial was conducted in a Petri dish, where 100 root lesion nematodes were inoculated on one side, and the root exudate was placed on the other. Six- and 24-hours post inoculation, the number of nematodes within each region was counted. Each treatment had five replicates and the trial was repeated twice.

ANALYZING YIELD AND FORAGE QUALITY IMPACTS OF ALFALFA GRASS FORAGE CROP MIXTURES

Presenter(s): Jasmine Bontrager
Agriculture & Animal Science
Mentor(s): Joseph Paling (College of Agriculture & Natural Resources), Kimberly Cassida (College of Agriculture & Natural Resources)

Developing our understanding of the different impacts growing alfalfa grass crop mixtures is important in the forage industry. This ongoing multi-year study is designed to analyze yield, forage quality, and soil moisture differences across field plots of pure alfalfa, pure grass, and alfalfa-grass mixtures. The experiments were conducted at two geographical locations in Michigan: MSU Agronomy Farm, East Lansing (EL) and Kellogg Biological Station (KBS), Hickory Corners. Each location had 60 different test plots consisting of fifteen different treatments replicated four times. There was a total of four cuttings at the EL location and three cuttings for the KBS location. The equipment used for this study included a Carter flail plot harvester, time-domain reflectometry (TDR) soil moisture probe, and Near Infrared Reflectance spectrometer (NIRS) for forage quality. Subsamples were collected to determine the alfalfa to grass abundance ratios for each mixture cutting. The dry matter yields of the different mixtures were analyzed for each cutting. The TDR soil probe was used to collect soil moisture percentages for the mixtures. In this poster, I will focus on yield trends, species abundance ratios, and TDR trends results gathered from the EL and KBS location of the 2022 growing season. The TDR measurements statistically showed a significant relationship to the mixture treatment. Statistically there was no significant difference between the two sites in the total yield trend for this year. The yield and forage quality data, however, showed a significant difference between the 2 sites by cutting and mixture.

WHAT RISK DOES BAITING DEER POSE TO NON-TARGET SPECIES?

Presenter(s): Rebekah Agnew
Agriculture & Animal Science
Mentor(s): Gary Roloff (College of Agriculture & Natural Resources), Samantha Courtney (College of Agriculture & Natural Resources)

Since the origin of big-game hunting in America, the ethics behind baiting have been questioned, but the cascading ecological impacts are often overlooked. Baiting presents a concentrated food source for white-tailed deer (Odocoileus virginianus), and attracts various species that otherwise might not interact with deer, potentially spreading parasites, bacteria, or diseases among organisms. Little is known about how concentrated sources of food might be facilitating the spread of diseases, such as chronic wasting disease (CWD) among non-target species on the landscape. Therefore, it is critical that we understand how baiting wildlife may influence disease transmission across the landscape. Considering these factors, we asked: what species are visiting deer bait sites and are they interacting in a manner that poses a risk for disease transmission among species? To address this question, our objectives were to 1) determine species using bait sites 2) quantify the total amount of time a species spends at each site; and 3) quantify the nature and duration of interactions that occur among species. The study occurred in an agricultural region of southern Michigan at 10 bait sites (separated by 3 km). We viewed approximately 3745 hours of video footage collected at camera trapping arrays from January-April 2022. Video footage was recorded on a 24-hour period, 7-days per week. We identified 31 species, 2,296 contact events among species, and 34.03 hours of other species being present at the bait sites. These results provide a better understanding of the potential disease risks that baiting poses to non-target wildlife species.

THE EFFECT OF ORGANIC ACIDS ON MINERAL ASSOCIATED ORGANIC MATTER STABILITY ACROSS A MANAGEMENT PRACTICE GRADIENT

Presenter(s): Paige Sirak
Agriculture & Animal Science
Mentor(s): Lisa Tiemann (College of Agriculture & Natural Resources), Yuan Liu (College of Agriculture & Natural Resources)

Mineral-associated organic matter (MAOM) is a protected form of soil organic matter (SOM) that can act as a long-term energy source for microbes and improve the long-term persistence of SOM. While it is known that root exudates like organic acids (OAs) can destabilize MAOM, it is unclear whether different organic acids have similar effects. In this study, we sampled soils from Kellogg Biological Research Station across a successional gradient of eight management practices: conventional corn/soy/wheat rotation, no-till corn/soy/wheat rotation, biologically based corn/soy/wheat/cover crop rotation, poplar, switchgrass, early successional community, successional forest, and deciduous forest. The MAOM was isolated and a short-term incubation lasting 144 hours was performed with the addition of three 13C-labeled OAs with increasing carboxyl groups (acetic acid, succinic acid, and citric acid). Changes in soil pH, microbial respiration (12CO2, 13CO2), microbial biomass, dissolved organic carbon (DOC) and nitrogen (DON) were measured. Our preliminary results demonstrate that soil pH increased significantly with OA addition, but had no significant difference between acids. Adding OAs significantly increased overall microbial respiration. In the first 72 hours, the highest average respiration occurred in succinic acid and the lowest in acetic acid, but the order reversed in the later stage. With 13C data from respiration and soil samples, we will distinguish the OA-fueled respiration from MAOM-fueled respiration. Both DOC and DON generally increased with the successional gradient, indicating that carbon and nitrogen content in the soil increases as management levels decrease. This presentation examines the relationship between MAOM stability, OAs, and management practices.

VALIDATION OF ACCELEROMETERS FOR USE IN KENNELED DOGS

Presenter(s): Eileen Chen
Agriculture & Animal Science
Mentor(s): Jacquelyn Jacobs (College of Agriculture & Natural Resources)

Actigraph is an accelerometer which measures movement on a three-dimensional plane. These accelerometers have previously been validated to measure activity levels in dogs by observing locomotive behavior and comparing to the Actigraph count per second output. However, kenneled dogs, such as those in shelters, do not have the space to walk longer distances or experience vigorous activity. Therefore, these accelerometers have not yet been validated for use in dogs with restricted opportunity to locomote. A total of ten dogs housed at a local shelter were fitted with an Actigraph on their collars and recorded in their kennel for one hour via a GoPro camera. Behavioral data was decoded from video and continuously scored in each of the following categories: sitting, lying, standing still, walking, running, and jumping. The activity count per second (CPS) was extracted from the Actigraph for comparison to behavioral data. We established 5 new activity categories for kennel activity based on quantiles of CPS: category 1 (1 - 14 CPS), 2 (14.01 - 33.73), 3 (33.74 - 59.65), 4 (59.66 - 100.71), and 5 (> 100.71). The mean CPS of our population of kenneled dogs was 23.55 CPS (range: 0-954.72). Preliminary results suggest non-activity behavior (e.g., sitting, lying, and standing) is most observed in Actigraph category 1, while activity behavior (e.g., walking, running, and jumping) is observed in categories 2 - 5. Analysis is currently ongoing, but we expect these results to aid researchers and shelter staff in easily implementing and interpreting activity behavior of kenneled dogs.

THE EFFECTS OF INTRA-ARTICULAR STEROID ADMINISTRATION ON THE METABOLIC PROFILE OF METABOLICALLY NORMAL HORSES

Presenter(s): Carissa Clark, Ramzee Miller
Agriculture & Animal Science
Mentor(s): Jane Manfredi (College of Veterinary Medicine)

Corticosteroids are a commonly used, inexpensive intra-articular treatment for osteoarthritis which may increase the risk of steroid-induced laminitis in horses. Humans with metabolic syndrome experience increases in insulin and glucose post-injection, but responses in horses are not known. The objective of this study was to determine the effect of intra-articular steroids on systemic insulin and glucose values. We hypothesized corticosteroid injections would result in significant increases in glucose and insulin levels in all observed horses. We injected the middle carpal joint of nine metabolically normal horses with 18 mg of triamcinolone acetonide, a common corticosteroid and serially evaluated insulin and glucose concentrations post-administration. Statistics included repeated measures ANOVAs (significant at $P<0.05$). Peak insulin concentration was 28+/-12.9 uIU/mL at 48 hours with significantly increased concentrations from baseline at 6hr ($p=0.03$), 24hr ($p<0.01$) and 48 hr ($p=0.04$) post steroid administration. Peak glucose concentration was 128+/-11.9 mg/dL at 24 hours with significantly increased concentrations from baseline at 6 hr ($p<0.01$), 8hr ($p<0.01$), 24 hr ($p<0.01$), 48 hr ($p<0.01$) and 72 hr ($p<0.01$) post steroid administration. These values are within the range reported during regularly performed diagnostic endocrine tests in metabolically normal horses. Our clinical take home is that intra-articular steroids do not appear to cause insulin spikes consistent with inducing laminitis in normal horses and therefore can be used safely.

EFFECTS OF HEALTH CARE WORKERS' PARTICIPATION IN EQUINE ASSISTED ACTIVITIES ON THEIR ATTITUDE TOWARDS HORSES AND FUTURE PARTICIPATION IN HORSE ACTIVITIES

Presenter(s): Alex Mast
Agriculture & Animal Science
Mentor(s): Christine Skelly (College of Agriculture & Natural Resources), Gwyn Shelle (College of Agriculture & Natural Resources), Karen Waite (College of Agriculture & Natural Resources), Paula Hitzler (College of Agriculture & Natural Resources), Thomas Guthrie (College of Agriculture & Natural Resources)

This study explored the influence of participating in an equine assisted activity (EAA) on health care workers' (HCW) attitude towards horses and their future participation in horse activities. The study, conducted at the Michigan State University Horse Teaching and Research Center (HTRC), randomly divided HCW (n=55) into three groups: Control - walk on farm roads with no EAA (n=17); Low EAA - self-guided tour of the HTRC with opportunity for horse interactions (n=20); and Mid EAA - grooming a horse under supervision (n=18). All HCW completed a pre- and post-survey immediately before and after their activity and received a riding lesson voucher at the end of their session. Pre- and post-survey data were analyzed using the repeated measures one-way ANOVA procedure in SPSS. A repeated-measures ANOVA in SPSS showed that mean horse attitude scores improved significantly between pre- and post-test overall ($F(1, 52) = 15.89$,?P?< .001), with no differences between groups. HCW were sent a one-year follow-up survey to determine if they used their vouchers and if not, why. The follow-up survey had a 65% return rate (n=34) and showed that only 14.7% (n=5) HCW used their voucher. Forty-seven percent of HCW who did not use their voucher selected lack of time as the primary reason. This study suggests that participating in an activity on a horse farm may improve HCW attitude towards horses regardless of their opportunity for horse interactions. However, lack of time is a prohibiting factor for HCW future participation in horse activities.

HOW SEX COMPOSITION OF A GROUP INFLUENCES CONSISTENCY OF LEADER/FOLLOWER POSITIONS IN SHEEP

Presenter(s): Sara Levendoski
Agriculture & Animal Science
Mentor(s): Renee Harbowy (College of Agriculture & Natural Resources)

When handling animals, it is important to implement practices that utilize their natural behaviors to ensure the experience is stress-free and efficient for both the animal and handlers. Sheep are social animals and are easiest to move or handle when in groups. However, there is little research on whether sheep indicate position preference within their group and what factors may influence preference. The objective of this study was to investigate if there is an association between sex and position preference within groups. Thirty-six sheep, participating in a larger ongoing study, were observed exercising in small groups. Videos were taken at the beginning and end of each exercise session. Videos were then reviewed, and sheep were categorized as consistent, intermediate, and inconsistent based on the frequency that the sheep was observed changing position from beginning to end of exercise. Furthermore, the sex composition of each group (number of ewes or wethers) was recorded to determine if sex ratios influenced the consistency within their movement during exercise. Data were further analyzed to determine if there was an association between sex of the animal and movement category. Results will be shared upon presentation.

ANTHROPOLOGY & ARCHEOLOGY

FREQUENCY AND DISTRIBUTION OF SKELETAL FEATURES USED IN SCIENTIFIC IDENTIFICATION OVER TIME

Presenter(s): Stephen Hostetler
Anthropology & Archeology
Mentor(s): Carolyn Isaac (College of Social Science)

Forensic anthropology is the application of osteological expertise to the medico-legal death investigation process. More specifically, forensic anthropologists apply a wide variety of practices to answer important questions about an unidentified set of remains. Assuming the remains are human and forensically-significant, the most important question to be answered is the identity of the deceased, or decedent. One identification technique is comparative medical radiography, wherein postmortem radiographs are compared with antemortem radiographs associated with a prospective missing person. By comparing skeletal features in corresponding radiographs, forensic anthropologists determine whether they are one of three options: 1) consistent enough to establish an identity for the decedent, 2) too inconsistent to declare a scientific identification of the decedent, or 3) does not provide enough evidence to make a decision about the identity of the decedent.

Many practitioners are looking to refine systems of matching antemortem and postmortem radiographs with the assistance of artificial intelligence and computer learning, which could provide more objectivity to scientific identifications of this nature. This study looks through a history of comparative medical radiography cases from the Michigan State University Forensic Anthropology Laboratory (MSUFAL) in order to determine relevant statistics about the frequency and distribution of skeletal features utilized in ID and the anatomical regions of the radiographs used therein. This information is important in the development of a computer-assisted means of comparative medical radiographic identification.

AGING OF SKULL FRACTURES

Presenter(s): Emma Rico
Anthropology & Archeology
Mentor(s): Carolyn Isaac (College of Social Science), Clara Devota (College of Social Science)

Investigation of the histological progression of osseous fracture repair is integral to medicolegal death investigations. Estimation of the time elapsed since fracture until the time of death, known as post-traumatic survival time (PTST), can clarify if an observed pattern is consistent with accidental or non-accidental injury (NAI) and assist in determining the cause and manner of death. A recent paper by Naqvi and colleagues (2019) developed an algorithm for the estimation of PTST in fractures from infants less than one year of age. While this research is significant, it remains unclear if the Naqvi et al. method is suitable for dating fractures to the cranial vault as the authors do not provide any indication as to the skeletal elements used to develop the algorithm. The cranial vault develops through intramembranous ossification while most bones of the postcranial skeleton undergo endochondral ossification. As such, significant differences may exist in the progression and timing of fracture repair between the calvarium and postcranial bones necessitating methods for PTST estimation specific to different skeletal elements.. The aim of this study is to apply the criteria developed by Naqvi et al. to a sample of known PTST cranial vault fractures, n = 14, from infants (≤12 months) to ascertain if the algorithm is suitable for use in determining the age of cranial vault fractures. A secondary aim of this study is to apply the Naqvi et al. method to known-PTST cranial fractures from an adult sample to investigate the accuracy and precision of the infant criteria applied to mature cranial bone.

EVALUATING THE ASSOCIATION OF DIETARY DIVERSITY AND FOLATE NUTRITION IN BREASTFEEDING MOTHERS DURING SEVERE DROUGHT

Presenter(s): Ananyaa Asthana
Anthropology & Archeology
Mentor(s): Masako Fujita (College of Social Science)

Climate change has led to increased severity of droughts across the world, including northern Kenya, home for agropastoralists. Increasing droughts increases food insecurity, with negative health implications, particularly for postpartum women. People typically respond to food insecurity by narrowing the range of food consumed in favor of more accessible, less nutritious foods. Consequences of a compromised diet includes micronutrient deficiency and obesity. One important micronutrient is folate, a critical molecule for various biological pathways necessary for life. This makes folate important for the growth and development of infants, which is reflected in elevated folate levels in human milk at the expense of maternal folate deficiency. The United Nations developed the minimum dietary diversity score for women (MDD-W). The current recommendation is that women consume at least five of ten food groups for nutrient adequacy. This is not attainable for everyone, especially those impacted by climate change. Our study aims to evaluate the association of a lower-than-recommended MDD-W score with 1) adequate dietary folate (and associated vitamins) and 2) adequate folate levels in the body. We used 24-hr dietary recall data from 228 breastfeeding mothers in northern Kenya during a severe drought to estimate micronutrient levels. We measured serum homocysteine levels in the mothers; homocysteine accumulates with folate deficiency, making it a biomarker of folate levels. We used logistic regression models with the outcome variable of MDD-W$\geq$3 to evaluate the associations. These results can be used to inform nutrition policies in communities being severely affected by droughts due to climate change.

ETHNOGRAPHIC RESEARCH ON THE JERMA985 FANBASE: A JERMAMITE INFESTATION

Presenter(s): Maxine Levanduski
Anthropology & Archeology
Mentor(s): Steven Fraiberg (College of Arts & Letters)

The internet has given rise to new forms of communication, socialization, and culture. A central hub of this culture is Twitch, a popular streaming platform, where communities can form due to streamer and audience interaction. Jerma985 is a popular Twitch streamer with a large and devoted fanbase referred to as Jermamites. Commonly referred to as Jerma, this streamer has become famous for his eccentric streams and the entertaining exchanges with fans. Due to this, Jerma has developed a legion of fans with a rich culture of inside jokes, memes, lore, and language that has become an integral part of the community. These have become the building blocks of the community and the reason this community has gained notoriety. In this research, I'm studying how these aspects mesh together to create a unique dynamic and lead to the formation of a culture. Specifically to study this process, my research uses participant observation, semi-structured interviews, and artifact collection to study Jerma985's fan community. This research aims to demonstrate that internet-based cultures can be as vibrant and complex as traditionally studied cultures and can contribute to our understanding of how digital spaces shape social behavior and communication.

BIOARCHAEOLOGICAL ANALYSIS OF HUMAN SKELETAL REMAINS

Presenter(s): Allison Thomson
Anthropology & Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

Archaeology carried out at the site of Caesarea Maritima, Israel, has been instrumental in understanding key elements of the Crusades. Excavations in the

1970s and 1980s revealed focused on Medieval cemeteries overlying earlier Roman contexts. The burials included a mixed demographic makeup and included both Christian and Bedouin individuals, distinguished by their body positioning. Among these was Burial 70, holding a well-preserved individual, whose skeletal remains were used in the current study. This poster discusses the various processes of determining age and sex, a complete skeletal catalog, an osteobiography of the individual, and the socio-cultural significance of the skeletal remains in reference to Caesarea Maritima, in an effort to situate this individual in the larger historical context of the Crusades.

A SKELETAL ANALYSIS OF A BEDOUIN BURIAL FROM CRUSADER-ERA CAESAREA MARITIMA, ISRAEL

Presenter(s): Josephine Cowles
Anthropology & Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

Skeletal analysis of an ~800 year old Bedouin burial recovered from the archaeological site of Caesarea Maritima, located in modern-day Israel, focused on reconstructing aspects of the individual's life history. I conducted an inventory of the mostly complete skeleton and was able to estimate age and sex, as well as to identify pathologies and dental anomalies. Through my research I learned a variety of analytical methods and applied the data collected from the skeletal remains and from the archaeological and historical record of Caesarea Maritima to help generate a picture of life in Islamic-era Bedouin society.

SERIOUS SERIATION: AGE-AT-DEATH ASSESSMENT OF SKELETONS FROM CAVES BRANCH ROCKSHELTER, BELIZE

Presenter(s): Gabi Murphy
Anthropology & Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

The Caves Branch Rockshelter (CBR) is a large cemetery site in Central Belize used for burial by a rural Maya community during the Late Preclassic and Early Classic periods (~300 BC - AD 400). The CBR skeletal series is unusual in the region as it is large and appears to comprise a relatively complete mortality profile. However, due to poor preservation, different aspects of the biological profile have been difficult to assess. In this study, we explore age-at-death estimation by seriating individuals based on the extent of dental attrition and using standard mortality profiles to place individuals into age groupings. Additionally, for each individual, we calculate rate of wear by comparing attrition between first, second, and third molars.

LIVES AND DEATHS IN THE PAST: OSTEOBIOGRAPHY OF BURIAL CONCENTRATION 13 FROM CAESAREA MARITIMA, ISRAEL

Presenter(s): Lilly Bucher
Anthropology & Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

The burial assemblage from Caesarea Maritima dates to the Medieval period and was excavated from the soil overlying an earlier Roman city. Burials were found in primary contexts and in concentrations of bones from earlier burials disturbed by later ones. I conducted an osteobiography of one of these concentrations (C-80 BC13), carrying out an inventory to determine the minimum number of individuals and aspects of the individuals' identities. The bones in the burial concentration were highly fragmented, but my analysis identified at least four incomplete individuals. Three of these, two adults and a neonate, were more complete, and the fourth was represented by fewer, more fragmentary bones. For each individual I collected data useful in estimating age, sex, health, and stature. My overall goal was to study the life and death of those within this burial concentration and to interpret these data within the cultural context of Caesarea Maritima.

BIODISTANCE ANALYSIS OF ATHABASCAN SPEAKING GROUPS USING CRANIAL MACROMORPHOSCOPIC TRAITS

Presenter(s): Alison Weber
Anthropology & Archeology
Mentor(s): Joseph Hefner (College of Social Science)

Many anthropological measures of biological distance rely on inherent human variation differentially expressed within and between populations. Methods of skeletal analysis rely on two broad data types: cranial metrics and cranial nonmetrics. No matter the data type, biological distance analysis quantifies the similarities and dissimilarities among individuals at the population level. One measure of analysis is Smith's Mean Measure of Divergence, which is appropriate for cranial nonmetric traits. This project will assess one suite of cranial nonmetric traits-Macromorphoscopic (MMS) data - to evaluate biological distances between Athabascan-speaking groups. To assess biological distance, MMS data from the Macromorphoscopic databank will be applied to Smith's Mean Measure of Divergence. These data, along with linguistic, cultural, and archaeological data, will contextualize Athabascan-speaking groups. These efforts will add to the growing body of literature on the origins of the Navajo Nation, an Athabascan-speaking culture in the American Southwest believed to represent a relatively recent cultural tradition in the region.

PATTERNS OF LITHIC RESOURCE ACQUISITION AT QUEBRADA JAGUAY, AN ICE AGE ARCHAEOLOGICAL SITE IN COASTAL PERU

Presenter(s): Elizabeth Longcore
Anthropology & Archeology
Mentor(s): Kurt Rademaker (College of Social Science)

Quebrada Jaguay is one of the earliest archaeological sites in the Americas, located on the coast of Peru and dating from the late Pleistocene (Ice Age), about 12,000 years ago. The site contains formal stone tools, along with many flakes from the tool making process. As one of the oldest sites in South America, Quebrada Jaguay is important for looking at patterns of early migrations. One way of studying people's movement is by looking at where they were getting their resources from. Obsidian, a rare lithic material at Quebrada Jaguay, can be sourced to known bedrock outcrops in the high Andes with incredible precision, and is therefore very useful for this type of research. Chemical analysis of obsidian artifacts from Quebrada Jaguay using portable x-ray fluorescence, along with identification of other stone materials from the site, allows us to see patterns of when and where the people living there were getting their resources.

POLYCYSTIC OVARIAN SYNDROME AND IMPACTS OF ORAL CONTRACEPTIVES

Presenter(s): Alli Harkenrider
Anthropology & Archeology
Mentor(s): Masako Fujita (College of Social Science)

Polycystic ovarian syndrome (PCOS) is an endocrine disorder which causes many detrimental symptoms. This disorder manifests in the body as irregular menstruation, insulin resistance, and inflammatory issues due to hormone imbalances. Though PCOS is life-long and has no permanent cure, medical interventions such as oral contraceptives are used to reduce symptoms. Contraceptives work by balancing hormones thus decreasing hyperandrogenism and inducing regular menstruation. Our goal was to summarize the current knowledge on the health impacts of hormonal contraceptives on women with PCOS. To this end, a literature search was conducted using the Web of Science database and google scholar, focusing on PCOS and the long-term and short-term consequences of hormonal birth control. Collected sources were evaluated to see if oral contraceptives as a PCOS remedy have associations with illnesses. Although we found many reports that oral contraceptives alleviate the symptoms of this disorder, we did not find studies that investigated long-term health effects of contraceptives in PCOS individuals. However, we found that hormonal oral contraceptives increase the likelihood of ovarian cancer and heart issues such as atherothrombosis and thromboembolism among all users. Though further research is needed, contraceptive use in people with PCOS increases susceptibility of developing metabolic dysfunction. For PCOS patients, long term symptom management with contraceptives puts them at greater risk of not only side effects of contraceptives, but the health issues that also come with the disorder. Future research on the safety of long-term contraceptive use in people with PCOS is needed.

PATRILINEAL VS. MATRILINEAL EFFECTS ON FERTILITY AND INFANT SURVIVAL IN THE HOUSEHOLD

Presenter(s): Natalie Mourou
Anthropology & Archeology
Mentor(s): Masako Fujita (College of Social Science)

By taking an in-depth comparative approach into familial ties, this project explored if and how fertility and infant survival differ between matrilineal (kinship through the female line) and patrilineal (kinship through the male line) societies. We searched the literature on the Web of Science, using a combination of keywords including infant survival, women's health, and familial ties. The information in the gathered sources was then analyzed and compared. We identified three articles that reported both the kinship system of the society/household and maternal fertility or infant survival. One article was on matrilineal and two articles were on patrilineal societies. We found that

matrilineal households generally have a lower fertility and infant mortality rate than patrilineal households. Through the qualitative comparison of the household compositional and behavioral information in these articles, a theme emerged that the maternal grandmother tends to protect her daughter from possible male exploitation and promote her general well-being. The trend in fertility and survival differences by kinship system then could be explained by beneficial impacts of the maternal grandmother. There is a possibility that other factors take part in fertility rates and infant survival, but these were less evident in the reviewed articles. These findings highlight the importance of anthropological and social science research on societal foundations such as kinship systems to better understand the context of gender disparities that in turn affect fertility and infant survival. It is with understanding the kinship relationships, social scientists can advise policies for health improvements.

THE GENERATIONAL CULTURE CRISIS IN THE ITALIAN-AMERICAN COMMUNITY

Presenter(s): Isabella Padula
Anthropology & Archeology
Mentor(s): Steven Fraiberg (College of Arts & Letters)

Italian culture is historically amongst the oldest with the Roman Empire dating back to 27 B.C. While now Italy is minimized to a singular peninsula country, the traditions are still relevant to those native and abroad. Over the course of years, many individuals have left Italy pursuing a better life for future generations. However, due to the gradual generational shift from Italian to American culture in the United States, traditions are being lost; I am currently experiencing this with my family. With my Italian heritage, my desire to continue my cultural understanding is critical. Through semi-structured interviews of family members, retrospective accounts, artifacts, and online communities, I will attempt to discover central themes within this struggle and ways to continue the traditional culture. The ultimate purpose of this study is to demonstrate how a better understanding of one's culture may lead to future generations continuing traditions and subsequently allowing for respect for other individuals' cultures.

SKELETAL SEX ESTIMATION BASED ON APPLICATION OF DISCRIMINANT FUNCTION ANALYSIS OF MAYAN LONG BONE LENGTHS

Presenter(s): Maegan Jankowski
Anthropology & Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

The aim for this study is to determine the sex estimation of Mayan skeletal remains based on the analysis of long bones. In order to achieve this, I first had to determine which of the Mayan skeletal remains would be usable for this project. Then, I estimated the sex of each individual by analyzing specfic features of the pelvic girdle. Afterwards, I took the measurement each of the long bones and their specific features, and estimated the sex of each individual based on how robust each of the features were. Lastly, I compared the sex estimation results of the pelvis to the results of the long bone estimation to see if the sex estimation methods matched.

REMEMBERING AN INDIVIDUAL LOST IN TIME: AN ANALYSIS OF SKELETAL REMAINS FROM CAESAREA MARITIMA

Presenter(s): Allison Ahrens
Anthropology & Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

Working in the Michigan State Bioarchaeology Lab, I have analyzed burial concentration (BC 33) from the archaeological site of Caesarea Maritima. This burial consisted of an adult, an infant, and a fetus; my analyses focused on the adult. This research aimed to examine the biological profile of this individual within a historical and cultural context. Age and sex were determined using macromorphoscopic traits, while historical and mortuary contexts were used to determine ancestry. By examining both the biological and cultural aspects of this individual's life, an osteobiography can be conducted. An osteobiography allows us to gain insight into the lived experiences of an individual while at the same time offering us a more human and empathetic understanding of past cultures and histories.

DIGITIZING SKELETAL DATA

Presenter(s): Melanie Pitt
Anthropology & Archeology
Mentor(s): Gabriel Wrobel (College of Social Science)

Archaeology's long history of excavation has resulted in the accumulation of large, but often poorly documented archaeological collections of material and skeletal remains. Written data carries an inherent vulnerability to being misplaced, lost, or otherwise separated from the materials they concern, resulting in an ultimate obsolescence of those materials - if we know nothing about what we have, it's rendered meaningless. Despite the ever increasing availability of technological resources for digital archiving of archaeological collections, there is no standard system in place. Besides functioning as a space to better organize information with less risk of data loss, a digital system also allows researchers to carry out research by testing for relationships between different variables and sharing data directly with collaborators.During my second year in the MSU Bioarchaeology Lab, I've undertaken a project to develop a digital repository with which to better organize the written records of the skeletal collections in our possession. By implementing a digital platform to store data on as well as improving organization of storage within the lab, this project has laid the foundation for long term physical and digital organization and digital data management.

FAMILY MATTERS: AN ETHNOGRAPHY OF THE FIRST-GENERATION UNDERGRADUATE POPULATION AT MICHIGAN STATE UNIVERSITY

Presenter(s): Corinne Mansour
Anthropology & Archeology
Mentor(s): Steven Fraiberg (College of Arts & Letters)

Michigan State University defines roughly 20% of its undergraduate population as first-generation college students. These are students whose parents or guardians did not complete a degree from a four-year university. Despite the large percentage of undergraduate students qualifying as first-generation (hereafter "first-gen"), there is limited information available on this population and the unique struggles they experience. This research seeks to understand associative themes of student struggles among the first-gen undergraduate population at MSU and the measures the university has taken to alleviate student pressures and develop a sense community on campus. Data was collected through ethnographic methods such as interviews, surveys, and digital media.

ARTS & HUMANITIES

A PARKAS JOURNEY THROUGH THE SNOW TO THE RUNWAY: AN ANALYSIS OF THE INDIGENOUS HISTORY AND BIOMIMICRY OF THE FISHTAIL PARKA

Presenter(s): Lauren Freeland
Arts & Humanities
Mentor(s): Theresa Winge (College of Arts & Letters)

The parka is a classic staple in all closets for those who have to endure cold climates or snowy winter months. This piece of clothing has been modified over many years to adapt to different lifestyles, climates, and activities. Brands continuously produce new parkas with different silhouettes, insulation patterns, and exterior materials to address their market. All of these styles, however, can be traced back to groups of Inuits, most notably the Caribou from Kivalliq region, who originally created fishtail parkas to survive harsh climates and environments. The indigenous history of the parka is not always acknowledged by the brands that manufacture newer versions sold today. Furthermore, indigenous groups who designed, created, and manufactured the parka that originally drew on biomimicry. As we continue to push the boundaries and expectations of the parka, we have much to learn by recognizing its rich history and possible sustainable future. This research study focuses on the history and biomimicry of the parka that inspired a new wave of modern parkas with cutting-edge materials and manufacturing worn throughout the world.

ASSORTATIVE MATCHING

Presenter(s): Calder Moore, Jack Metty, Jay Stansberry, Meital Lurie, Nadav Langberg, Rainy Jain
Arts & Humanities
Mentor(s): Hanzhe Zhang (College of Social Science)

Conceptually, assortative matching occurs when individuals of the same or similar characteristics marry (or cohabit) with each other, but how prevalent assortative matching is differs by society and time. Theoretically, the faculty PI has developed new axiomatic measures of assortative matching for heterosexual couples (in two-sided marriage markets) and homosexual couples (in one-sided marriage markets), respectively. Empirically, the undergraduate students will examine the degree of assortative matching on college education (and other socioeconomic characteristics) across countries and periods. The data for the US are available on IPUMS USA

(Integrated Public Use Microdata Series), and the data for other countries are available on IPUMS International. To provide a comprehensive example to guide undergraduate students, the PI and a graduate student will browse the literature and document the pattern of assortative mating on college education in the US. IPUMS International contains over 1 billion personal records from 547 censuses and surveys in 103 countries. Specific tasks. Each undergraduate student will (1) review and summarize the literature on previous documentation of assortative mating for a continent of international countries (Asia, Europe, North America, South America, and Africa, respectively), (2) document assortative mating pattern for countries on each continent and across time in statistical packages such as STATA or R, and (3) compare the degree of assortative matching between heterosexual and homosexual couples (for the 30+ countries that legalized same-sex marriages).

ANALYSIS OF THE INTERPLAY OF SOUNDTRACK WITH VISUAL MOTIFS AND PLOT IN HITCHCOCK'S VERTIGO

Presenter(s): Kelly Bohan
Arts & Humanities
Mentor(s): Cara Stroud (College of Music)

This project sought to examine the parallels between Bernard Herrman's soundtrack and the visual motifs present in Alfred Hitchcock's film Vertigo, particularly as they relate to nuances in plot. Hitchcock's works are renowned for the level of detail and intentionality in their creation. They frequently feature visual signs that provide layers of commentary and depth to each scene. Specific visual motifs in Vertigo include spirals, heights, and mirrors. These have parallel musical representations present throughout the film, achieved by means of compositional techniques and characteristics of the music itself. These musical instances are analyzed in terms of their possible significance to the plot. Occasional instances where these musical techniques are used simultaneously are explored. Additionally, the similarities between this film score and the music from Wagner's Tristan und Isolde are noted. All observations are a result of individual research through careful analysis of the film as well as review of previous studies on the work. Sources consulted include Jack Sullivan's Hitchcock's Music and David Cooper's Bernard Herrmann's Vertigo.

EXPLORING THE ICONS OF ICONIC WOMEN: AN ANALYSIS OF TWO INFLUENTIAL GRAPHIC DESIGNERS

Presenter(s): Grace Cyporyn
Arts & Humanities
Mentor(s): Rebecca Cifaldi (College of Arts & Letters)

This research study compares and contrasts the works of two influential female designers from the 20th century, American graphic designer Susan Kare (active 1980-present) and British graphic designer Margaret Calvert (active 1957-present). It examines their respective use of texture, color, and shape which resulted in some of the most recognizable icons still used today.

FEMINIST ARTWORK VIDEO GAME

Presenter(s): Alexis Mawhinney, Mariah Fletcher, Numa Arif

Arts & Humanities
Mentor(s): Dan Li (College of Human Medicine)

We have created an interactive video game to promote awareness of feminism in art and to encourage more inclusivity of feminist artwork. We have created this video game via Scratch, an online multi-media platform, in order to spread more awareness about the widespread lack of feminist artwork and thus the lack of feminist ideas around not only the US, but especially globally. This multi-media platform game will engage viewers and those who interact with our presentation in a very unique, creative way that differs from many of the other presentations that would fall within the exhibition category, but is nonetheless a creative take on spreading awareness in a way that any one engaging with our presentation can see first hand. Our goal is to spread awareness of feminist ideals and what they stand for to society.

THE ART OF TYPOGRAPHY IN GRAPHIC DESIGN: ANALYZING THE WORKS OF PAULA SCHER AND OMAR UDDIN

Presenter(s): Shahed Mady
Arts & Humanities
Mentor(s): Rebecca Cifaldi (College of Arts & Letters)

This Undergraduate Research and Arts Forum serves the purpose of educating the audience on two different, yet unique, artists who's works have inspired many. The research dives into the Philosophy, Historical Context, and Work of Omar Uddin's Arabic Calligraphy and Paula Scher's Graphic Design. Both designers have left an impact on the world with their art pieces and I'm going to be discussing some of their similarities and differences.

A SUSTAINABLE MARS

Presenter(s): Erin Martin
Arts & Humanities
Mentor(s): David Godden (College of Arts & Letters)

The goal of sustainability is to meet present needs, and not compromise those of later, to leave the capacity for each generation to be as well off as the one who came before it. In modern society, the recent discovery of lakes on Mars have rekindled the hopes for a better civilization, or brighter future, on the red planet that neighbors Earth. In the discussion that follows, Robert Solow's approach to sustainability will be used to argue for a sustainable transition to it; one that prioritizes enactment of robust policies, emphasizes distributional equity, and a future that is not landscaped by market values or precise numbers. In this conversation, there are three main concerns which will be addressed: the resource intense industry of space exploration (1), how to care for Earth while prepping (2), and how to care for Mars when there (3). This is important because Mars may provide a haven for life when Earth becomes too dangerous, and humans can still learn from what they plan to leave behind.

UNDERSTANDING QUAKER, OHIO, AND ANTI-SLAVERY HISTORY THROUGH A 19TH CENTURY QUILT

Presenter(s): Kathleen Mayer

Arts & Humanities
Mentor(s): Marsha Macdowell (College of Arts & Letters)

In December 2022, I began an object-based research project focused on a quilt that was acquired by Michigan State University Museum. The only data that accompanied the acquisition was that it was purported to be affiliated with a group of Quakers. The quilt itself offered many clues to be investigated as individual names and phrases were stamped in black ink on 39 of the 85 blocks forming the quilt. Both male and female names were listed and some of the last names were similar. The phrases included anti-war and religious sentiments. A few blocks contained a location - Salem, Ohio - and one contained a date - 1846. My research task was to find answers to questions such as: Who are the people whose names are inscribed on the quilt? What connects them to each other? Who made the quilt? What was the purpose of the quilt/why was the quilt made? Is it really a Quaker quilt? And, if yes, how does this quilt reflect Quaker culture? Is this quilt unusual or is it part of a tradition of quilt art? What was going on in Salem, Ohio, in the mid-19th century? My presentation will describe the research processes I used to investigate these clues and questions; I will report on what I have found to date.

FEMINIST METHODS IN MUSIC EDUCATION

Presenter(s): Charlotte Jansky
Arts & Humanities
Mentor(s): Marcie Ray (College of Music)

Through my research, I would like to explore how gender equality can be sought after in the music classroom. Music in general as a field is primarily male-dominated and patriarchal. I would like to explore ways to circumnavigate that, and help non-male music students find their voice and place in the music industry. Through early exposure and role models of non-male musicians, female and non-binary students can find more empowerment in the music classroom and beyond into a music career.

CLOSING THE GAPS: A DATABASE PROJECT IN SUPPORT OF EDUCATIONAL EQUITY

Presenter(s): Taylor Hughes-Barrow
Arts & Humanities
Mentor(s): Joyce Meier (College of Arts & Letters)

Michigan State University has an abundance of resources centered on diversity, equity, inclusion, and belonging, but it's uncertain whether all incoming students are aware of them. In my initial research, I analyzed Michigan State University's graduation rate data by race/ethnicity to highlight existing disparities that exist here, and within the larger context of higher education for racially diverse students. I simultaneously unpacked historical barriers by creating an embedded timeline that demonstrated specific events and policies that contributed to these ongoing disparities. Incorporating direct feedback from marginalized students at MSU, I then created a website that counters these disparities. I am currently working on a database similar to My Spartan Experience that allows BIPOC students to curate their own sense of belonging by having an abundance of resources digitalized and personalized to fit their specific needs. This customized portal would have areas to prompt the holistic growth of our students, that directly support their social, emotional, academic, and professional needs (i.e., personal finance, sex literacy, health, wellness, etc.). This project would center DEI-B resources, clubs, and university-required classes such as IAH and ISS courses that would filter to learning outcomes and interests that a student could navigate and personalize. Using this portal as a guide and planner, first-generation, Black/African American students would experience an enhanced sense of belonging while being able to map their futures.

BIOCHEMSITRY & MOLECULAR BIOLOGY

ENGINEERED FUNGAL AND BACTERIAL LIVING MATERIALS

Presenter(s): Bryce Waller, Nadia Schoenherr
Biochemistry & Molecular Biology
Mentor(s): Gregory Bonito (College of Agriculture & Natural Resources)

Engineered living materials are materials composed of inert substances containing living organisms that benefit from the organism's structure, metabolic processes, and other functional properties. This study aims to create new living materials with a focus on mutualistic relationships between fungi and bacteria to display increased strength, lifespan and self-healing capabilities, compared to their uninoculated counterparts. Different wood type samples and biocomposite blocks made from hemp hurd, straw, and inoculated grain spawn pressed in molds will be the base structures to create our living materials. Fungi were selected based on inoculation procedures (mycelial vs. spore-based), incubation times, strength, and growth conditions to yield 70% inoculation of the pore sapces in test wood blocks 2 weeks after inoculation. Bacterial-fungal inoculations will be inoculated into wood and biocomposite blocks individually. If bacterial-fungal relationships prove ineffective, select microbe inoculation will follow. qPCR will be used to verify that cell densities of both organisms increase over time, while compound and electron microscopy will be carried out in conjunction with weight comparison to ensure that fungi and bacteria have reached 70% inoculation of wooden blocks. All materials will undergo tensile strength testing to determine the effectiveness of fungal and bacteria inoculations.

LIPID SPECIFICITY OF THE DROUGHT STRESS SIGNALING PROTEIN PLAFP

Presenter(s): Dayna Olson
Biochemistry & Molecular Biology
Mentor(s): Josh Vermaas (College of Natural Science)

Food security for a growing global population in a changing climate depends on growing food crops under harsher conditions. Under heat and drought stress, plants redirect their metabolism to respond to the adverse conditions. Mechanistic understanding for heat stress responses are thus fundamental to mitigating harvest yield losses due to drought. Under drought stress conditions, the protein PLAFP and lipid phosphatidic acid (PA) interact at the plasma membrane of Arabidopsis thaliana. PLAFP is a potential long range transporter protein that transmits stress signals carried by PA to other parts of the plant. However, the exact mechanisms for PLAFP substrate specificity, lipid binding, and membrane dissociation are still unknown. Through molecular dynamics simulations, we show that anionic phospholipds bind more favorably to PLAFP than alternative lipid headgroups, and demonstrate that PA can enter PLAFP, which is a necessary step in signal transduction. During constrained equilibrium simulations, the PA signaling lipid slides head first into a binding pocket formed by two β-sheets. It then rotates in the pocket, forming hydrophobic interactions between the lipid tails and the amino acids in the protein core. The lipid head group then sticks out of the binding pocket, allowing for it to bind to receptor proteins, transmitting the drought stress signal. The free energy perturbation simulations demonstrate that anionic lipids have a higher binding affinity to PLAFP than other plasma membrane lipids. Our study helps in understanding the functioning of long range transporter proteins that may be introduced in other plant systems to increase drought stress tolerance.

DESIGNER DUB: MODULATING THE SPECIFICITY OF A DEUBIQUITINASE, YUH1

Presenter(s): Anh Phan
Biochemistry & Molecular Biology
Mentor(s): Min Kuo (College of Osteopathic Medicine)

Proteases can catalyze highly specific reactions of proteolytic processing, which in turn can produce new protein products, or lead to degradation and clearing of the target proteins. A protease with such specificity will afford ample opportunities in biomedical research and applications, e.g., selective elimination of pathogens or toxic proteins. Unfortunately, the development of a designer protease with controllable substrate specificity is in its infancy. The well-characterized ubiquitin- DUB binding and the subsequent proteolytic reaction is an attractive model for the attempt to synthesize a designer protease. To this end, I use a mutated ubiquitin (Ub) that resists the digestion by all deubiquitinases (DUBs), and Yuh1, a yeast DUB, to screen for sequence changes that render the underlying Yuh1 capable of digesting the mutant Ub. The well-characterized ubiquitin- DUB binding and the subsequent proteolytic reaction is an attractive model for the attempt to synthesize a designer protease. When ubiquitin is mutated by altering residues at the cleavage site (LRLRGG¯X, with X being any amino acid), it resists the digestion by wildtype DUBs. If a DUB has the compensatory mutation(s), I can then restore the digestion of the mutant Ub using this new DUB. Preliminary data has shown that these mutants were indeed refractory to DUBs in vivo. Two approaches were taken to discover a designer DUB that can act on one of the mutant Ubs: designing a specific mutant DUB based on published structural details of Yuh1and use error-prone PCR mutagenesis on Yuh1 for a non-biased screening.

GERM CELL-SPECIFIC RNF216 EXPRESSION IS REQUIRED FOR MALE FERTILITY

Presenter(s): Taylor Keighley

Biochemistry & Molecular Biology
Mentor(s): Chen Chen (College of Agriculture & Natural Resources)

Impaired male fertility can be a result of disrupted spermatogenesis due to genetic mutations and affects approximately 1 in 10 males. Ring-between-Ring E3 ubiquitin ligase RNF216 has been reported to be required for male fertility in murine models and has been linked to Gordon Holmes Syndrome, a neurodegenerative disorder, in humans. Our previous global knockout (KO) model of RNF216 led to complete azoospermia. However, it is unclear whether RNF216 expression in male germ cells alone is required for fertility independently of HPG control of reproduction. Additionally, our preliminary data shows RNF216 is expressed in specific germ cell types, notably spermatogonial stem cells (SSCs), which its role is unknown in SSC biology. To investigate these questions further, we created a novel conditional knockout (cKO) mouse model in male germ cells alone, which was confirmed though PCR and wester blotting. These cKO mice showed a significant decrease in testes mass and size, similar to KO mice. Histology of testes and epididymis using H&E staining showed a progressive germ cell loss phenotype, ultimately resulting in infertility. When investigating SSC populations, immunofluorescent staining using known SSC markers at different time points in sexual development, showed that SSC longevity did not appear to be impacted by RNF216 loss. This may suggest RNF216 plays a role in SSC differentiation rather than self-renewal or in meiotic germ cells. In conclusion, endogenous RNF216 is required in male germ cells for fertility to occur and its role in other male germ cell functions need to be inverstigated further.

MOLECULAR MECHANISMS OF TRANSCRIPTIONAL REGULATION BY THE C-TERMINAL BINDING PROTEIN IN THE FLY

Presenter(s): Megha Suresh
Biochemistry & Molecular Biology
Mentor(s): David Arnosti (College of Natural Science)

Transcriptional corepressors play an important role in gene regulation; mutations in corepressors are associated with human diseases such as cancer. One highly conserved transcriptional corepressor is the C-terminal binding protein (CtBP). It is expressed in all animals including humans and flies. Mammals express the CtBP1 and CtBP2 genes, which encode proteins with unique and overlapping roles in gene regulation. Fruit flies (Drosophila) express one gene that encodes two major isoforms of the protein: CtBP-long and CtBP-short. CtBP-long contains an unstructured C-terminal domain of about 100 amino acids that CtBP-short lacks. Previous studies have shown that CtBP-short may have additional gene regulatory roles that CtBP-long does not have. To uncover possible differences between how these two CtBP isoforms may differ in transcriptional regulation and promoter contexts in which they function, we fused them to a nuclease dead Cas9 (dCas9) enzyme. Using this RNA-guided dCas9, we have recruited CtBP isoforms to diverse gene promoters to study their impact on gene expression. When targeting the Mpp6 gene in developing Drosophila wings, we found that CtBP-short is a stronger repressor than CtBP-long. This suggests that the C-terminal extension may play a suppressive role. In cell culture, we are testing possible differences in the range of action of each isoform on a gene's promoter. Our work on understanding mechanisms of repression by CtBP isoforms may eventually inform therapeutic design aimed at targeting mutant CtBP in human cancers.

SORGOLEONE PERMEABILITY THROUGH MOLECULAR DYNAMICS SIMULATIONS

Presenter(s): Troy Sievertsen
Biochemistry & Molecular Biology
Mentor(s): Josh Vermaas (College of Natural Science), Saad Raza (College of Natural Science)

Sorghum is a plant that produces the compound sorgoleone and releases it in its exudate. Sorghum is used agriculturally to suppress weeds since sorgoleone kills small-seeded plants by inhibiting PSII during photosynthesis. Sorgoleone is a well-studied allelochemical; however, since the final enzyme in the synthesis pathway of sorgoleone is found both inside and outside of sorghum's cells, the location of synthesis of sorgoleone and the way it is released from the roots of sorghum into the surrounding soil has not yet been elucidated. By conducting unbiased molecular dynamics simulations for one microsecond to compare the permeability of sorgoleone with some of its precursors, we were able to make some conclusions about sorgoleone's synthesis and release. Our experiment shows that sorgoleone has a higher permeability coefficient (based on Fick's law of diffusion) than its precursors. Our results demonstrate that sorgoleone can permeate out of cells relatively easily while its precursors cannot, thus indicating that the synthesis occurs within sorghum cells and that sorgoleone is exuded by permeating through the cell membrane. Our results could be expanded upon by first increasing the timescale of our experiment or by conducting biased molecular dynamics simulations in the same environment.

BIOFILM FORMATION AND STRESS RESISTANCE IN GROUP B STREPTOCOCCUS

Presenter(s): Akshitha Karthikeyan, Shreya Kankanalapalli
Biochemistry & Molecular Biology
Mentor(s): Jonathan Hardy (College of Human Medicine)

Group B Streptococcus, Streptococcus agalactiae, is a bacteria that can cause severe infections to fetuses during pregancies. GBS colonizes about 20% of women and requires them to recieve 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 antiobiotic 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 biofilm formation, stress resistances, capsules, microscopy, and other differences associated with virulence. We are currently continuing to work on finding more differences in these strains. Additionally, we are attempting to insert the lux operon of E. coli into GBS to create congujates that will offer us better methods of imaging these strains and see their mobility patterns.

THE ROLE OF LANGERHANS CELLS IN ATOPIC DERMATITIS

Presenter(s): Audrey Bench
Biochemistry & Molecular Biology
Mentor(s): Sangbum Park (College of Human Medicine)

Atopic dermatitis (AD) is the most common inflammatory skin disease, and ~16.5 million in the US suffer from its numerous impacts. Although Langerhans cells (LCs) form the immunological barrier in the skin by acting as sentinels, it is still unclear whether LCs impact inflammatory responses to AD. To address this question, both microscopic and genetic approaches are used in this study with a mouse model that exhibits AD symptoms. After preliminary trials using different forms and concentrations of MC903 (a Vitamin D3 analog), a method to successfully induce eczematous ear tissues was established, involving daily topical treatment of mouse ears with MC903 for 16 days. Using an intravital imaging system with fluorescence mouse lines established in the Park lab, spatial and temporal LC changes are identified during AD progressions in live mice. Preliminary trials using fluorescence microscopy have shown increased wrinkles, thicker epidermis layers, and atypical appearance of LCs in the skin of diseased tissue when compared to control tissue. In the next stage, histology analyses of tissue midsections will be acquired using H&E staining. This will reveal the progression of AD, along with skin inflammation, such as a thickening epidermis and/or infiltration of immune cells, including monocytes, neutrophils, macrophages, T cells, etc. Expression of inflammatory cytokines involved in AD will be identified in RNA (RT-PCR) and protein (ELISA) levels. The results from these investigations will culminate into a preliminary understanding of the way in which LCs contribute to AD development and progression.

UTILIZING CRYSTALLOGRAPHY TO FIND THE BINDING SITE OF ANTITUBERCULAR DRUGS

Presenter(s): Maude Antol
Biochemistry & Molecular Biology
Mentor(s): Sean Crosson (College of Natural Science)

DosS/DosR is a two-component regulatory system in which DosS, a heme-containing sensor histidine kinase, is regulated by oxygen binding to the heme cofactor. Upon phosphorylation, DosS transfers a phosphoryl group to DosR (1). DosR is a DNA-binding protein that controls the entry of Mycobacterium tuberculosis and other mycobacteria into a latent, dormant state (1). The dormant state refers to a physiologic state when Mycobacterium tuberculosis is able to resist antibiotics and the immune system. DosS is therefore a possible target for antimicrobial treatment of Tb. This research is aimed at elucidating the structural basis by which select drugs bind to DosS and function as a possible adjunct therapy to eliminate Mycobacterium tuberculosis reservoirs and shorten the length of therapy. My experiments are aimed at defining the exact binding site of experimental tuberculosis antibiotics. Through protein crystallography, we are working to image the drug bound to DosS so we can see exactly where it is bound to DosS and what conformational changes occur. There is spectroscopic data indicating that the binding site of these compounds is near the heme site, which is blocked when DosS is oxidized (1). To date, we have been able to successfully image DosS in its unstable, reduced form where a drug could be potentially bound. Our next steps are finding new methods of drug soaking to solve the structure(s) of the reduced DosS crystal while it is bound to experimental drug compounds. Finding this binding site will allow us to understand how DosS targeting drugs might be used to inhibit DosS and therefore decrease the pathogenicity of Mycobacterium tuberculosis. 1. Huiqing Zheng, John T. Williams, Bilal Aleiwi, Edmund Ellsworth, and Robert B. Abramovitch. ACS Chemical Biology 2020 15 (1), 52-62 DOI: 10.1021

CLONING AND ANALYZING NATIVE AND ENGINEERED GLDP1 PROMOTERS

Presenter(s): Rylee Sokoloski
Biochemistry & Molecular Biology
Mentor(s): Susanne Hoffmann-Benning (College of Natural Science)

The Glycine shuttle is a carbon concentrating pathway that is used to increase net CO2 incorporation by capturing, concentrating, and re- assimilating CO2 that was released through photorespiration; this process operates between the mesophyll and bundle-sheath cells. Within plants that undergo C3 photosynthesis both the mesophyll cells and the bundle-sheath cells contain the glycine decarboxylase complex (GDC) allowing the two cells to operate independently from one another as a result do not need to utilize the glycine shuttle pathway. However, in plants that are C3-C4 photosynthesis do not contain an active GDC in the mesophyll cell but is active within the bundle-sheath cells causing the generated glycine to be transported vis the glycine shuttle from the mesophyll cell into the bundle-sheath cell to be converted into serine and shuttled back to the mesophyll cell to change the serine into 3-PG to reenter CBB-cycle and repeat the process, C3-C4 photosynthesis relies on differential gene expression.

HETEROLOGOUS PRODUCTION OF PROTEINS INVOLVED IN CHLOROPLAST LIPID METABOLISM TO DETERMINE PHOSPHATIDIC ACID PHOSPHATASE ACTIVITY

Presenter(s): Ilayda Korkmaz
Biochemistry & Molecular Biology
Mentor(s): Christoph Benning (College of Natural Science), Ron Cook (College of Natural Science)

Monogalactosyldiacylglycerol (MGDG) and digalactosyldiacylglycerol (DGDG) make up around 80% of the lipids in the thylakoid membranes where photosynthesis takes place. Diacylglycerol (DAG) is the precursor of MGDG and DGDG; it is produced through the dephosphorylation of phosphatidic acid (PA). The enzyme that dephosphorylates PA in the plastid is unknown; therefore, the PA phosphatase (PAP) activity of various A. thaliana candidate proteins are being investigated through production in S. cerevisiae and E. coli, and PAP activity assays. The candidate proteins include predicted chloroplast lipid phosphate phosphatases LPPg, LPPe1, and LPPe2. Because a knockdown mutant of known acyltransferase ATS1 may have lower PAP activity, and a knockout mutant of predicted rhomboid protease RBL10 is deficient in the conversion of plastid PA to MGDG, these proteins are also being investigated as possible PAPs. Gene expression and protein extraction are being optimized for the aforementioned proteins in order to carry out PAP activity assays that will show which ones will catalyze PA dephosphorylation and produce DAG.

MODIFYING PSEUDOMONAS SYRINGAE PHAGE AS A MODEL FOR PLANT PATHOGEN BIOCONTROL

Presenter(s): Roksana Riddle
Biochemistry & Molecular Biology
Mentor(s): Bjoern Hamberger (College of Natural Science), Daniel Ducat (College of Natural Science), Masako Harada (College of Engineering), Michaela TerAvest (College of Natural Science)

The United States CDC estimates 2.8 million drug-resistant infections resulting in 35,000 deaths yearly as a result1. Pseudomonads are amongst the most resistant to antimicrobials, not only in clinical settings, but equally in plant systems like P. syringae4. P. syringae is a causative agent for multiple diseases including bacterial cankers and apical plant necrosis affecting nearly all major economical crops worldwide2,5,7. Despite the yearly rising numbers in drug-resistant infections, common treatments continue to include antimicrobial drugs4. Drug-resistant microbes have sparked renewed interest in bacteriophage use in plant infections. Bacteriophages, or phages, are natural predators of bacteria using them as a host to reproduce6,8. Due to phage's high-host specificity and ability to kill microbes efficiently, the use of phages as a plant biocontrol have increasingly been studied with the rise of drug-resistant microbes6,8. Although this is viable in vitro, application of phage on crops results in decreased phage viability as a result of exceedingly variable environmental conditions including UV and pH levels3. Our team has isolated two novel P. syringae DC3000 tomato pv. phages from the Red Cedar River and tomato plants. We aim to characterize these phage and test environmental tsensitivity for use as a biocontrol. We propose modifying the phage capsids through the novel CRISPY BRIP method to increase capsid rigidity. We will do so through the addition of spy tags on the capsid with variable spy catcher proteins such as GFP to increase capsid UV resistance, increasing protection against variable climates on the plant surface to increase phage viability.

UNDERSTANDING THE ROLE OF ENDOGENOUS DROSOPHILA TAU IN IN CIBO HUMAN TAU INDUCED NEUROTOXICITY

Presenter(s): John Henige
Biochemistry & Molecular Biology
Mentor(s): Min Kuo (College of Osteopathic Medicine), Sandhya Payankaulam (College of Human Medicine)

Alzheimer's Disease (AD) is a neurodegenerative disease lacking any cure or prevention. While AD affects over 30 million globally, the World Health Organization predicts rates will triple by 2050. A landmark attribute of AD is aggregation of amyloid beta plaques outside of the neurons and hyperphosphorylated tau inside the neurons. Studies indicate that abnormally phosphorylated human tau spreads through brain regions, triggering accumulation as neurofibrillary tangle. However, whether this process involves recruitment of endogenous tau is unclear. Uncovering how p-tau renders normal tau to form toxic fibrils may be the key to developing efficacious treatments and understanding AD pathology. To address this, we developed a novel in cibo Drosophila AD model by feeding flies with E. coli-induced tau or p-tau protein. Our results show that oral administration of tau/p-tau protein recapitulates AD pathology such as the late onset of disease, brain vacuolization indicative of neurodegeneration, loss of motor function, and decreased lifespan. Here, we test the hypothesis that in cibo tau/p-tau acts through endogenous tau to cause neurodegenerative phenotype. We used tau knock out flies (TKO) and treated both TKO and control flies with E. coli induced tau/p-tau proteins. The flies were then monitored for behavioral changes, signs of neurodegeneration, and changes in life span. Our findings shed light on the validity of the tau propagation hypothesis, and pave the way for future studies aimed to delineate mechanisms by which p-tau induced neurotoxicity.

INTERACTION OF LIPID DROPLET ASSOCIATED PROTEINS WITH PLANT MEMBRANES AND WAX ESTERS EXPLORED WITH MOLECULAR SIMULATION

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

Lipid droplet-associated proteins (LDAPs) are proteins that are found in lipid droplets and are essential for regulation of lipid droplets and help in stress-related processes. LDAPs have played a role in multiple stress responses, including drought, heat, and cold, along with regulating overall plant development. However, the interactions LDAPs make with other biomolecules within plants is still unknown. The LDAPs are postulated to be involved in wax ester transport, particularly in drought-tolerant plant species. In collaboration with researchers at the University of North Texas, we test through molecular simulations the interactions with two LDAPs and biological membranes. The simulations for LDAPs from Jojoba, which accumulates wax esters, and Arabidopsis, which does not, let us test if LDAP interacts with plant membranes and might be involved in wax ester trafficking.This was done by conducting molecular dynamics simulations, using CHARMM-GUI to construct our membrane models with the LDAP proteins placed above the membrane. These simulation systems were run using the molecular dynamics engine NAMD to animate the systems. The interaction and dynamics of LDAP together with plant membranes and wax esters were quantified with python-enabled VMD, tracking membrane thickness, protein stability, and protein-membrane contacts. Surprisingly, the Arabidopsis form of LDAP was found to have the most significant binding to our plant membrane models. While we are still investigating possible differences between these peripheral membrane proteins, we hope that further analysis will reveal strategies for how LDAPs contribute to drought and extreme temperature tolerance.

CDNA LIBRARY SYNTHESIS AND GENE CLONING TO STUDY PROTEIN-PROTEIN INTERACTIONS IN COVID-19

Presenter(s): Vasudha Nimmagadda
Biochemistry & Molecular Biology

Mentor(s): Masako Harada (College of Engineering)

Many patients with severe SARS-COV2 suffer from small and/or large blood clots due to a state of hypercoagulation. The SARS-COV2 virus activates proinflammatory cytokines and chemokines in an array of cell-signaling pathways which is thought to cause the clotting disorder. We suggest that one of the viral proteins, ORF8, directly affects the clotting system and vascular physiology. The secreted ORF8 protein has been shown to interact with 40+ host proteins, including, importantly, the IL17 receptor A (IL17RA) and two proteases, ADAM9 and ADAMTS1. Other ADAM/ADAMTS family members are known to regulate blood clotting and vascular endothelial cell function. Therefore, we hypothesize that the state of hypercoagulation in severe COVID-19 patients is not only the indirect effect of the inflammation and cytokine storm but a direct effect of ORF8 interacting with members of the ADAM/ADAMTS family.The objective of this project is therefore to create recombinant cDNA clones encoding members of the ADAM/ADAMTS family of proteases to analyze protein-protein interactions between them and the ORF8 protein. Our lab has previously created recombinant plasmids for ADAMTS1 and IL17RA. Currently, we are working on creating a similar plasmid for ADAM9 using a cDNA library as a template. To synthesize this we extracted RNA from the A431 cell line, which exhibits relatively high levels of ADAM9 expression. cDNA was synthesized from the RNA via a reverse transcriptase reaction. ADAM9 cDNA sequences were amplified by PCR and cloned into the expression vector by recombination cloning (SLiCE, seamless ligation cloning extract).

CULTIVATED TOMATO ASAT1-LIKE ENZYME EFFICIENCY IS IMPROVED BY SWAPPING RESIDUES FROM WILD TOMATO

Presenter(s): Rhiannon Stevens
Biochemistry & Molecular Biology
Mentor(s): Jaynee Hart (College of Natural Science), Robert Last (College of Natural Science)

The Solanaceae family of nightshades possess specific protective metabolites contributing to insect resistance. Wild tomato (Solanum pennillii, Sp) and cultivated tomato (Solanum lycopersicum, Sl) secrete protective acylsugars from their trichomes. Acylsugars containing glycosylated myo-inositol acylated with nC7-coA were recently discovered in the roots of cultivated tomato. The presumptive first step of acylsugar biosynthesis in roots is performed by the BAHD family enzyme AcylSugar Acyltransferase 1-Like (ASAT1L), which acylates myo-inositol with nC7-coA in vitro. Even though wild and cultivated tomato ASAT1L only differ by 18 amino acids, SpASAT1L is 57-fold more efficient in synthesizing these advantageous acylsugars. To determine whether the activity of SlASAT1L can be improved, we implemented targeted mutagenesis to swap residues from the wild to cultivated tomato. After swapping residues, 4 separate mutations in cultivated tomato were found to have a notable positive effect on enzyme activity: C38S, L125F, T396M, and V407L+M415I, though these mutation groups alone did not reach the level of activity of SpASAT1L. Considering potential additive effects, single mutant groups were used to make combinations of multi-order mutants. The SlASAT1L mutants were analyzed by enzyme assay and reverse phase Liquid Chromatography-Time of Flight-Mass

Spectrometry (LC-ToF-MS) to quantify their relative enzymatic activity. The best single mutant was C38S which produced 39-fold more acyl-inositol, while the best multi-order mutant C38S+V407L+M415I produced 64-fold more acyl-inositol compared to SlASAT1L. The introduced mutations to SlASAT1L have been successful in improving the performance of the enzyme, which sheds light on BAHD structure and function.

PFOA/PFOS INDUCES IRE1 ACTIVITY AND DNA DAMAGE

Presenter(s): Caleb Sandum, Elaina Gouin
Biochemistry & Molecular Biology
Mentor(s): Christina Chan (College of Engineering), Kevin Chen (College of Engineering)

Perfluorooctanoic acid and perfluorooctane sulfonate (PFOA and PFOS) are man-made chemicals found in many household cleaning products, drinking water, food, and packaging. They enter the environment from manufacturing facilities or metabolism in larger organisms. These chemicals degrade slowly in the environment and have been accumulating in the body. Evidence suggests high concentrations of PFOA and PFOS in liver cells induce endoplasmic reticulum (ER) stress. The activation of ER stress sensor proteins is an indispensable step in remedying cellular stresses. Cells adapt to ER stress by activating the unfolded protein response (UPR), an integrated signal transduction pathway mediated by three ER stress sensor proteins: inositol-requiring enzyme 1 (IRE1)-α, protein kinase R (PKR)-like ER kinase (PERK), and activating transcription factor 6 (ATF6) (2). Cells sense ER stress through these ER transmembrane proteins. UPR signaling coordinates the cellular response to stress by down-regulating protein translation, enhancing expression of ER chaperone proteins that promote protein refolding, and activating proteases involved in the degradation of misfolded proteins. When these adaptive processes are insufficient to attenuate ER stress, the UPR triggers apoptosis. Of particular interest to this project is IRE1α, a ubiquitously expressed serine-threonine kinase that plays crucial roles in the UPR. IRE1α is a type I transmembrane protein with an N-terminal luminal domain (LD) that acts as an ER stress sensor and a C-terminal cytosolic domain (CD) containing both protein Ser/Thr kinase and endoribonuclease activities. Under ER stress conditions, the LD of IRE1α dimerizes/oligomerizes in the lumen, promoting self-association of the protein. Dimerization/oligomerization facilitates trans-autophosphorylation and the activation of the RNase domain.

FLUORESCENCE MODELS OF METABOLIC STRESS IN ARPE-19 CELLS AND THEIR ROLE IN UNDERSTANDING DIABETIC RETINOPATHY PATHOGENESIS

Presenter(s): Jonas Padilla
Biochemistry & Molecular Biology
Mentor(s): Denis Proshlyakov (College of Natural Science)

Diabetic retinopathy (DR) is the leading cause of vision loss globally. Mitochondrial damage to retinal pigment epithelial cells (RPE) leads to degradation of the blood-retinal-barrier and subsequent histopathological effects of DR. Fluorescence spectroscopy of immortalized RPE cancer cells from human donors (ARPE-19), allows for in vitro modeling of metabolic stress responses. ARPE-19 cells are placed in our microfluidic device, allowing for fluorescence spectroscopic measurements of the cells to be taken while manipulating their chemical environment. We are able to alter redox states of fluorescent markers within the mitochondria of ARPE-19 cells using chemical stressors, yielding distinct changes in the fluorescence spectra of ARPE-19 cells that represent metabolic stress. We hypothesize that oxidative stress and respiratory inhibition via inhibition of mitochondrial complexes III and IV can be observed through characteristic changes in the fluorescence spectrum of live ARPE-19 cells. Potassium cyanide reversibly inhibits cellular respiration via complex IV of the electron transport chain and alters the redox state of autofluorescent coenzymes in the mitochondria, characteristically altering cellular fluorescence. Tumor necrosis factor-α causes irreversible inhibition of cellular respiration via mitochondrial complex III, providing an additional fluorescence model of inhibited respiration. Hydrogen peroxide exposure induces oxidative stress, which distinctively alters redox states of mitochondrial fluorescent markers and causes mitochondrial damage through increased reactive oxygen species production. ARPE-19 models of metabolic stress open the door to understanding the mechanism through which damage to RPE mitochondria occurs in early stages of DR, providing the groundwork for development of potential treatments, diagnosis, and prevention of DR.

STRUCTURAL AND BIOCHEMICAL ANALYSIS OF SGT2-GET4/5 COMPLEX THAT PLAYS A CRITICAL ROLE IN TAIL-ANCHORED PROTEIN BIOGENESIS

Presenter(s): Tuan Kiet Trinh
Biochemistry & Molecular Biology
Mentor(s): Hyojin Kim (College of Natural Science)

Tail-anchored (TAs) proteins belong to a diverse class of integral membrane proteins required for many important cellular processes including electron transport chain, vesicular traffic, and apoptosis. Mislocalized and aggregated TAs could lead to diabetes, cancer, and cardiovascular diseases. The most well-studied ER-targeting pathway for TAs is the yeast "Guided-entry of TA" (GET) pathway, which involves an intricate cascade of protein interactions. The current model suggests that the heterotetrametric Get42Get52 (Get4/5) complex facilitates capture of nascent TA by homodimer Sgt2 chaperone following by TA transfer to homodimer Get3. The spatial arrangements of these transport proteins protect the aggregation of hydrophobic transmembrane domains. However, the exact binding interface of Sgt2 and Get4/5 are not clearly understood. The goals of this study are to obtain structural information and to imply the mechanism of the Sgt2-Get4/5 heteroprotein complex assembly. We purified and biochemically characterized the Sgt2-Get4/5 complex following obtaining snapshots of the complex by cryo-electron microscopy. His-tagged Saccharomyces cerevisiae Sgt2 and Get4/5 were each successfully overexpressed in Escherichia coli using a T7 promoter expression system and purified using Ni-NTA affinity chromatography. Incubation of purified Sgt2 and Get4/5 led to a stable assembly of Sgt2-Get4/5 complex. By size-exclusion chromatography and multi-angle light scattering, we confirmed that Sgt2-Get4/5 preparation was relatively homogeneous, with well-established oligomeric states. Crosslinking helped to counteract structural heterogeneity for structural verification by Cryo-EM. This study add more clarity to the GET pathway and potentially guide the development of novel therapeutic agents to treat diseases caused by defects in TA biogenesis.

TEMPERATURES EFFECT ON COMPLEX BUFFER

Presenter(s): Jacob Rupprecht
Biochemistry & Molecular Biology
Mentor(s): Alyssa Vadovsky (College of Natural Science), Jason Bazil (College of Osteopathic Medicine)

Suspension buffers are necessary components of mitochondrial bioenergetic research. They are typically designed to include the major ions and osmotic support molecules present in the cytoplasm. Importantly, these buffers should be at physiological temperatures; however, many labs run experiments at room temperature. But changing the buffer temperature necessarily changes the pH. Thus, buffers should be pH'ed at the experimental temperatures to avoid changes in pH. This can be somewhat cumbersome, so we developed a theoretical model tested against empirical data on pH vs temperature for our most common buffers. The temperature of the hotplate was adjusted in increments of 5°C from 20 - 40°C, and the pH was recorded using a pH probe after temperature stabilization. The data was then used to validate a theoretical model that explains why binding constants, such as a proton, are influenced by temperature. The model confirms the expected drop in pH with temperature and will be a helpful tool for the lab in the future.

ELECTRODE MULTIPLEXED SENSING OF MONOAMINE NEUROTRANSMITTERS

Presenter(s): Abdallah Daha
Biochemistry & Molecular Biology
Mentor(s): Jinxing Li (College of Engineering), Joshua Labbe (College of Human Medicine)

With the emergence of soft implants targeting the central nervous system and the gut, stretchability, mobility, biocompatibility, and miniaturization of such electrodes and circuits have been a major focus for researchers in the last decade. The rapid technological change in this field provoked several startups to ignite the race of commercializing brain-computer interfaces as personal devices. The potential attainment of fully functional personalized implants in the next few years demands the implementation of creative applications and accurate systems that utilize the devices' features. One such application is real-time monitoring of the complex levels of neurotransmitters and detecting their chemical imbalances. Dopamine, Serotonin, and Melatonin are three neurotransmitters of interest that play a crucial role in both the brain and the gut. Their presence in lower concentrations compared to the normal is correlated with particular diseases and could impose health issues. Using an electrochemical analysis technique called cyclic voltammetry, the team aims to train a machine learning model that could predict these neurotransmitters' concentrations in the brain and the gut as low as 1uM. Conventional detection is inadequate, especially considering the variability in abundance and the presence of other chemicals in the organs, making it impossible for the human eye to interpret the data and predict how they intertwine. By accurately interpreting the complex cyclic voltammogram, the model will provide researchers with more insights into how neurotransmitter dysregulations contribute to diseases and brain disorders and will offer people a means of monitoring brain and gut health in the future.

INVESTIGATION OF THE MOLECULAR FOUNDATION OF ALZHEIMER'S DISEASE DEVELOPMENT

Presenter(s): Nic Lewis
Biochemistry & Molecular Biology
Mentor(s): Min Kuo (College of Osteopathic Medicine), Stacy Hovde (College of Natural Science)

Countless neurodegenerative disorders, such as Alzheimer's Disease (AD), are lacking in available treatments. While much AD research is focused on reducing accumulation of beta-amyloid plaques, mounting evidence suggests that aggregation of hyperphosphorylated tau (ptau) may be a better model of the molecular disease pathology. Tau is a protein necessary for structure and signaling of neurons in the brain. In pathological states, it can become abnormally phosphorylated and aggregate into cell-deleterious neurofibrillary tangles (NFTs). With evidence demonstrating correlation between the cognitive decline in AD patients and NFT density, understanding the behavior of ptau is critical. In our study, four isoforms of ptau were phosphorylated via two different kinases, overexpressed in E. coli, and purified. These eight samples were fractionated using SP cation chromatography, and these fractions were examined using in-vitro ThS aggregation and CCK8 cytotoxicity assays. Additionally, the activity of Apomorphine, a substance that is shown to inhibit ptau aggregation and cytotoxicity in vitro, was more extensively investigated.

FUNCTIONAL VALIDATION OF ISOPRENE SYNTHASE GENE ISPS IN SOYBEAN (GLYCINE MAX)

Presenter(s): Violet Lefrancois
Biochemistry & Molecular Biology
Mentor(s): Mohammad Mostofa (College of Natural Science), Thomas Sharkey (College of Natural Science)

Isoprene is the greatest contributor of biogenic hydrocarbons to the atmosphere. It is catalyzed by the conversion of dimethylallyl diphosphate (DMADP) to isoprene by isoprene synthase (ISPS). Based on a previous analysis of the soybean (Glycine max) genome, it was suggested that the plant no longer could emit isoprene gas. However, a recent re-assembly of the soybean genome and data following the production of isoprene due to leaves being wounded or burnt suggests that soybean contains an ISPS that produces isoprene under specific environmental conditions. In this study, I aim to validate the function of Glycine max isoprene synthase (GmISPS) by determining the cooperativity of DMADP concentrations and the production of isoprene. I will test this by designing a pET11a plasmid with the GmISPS and having it synthesized in a lab. The plasmid will be transformed into E. coli cells, then cultured to produce large amounts of the transformed cells. The GmISPS was then purified and isolated from the cell cultures. The protein will be tested by being placed in an airtight container with differing concentrations of DMADP and incubated. I will then test the air in the containers in a Fast Isoprene Sensor (FIS) to determine the amount of isoprene produced by the GmISPS at different concentrations. The positive control will be a known functioning ISPS. The negative control will not contain the isoprene synthase protein. This study will determine if there is a relationship between isoprene production in soybean and the concentration of DMADP in a cell.

MICROFLUIDIC RESPIROMETRY OF CAGED NON-ADHERENT CELLS AND MITOCHONDRIA

Presenter(s): Jeremiah Hutson
Biochemistry & Molecular Biology
Mentor(s): Denis Proshlyakov (College of Natural Science)

Mitochondrial dysfunction is a hallmark of metabolic diseases such as diabetes and its complications. Oxygen consumption rates are a key metric in assessing mitochondrial health due to their importance in energy generation through oxygen reduction. Microfluidic Respirometry (MfR) is a technique developed to mimic capillary flow for in vitro oxygen consumption measurements. MfR has shown effective in limiting sample demand and reproducing traditional methods for probing cellular responses. However, this approach is best suited for cells that readily adhere to substrates. Cell types involved in metabolic diseases, do not always adhere spontaneously and can move in suspension. This mobility behavior impedes MfR methods. As a result, these studies require large sample amounts. Similar considerations apply to isolated mitochondrial studies, in which these samples must maintain their metabolic functionality in suspension throughout experimentation. We offer a solution through "caging", involving the use of a semipermeable membranes to trap a sample. In this approach, essential solutes can diffuse through the membrane and interact with the sample, while waste products diffuse out, allowing a single sample to be monitored repeatedly. In this study, we show that we can cage non-adherent trypsinized ARPE-19, T cells and isolated mitochondria while measuring their oxygen consumption over a course of time. Additionally, we show that we can stimulate these samples with substrates and alter metabolism with inhibitors and uncouplers. Ultimately, this technique significantly reduces sample demand (≤ 2 μL), improves reproducibility, allows for repeat measurements on a single sample, and provides transient stimulation for non-adherent samples.

INVESTIGATING THE IMPACT OF GENETIC ESSENTIALISM ON STUDENT BELIEFS

Presenter(s): Sarah Okeke
Biochemistry & Molecular Biology
Mentor(s): Shahnaz Masani (Lyman Briggs College)

The way genetics is taught and how students understand the relationship between genetics and racial health disparities can potentially lead to beliefs that support race-based medicine. However, race-based medicine has been criticized for its implementation in healthcare systems, and these beliefs can also unintentionally promote genetic essentialism and determinism in students. The discussion of genetics in the context of race and health disparities can also affect students' ability to learn and reduce the prevalence of essentialism or deterministic thinking.

Therefore, this research aims to investigate how the wording and framing of genetic concepts impact students' learning, as well as how the use of race as a variable to explain differences in health and genetic outcomes affects student beliefs. By exploring these factors, the study seeks to shed light on the potential consequences of the way genetics is taught and discussed in classrooms which can help mitigate the negative effects of genetic essentialism and determinism on health outcomes and social inequality.

APPLICATION OF HYDROGELS TO TREAT DEEP VEIN THROMBOSIS AND PULMONARY EMBOLISM

Presenter(s): Isabella Rodrigues, Michael Ngatio
Biochemistry & Molecular Biology
Mentor(s): Jinxing Li (College of Engineering)

Thrombosis is a blood clot that forms in a vein or artery. These blood clots lower or stop blood flow and can cause ischemia, stroke, or other complications. Current treatments of thrombosis are chemical or mechanical. Chemical treatment of thrombosis includes the injection of anticoagulants, blood thinners. Anticoagulants inhibit coagulation factors in the blood, preventing the growth of blood clots or creation of new ones. This procedure is often used for very minor blood clots since anticoagulants are unable to break down existing blood clots and can only prevent the creation of future blood clots. Contrarily, mechanical treatment, thrombolytic therapy, involves inserting a catheter into a vein near the blood clot, inserting the catheter through the blood clot, isolating the blood clot from the rest of the blood vessel, then spinning the catheter in order to break the blood clot. About 10% of patients have improved health after the procedure. However, due to the invasive nature of this procedure, it is usually performed only when necessary as a means to avoid any complications from the procedure, most commonly internal bleeding. Hydrogels can remedy this problem by serving as a more invasive but lower risk method of treating thrombolysis. Hydrogels are known to be biocompatible, able to deliver drugs, and flexible, with these properties it is possible to synthesize a hydrogel that will not bring harm to the patient, deliver local thrombolytic medication to the site of occlusion, as well as flexible enough to travel to a blood clot in any part of the body. Hydrogels also serve as an easier way to treat thrombosis instead of the complex procedure of thrombolytic therapy.

CHARACTERIZATION OF A FEMALE SPECIFIC REDUCTASE IN CHC SYNTHESIS IN D. MELANOGASTER

Presenter(s): Taylor Hori
Biochemistry & Molecular Biology
Mentor(s): Henry Chung (College of Agriculture & Natural Resources), Zinan Wang (College of Agriculture & Natural Resources)

Animals possess sexually dimorphic traits that serve ecological functions and contribute to mating and reproductive success. The evolution of these traits can be controlled by a single gene or require multiple interacting genes to produce a phenotype. The cuticular hydrocarbons (CHCs), a lipid layer on the surface of insect bodies, are an example of sexually dimorphic traits that are also ecologically important. In Drosophila melanogaster, several CHCs are present only in females which function as pheromones, prevent water loss, and aid the insect in withstanding desiccation stress. The female CHCs in D. melanogaster, compared to males, have been shown to confer higher desiccation resistance, which could lead to increased reproductive success. The synthesis of female D. melanogaster CHCs requires multiple genes that form a pathway converting acetyl-CoA to CHCs. Two genes with female-specific expression, a desaturase (desatF) and an elongase (EloF), have been found to contribute to the CHC synthesis. However, a key step in this synthesis pathway, the use of a reductase to convert fatty acyl-CoA precursors into aldehydes, is missing. Previous studies identified a reductase gene, CG4020, that is only expressed in adult oenocytes of female D. melanogaster. We hypothesized CG4020 is a candidate gene for synthesizing female specific CHCs. In this study, we aimed to characterize the function of CG4020 in CHC synthesis in female D. melanogaster using oenocyte specific knockdown and overexpression experiments. Results of this study can help us understand how multiple genes interact with each other to produce dimorphic phenotypes that are ecologically significant.

EXPLORING THE KINETIC PROPERTIES AND POST-TRANSLATIONAL MODIFICATIONS OF PLASTIDIC PHOSPHOGLUCOISOMERASE FROM ARABIDOPSIS THALIANA

Presenter(s): Caleb Fisher
Biochemistry & Molecular Biology
Mentor(s): Thomas Sharkey (College of Natural Science)

The Calvin-Benson Cycle (CBC) uses chemical energy from the light-dependent reactions of photosynthesis to fix carbon dioxide into various sugar intermediates. Starch synthesis comes at a cost when fructose 6-phosphate, a key intermediate of the CBC, is isomerized to glucose 6-phosphate by phosphoglucoisomerase (PGI). Currently the mechanism of PGI's regulation is not fully understood but plastidic PGI has been found to be in disequilibrium to maintain the metabolic functions within cells. In addition, previous kinetic studies have yet to demonstrate that plastidic isoforms PGI follows the Briggs-Haldane relationship, a general model for enzymatic activity. The goal of the present work aimed to answer two questions: (i) Do both isoforms of PGI, in their native state, conform to the Briggs-Haldane relationship, and (ii) What is the role of post-translational modifications in regulating the activity of plastidic PGI? Up to now, we were able to design a construct of cytosolic and plastidic forms of PGI with a SUMO tag at the N-termini of each, which we were able to express, purify, and return to their natives state using proteolytic cleavage. With native PGI, we performed assays to measure activity and calculate key kinetic constants. We also utilized site-directed mutagenesis to generate phosphomimic variants of plastidic PGI, guided by phospho-proteomic data, to explore how phosphorylation sites affect its activity and stability.

EFFECTS OF ACYLSUGAR ACYLTRANSFERASE TRANSCRIPTION FACTORS ON REGULATION OF ACYLSUGAR PRODUCTION IN SOLANUM LYCOPERSICUM

Presenter(s): Chris Babcock
Biochemistry & Molecular Biology

Mentor(s): Rachel Kerwin (College of Natural Science)

Acylsugars are produced within the glandular trichomes of cultivated tomato (Solanum lycopersicum) leaves and function as natural insecticides. They are assembled from sucrose and acyl chains by four distinct AcylSugar AcylTransferase (ASAT) enzymes, the genes of which are only expressed in trichomes. Gene expression is regulated by proteins called transcription factors that bind to specific DNA sequences upstream of a gene's coding region to activate or repress transcription. The goal of this study is to identify transcription factors that regulate acylsugar biosynthesis. Five lines of S. lycopersicum plants with CRISPR/Cas9-mediated loss-of-function, or "knockout", mutations among four candidate acylsugar transcription factors were studied. We hypothesized that if a transcription factor is an activator for an ASAT enzyme, then when it is knocked out, acylsugar abundance will decrease, and if it is a repressor, acylsugar abundance will increase. Transformed plants were genotyped at their target genes using Sanger sequencing to verify loss-of-function mutations. Liquid chromatography mass spectroscopy was used to look for alterations in the types and amounts of acylsugars extracted from the trichomes of each plant. Two genes, 03g098200 and 06g009710, were found to significantly increase total acylsugar content when knocked out. This research helps in building a better understanding of how plants in the Solanaceae family are able to choose where, how, and when special metabolites such as acylsugars are produced, which may prove useful for genetically modifying crops to improve pest resistance or crop yield.

MESOPOROUS SELF-ASSEMBLED NANOMAGNETS AS DELIVERY AGENTS AND HIGH QUALITY TRACERS FOR MAGNETIC PARTICLE IMAING

Presenter(s): Jessi Rodriguez
Biochemistry & Molecular Biology
Mentor(s): Ping Wang (College of Human Medicine), Saumya Nigam (College of Human Medicine)

Superparamagnetic iron oxide nanoparticles (SPIONs) have been utilized in a variety of biomedical applications including, but not limited to, drug delivery, diagnostic imaging, biosensing, biolabeling etc. While being in nanoscale dimensions, they can be fabricated into different structural morphologies which directly affects their physico-chemical properties. This further emphasizes their tailored use for applications in nanomedicine. To this end, we hypothesize that the self-assembled ordered architectures would not only increase surface area within its pores for hosting therapeutic mRNA but would also affect their imaging capabilities for magnetic particle imaging (MPI). In this study, we synthesized porous self-assemblies of SPIONs using a simple solvothermal method. These nanoassemblies were characterized using X-ray diffraction, transmission electron microscopy, magnetometry, porosity and surface area measurements, optical emission spectroscopy, dynamic light scattering, and zeta potential. Next, the surface of these nanoassemblies were coated with a peptidic polymer, poly-L-lysine. This not only imparts enhanced aqueous stability but also generates a cationic surface which would facilitate its complexation with negatively charged mRNA. Furthermore, agarose phantoms of varying iron concentrations of these nanoassemblies were evaluated for their MPI performances. When compared to commercial iron oxide (Vivotrax?), these nanoassemblies exhibited significant enhancement in their signal intensities. We are currently evaluating their cellular uptake and biocompatibility with the 293T cell line. Our next step would be to evaluate their efficacy to host luciferase mRNA within their cavities. This work would extend in evaluating their delivery performances to the lungs in a small animal model in conjunction with non-invasive MPI diagnostics.

SEX DETERMINATION IN PARAMORMYROPS KINGSLEAYE

Presenter(s): Christian Roberts
Biochemistry & Molecular Biology
Mentor(s): Jason Gallant (College of Natural Science)

Does Paramormyrops kingsleaye use the amhr2b gene to determine its sex? P. kingsleaye is a mormyrid fish found in Bambomo Creek, Gabon. The goal of my labs research is to confirm that the amhr2b gene is responsible for determining the sex of P. kingsleaye, and possibly other mormyrid species. This research is ongoing, and the data collected so far is showing promising results. More work must be done to confirm if the gene determines the sex, but the possibilities after could be crucial for post-hoc determination of organism sex for genomic and transcriptomic work.

UNLOCKING THE POTENTIAL OF MICROROBOTS IN MEDICINE: A BREAKTHROUGH IN IN VIVO AND IN VITRO TRACKING AND IMAGING

Presenter(s): Kevin Mozel
Biochemistry & Molecular Biology
Mentor(s): Jinxing Li (College of Engineering)

Microrobots have the potential to revolutionize medicals fields such as drug delivery, disease diagnostics and minimally invasive surgeries. However, there is a significant challenge that must be addressed before they can safely be used in living organisms. The main problem is that lack of ability to accurate image and locate microrobots in real time within the body. This research proposes a unique approach for imaging and tracking microrobots in vivo and in vitro using a combination of magnetic particle imaging (MPI), computed tomography (CT) and electrical properties such as resistance. The microrobot design presented in this study utilizes superparamagnetic nanoparticles to make them detectable by MPI and CT, enabling non-invasive monitoring of the microrobot's position and movement. This technique holds significant promise for medical and biological research, opening new opportunities in these fields.

METALLIC SMELL OF THE DORM WATER

Presenter(s): Ziang Gu
Biochemistry & Molecular Biology
Mentor(s): Carl Boehlert (College of Engineering)

Some students at MSU have reported a metallic smell of the water from their dorm. Based on the knowledge I have learned about Scanning Electron Microscopy and Energy Dispersive Spectroscopy in the Honors Research Seminar, I think it would be reasonable to use Scanning Electron Microscopy to research the origin of the Metallic smell. I will collect water different buildings on campus (old and new) such as Engineering, Natural Science, Case Hall, and STEM buildings. By directly looking at the water sample using Scanning Electron Microscopy, I would not have high-quality images that I could use to make the comparison.Based on the characteristics of Scanning Electron Microscopy, I need to evaporate the water to get the sample and collect images to make a comparison. I will organize images and results found into a poster and present it.

FUNCTIONAL VALIDATION OF HALO-TAGGED PROTEINS USING GENOME EDITING

Presenter(s): Paul Szczerba
Biochemistry & Molecular Biology
Mentor(s): Jens Schmidt (College of Human Medicine)

The genomes of all organisms acquire damage to their DNA every day. If DNA damage is not repaired, it may lead to a variety of human diseases, including cancer. In order to maintain genomic integrity, all organisms have evolved many proteins that are specifically dedicated to repairing DNA. Understanding the basic mechanisms underlying how cells accurately maintain their genomes is critically important for human health and may unlock new treatment and prevention possibilities in the medical field. The proteins in this study are involved in one of two common repair pathways including homologous recombination (HR) and non-homologous end joining (NHEJ). HR and NHEJ are the most common pathways employed by human cells to facilitate the repair of double-stranded breaks. If cells are unable to repair their DNA, the cell will often undergo apoptosis. Therefore, the survival of cells is indicative of successful repair and furthermore the functionality of the Halo-Tagged proteins. The colony survival phenotype for wildtype repair proteins in comparison with their Halo-Tagged counterparts will demonstrate their functionality in the repair of DNA double-stranded breaks. The Schmidt lab uses single-molecule imaging to observe the activity of DNA damage response proteins in living human cells. To enable imaging, HaloTags can be inserted into the genome of human cancer cells using CRISPR-Cas genome editing. Following insertion, it is important to validate that it is present in the genome. Polymerase chain reactions and agarose gel electrophoresis are used to confirm results.

IMPACT OF INFANT FORMULA EXPOSURE ON HUMAN MILK OLIGOSACCHARIDE METABOLIZING GENE REPERTOIRES IN STOOL BACTERIAL COMMUNITIES OF HUMAN INFANTS AT ONE MONTH OF AGE

Presenter(s): Katrina Liang
Biochemistry & Molecular Biology
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. Breast milk offers a balance of nutrients for the infant, which contains bioactive ingredients such as hormones, cytokines, leukocytes, immunoglobulins, and lactoferrin. Human milk oligosaccharides (HMOs), one of the highly concentrated bioactive factors in human milk, are polymers of simple sugars that contribute to the development of the infant's microbiota. By acting via various mechanisms, they protect against infections (pathogens) and improve brain development. The most abundant HMO in human milk is 2'-FL (2'-Fucosyllactose). Infant formula is a substitute method of feeding, which can provide the necessary nutrients. Currently, some infant formula includes one or more HMOs, though formulas still lack the other bioactive ingredients in human milk. 2'-FL has been synthesized and shown to be structurally identical to the 2'-FL in human milk. The objective of the study was to screen specific HMO-metabolizing genes in genomic DNA of 1-month infant stool using qPCR (quantitative real-time PCR). Then, using that data and information about infant formula intake, we will evaluate the effects of different infant formulas on the presence and abundance of HMOs metabolizing genes in 1-month infant stool. Future studies of infant formula and microbial genes of the gut microbiota are needed to fully understand the impact of gut microbes on infant development.

BUSINESS

AUTHENTIC VS. IMITATIVE SUSTAINABLE TECH COMPANIES: DO INVESTORS CARE?

Presenter(s): Allyson Tishler, Emily Mason
Business
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

As technology continues to develop and become more indispensable in everyday life, we believe it is of utmost importance that technology companies make sustainable decisions and maintain a healthy environment for all. Our project seeks to determine the superiority of investing in authentic sustainable tech companies compared to imitative sustainable tech companies. Out of a group of 30 tech companies that have made public sustainability goals, 15 have recent low carbon emissions, and the other 15 have recent high carbon emissions, thus causing a standard separating these companies into authentic and imitative. $2 million was evenly invested between the two groups using a stock portfolio simulation called Stocktrak. Stocktrak allows a comparison of risks and returns of each portfolio both to each other and to the S&P 500. In this presentation, data compiled in Microsoft Excel will display a statistical analysis of how the S&P 500 and the two sets of technology companies compare to one another. This project aims to measure whether the stock market values companies that follow through on their sustainability goals. Additionally, this project investigates what effect public opinion has on the stock market regarding sustainability and how investors prioritize the authenticity of tech companies' sustainable goals. Both sets of tech companies are expected to outperform the S&P 500 because the tech industry is rapidly growing. More so, it is hypothesized that the imitative tech companies will perform slightly better because most investors value market performance over truthful sustainability.

SUPPLY AND DEMAND OF LITHIUM AND HOW IT IMPACTS THE SUPPLY CHAIN IN THE SOLAR POWER INDUSTRY

Presenter(s): Celeste Tinsley, Olivia Northrup
Business
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

Sustainable finance focuses on investment decisions that take into account the environmental, social, and governance (ESG) factors of an economic activity or project. Sustainable finance is becoming increasingly important as climate and environmental issues arise, and corporate action becomes more necessary. Environmentally responsible stock portfolios propel the market into more sustainable practices and encourage corporations to move toward sustainable actions. The design of our research is to simulate two stock portfolios focused on sustainable investments in (i) lithium mining companies and (ii) solar energy companies. Lithium-ion is a clean source of energy that provides functionality to electric cars, iPhone, batteries, and energy storage for various forms of renewable energy sources. Among renewable energy sources, solar energy is one of the most prevalent. One portfolio is invested in 13 companies in the lithium-ion industry. The other portfolio is invested in 15 solar power companies that use lithium-ion batteries. We collected daily portfolio data over a period of six months and compared it to the S&P 500 daily data as a benchmark. We analyzed market risk, average daily return and total daily risk. As Lithium-ion is a raw material used in the manufacturing of solar panels, it is an essential participant in the supply chain of solar panel corporations. Our goal is to evaluate the effects of the lithium-ion battery industry as suppliers to consumers of lithium, such as solar energy companies, and how the supply chain between the two industries affects their stock performance.

PROMOTING SUSTAINABILITY THROUGH STOCK INVESTMENT: A STUDY OF SUSTAINABLE AGRICULTURE AND CARBON NEUTRAL LOGISTICS

Presenter(s): Katerina Skarakis, Shubham Aggarwal
Business
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

Sustainable finance integrates environmental, social, and governance (ESG) factors into financial decision-making. From an environmentalist perspective, sustainable finance is necessary because it directs capital towards projects and companies that positively impact the planet, such as renewable energy, energy efficiency, and sustainable agriculture. According to estimates from the Intergovernmental Panel on Climate Change (IPCC), the livestock production and shipping industries combined are responsible for around a quarter of global greenhouse gas emissions. As the most prominent industries contributing to the negative impacts of climate change, livestock production and shipping are also the industries with the most significant potential to curb the ongoing climate crisis. For our research, we built two portfolios in the agriculture sector, particularly alternative proteins, with 15 companies, and the transportation sector, with 16 companies. All the companies in our portfolios are considered sustainable or follow sustainable practices. We will be calculating the daily risk and return from these portfolios. Further, we will measure the performance of these portfolios and compare the results with non-sustainable companies' stock indexes. Our research aims to understand how the stock market values investments that promote sustainable development and address critical global challenges such as climate change. We want to show that stock ownership in the right companies can be profitable and impact the economy by generating a positive ripple effect for other sectors and markets. We want to show that making the right stock investment decisions can help us achieve our sustainability goal much sooner.

CAN GREEN ETFS ATTRACT INVESTORS INTO MOVING TOWARDS SUSTAINABLE INVESTING?

Presenter(s): Mark McCormick, Sean Egan
Business
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

Sustainability will become more important for investors going forward as the world becomes increasingly environmentally conscious. Exchange Traded Funds (ETFs) with an environmental outlook have been instrumental in giving investors an option for more sustainable investing. We would like to prove that sustainable investing via green ETFs offers higher rewards when compared to the S&P500 and the S&P500's sustainability benchmark ETF. We use the website Stocktrak to simulate two $1M portfolios. One portfolio focuses on thematic ETFs (ETFs around one specific sustainability theme such as wind power). The other portfolio focuses on broad ETFs (ETFs that broadly invest in clean energy and sustainability). We make this distinction to see which portfolio will be subject to more significant price fluctuations. We are concerned about price fluctuations as it will mean that one portfolio is riskier than the other. We also selected ETFs for our research that has similar expense ratios with an average expense ratio of 0.62. As an ETF's expense ratio directly affects its overall return, maintaining a similar ratio allows us to ignore this effect in our analysis. We also avoid ETFs that have even a small investment in oil or coal. We believe that a green ETF that contains even one oil/coal investment is in conflict with its "green" title because those investments do not encompass the values that characterize green companies. Over five months, both portfolios' daily performances will be compared to one another and to their benchmarks.

IS THE ESG-SCORE JUST ABOUT THE E, OR DO THE S AND G COMPONENTS ALSO MATTER TO INVESTORS?

Presenter(s): Nik Gebler, Ryan Kurrie
Business
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

Sustainability is often associated with the environment and how to sustain it for future generations. For example, stock market investors tend to believe that sustainable finance means investing in environmentally friendly companies. However, the environment is only one of the three components of sustainability measured by the Environmental, Social, and Governance (ESG) Score. By relying on an ESG score, investors can select companies that place a higher value on sustainability and make noticeable progress toward a circular economy, i.e., a process that eliminates the production of waste. In our research, we use StockTrak, a stock market simulation, to build and manage two $1,000,000 portfolios over a period of 4 months. One portfolio focuses on companies with high ESG scores while the other portfolio includes companies with moderate to low ESG scores. While almost all the selected companies have a high environmental (E) score through the practice of circular economy, our research is more interested in the chosen companies' social (S) and governance (G) scores. The two portfolios differ in terms of S and G scores. Our goal is to determine whether the two portfolios perform differently due to the fact that one has higher governance and social scores than the other. In this presentation, we will outline how the two portfolios compare in risk and returns and highlight whether investors are also influenced by (S) and (G) factors.

AN ASSESSMENT OF HOW NET-ZERO IS VALUED IN THE STOCK MARKET

Presenter(s): Rania Rafiq, Ruya Antisdel
Business
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

With the recent spotlight on the pharmaceutical sector during COVID-19, their role in sustainability was looked at with great interest. We believe that the pharmaceutical industry carries a high degree of social responsibility. Most pharmaceutical companies are progressing towards reaching a net-zero status by the year 2050. Reaching net zero requires a company to balance the greenhouse emissions being produced to obtain a carbon-neutral status. In the research being conducted, we compare a focused portfolio that solely consists of pharmaceutical companies that claim to be reaching a future net zero status within the next twenty to thirty years, with a portfolio invested in non-pharmaceutical companies that have attained or will reach net zero status in the short term. The comparison portfolio is invested in the sustainable energy sector which consists of companies who produce products using wind, solar, and other renewable energy sources. $1 million dollars is invested in each portfolio using a simulation platform, Stock Trak. The S&P 500 index is used as a baseline to compare performance. Our goal is to observe the signals the stock market will produce and how our portfolio comparison will shed light on whether investors trust that pharmaceutical companies will make progress towards their long term goals and, therefore, choose to invest in such companies. We hope the pharmaceutical industry follows through on their sustainability goals by comparing the portfolio to sustainability metrics and determine if there is a relationship between attractive market perfromance and a net zero behavior.

GOING GREEN TAKES TIME! A TREND ANALYSIS OF LEED CERTIFIED HOTEL DEVELOPMENTS IN THE UNITED STATES

Presenter(s): Live Cannella
Business
Mentor(s): Mi Ran Kim (Eli Broad College of Business)

Sustainability has been a topic of conversation for decades, and will continue to be in the coming years. As a high carbon-producing industry, hospitality businesses have a responsibility to be at the forefront of green technology and environmentally friendly practices. The first LEED platinum building opened in 2001 and the first LEED certified hotel opened 6 years later in 2007. LEED certifications were established to highlight leaders in the industry that are setting the right example for the next generation of property developments or renovations. Ecotourism is growing in popularity and there is a generation of tourists that are demanding greener behavior from hotels and hospitality companies. Given that guest perceptions of a business that incorporates green initiatives are either indifferent or positively impacted, there are few drawbacks when considering customer responses. Over the past 20 years, there have been hundreds of hotels that earned various tiers of LEED certifications, opening an opportunity for exploration regarding when, why, and where these properties are becoming certified. This review will be the first of its kind to attribute over two decades of sustainable hotel development to manager and consumer behavior.

LINGUISTIC MARKERS OF DEMOGRAPHY IN CEO ANNOUNCEMENTS

Presenter(s): Priyanka Sharma
Business
Mentor(s): Quinetta Connally (Eli Broad College of Business)

Research has revealed that the announcements of top executive appointments, particularly those of CEOs, impact investors' evaluation of firms. Yet, with women and racial minorities representing less than 10% of the CEOs within S&P 500 companies, evidence regarding investors' specific reactions has been equivocal. In particular, market reactions to CEO announcements vary depending on the demographics of the incoming CEO, with white males typically drawing the most favorable reactions among investors. While existing research attributes this observed pattern of market reactions to stereotypes and associated biases among investors, we propose the content of CEO announcement to be alternate exploratory mechanism. We hypothesized that the sentiments of the CEO announcements for members of underrepresented groups would be more negative and subsequently, generate more negative market perceptions reactions. To test our general hypothesis, we manipulated the gender (male, female) and nationality (US, non-US) of CEOs across various announcements and included two neutral conditions for each manipulation. The results showed that respondents perceived women CEOs to be less qualified to lead the company and companies lead by women CEOs to be seen as less attractive and riskier investments. In contrast, respondents perceived non-US CEOs to be more qualified and ideal candidates for the position and reported greater confidence in their ability to lead the company and those companies to be less risky and more attractive investments. We discuss the implications of our findings for corporate governance research and practice.

CELL BIOLOGY, GENETICS, & GENOMICS

THE ROLE OF AUREOCHROME BLUE LIGHT PHOTORECEPTOR PROTEINS IN NANNOCHLOROPSIS

Presenter(s): Allen Trevizo
Cell Biology, Genetics & Genomics
Mentor(s): Eva Farre Prokosch (College of Natural Science)

Marine environments are enriched in blue light due to the fact that longer wavelengths can't reach deeper levels in the ocean. Light input can act at different levels regulating a wide range of physiological responses. Stramenopiles are a diverse group of secondary endosymbionts whose plastids originated from red algae. Aureochromes are stramenopile-specific proteins able to sense blue light that contain a light-oxygen-voltage-sensing domain (LOV) that associates with a flavin mononucleotide and a basic leucine zipper DNA-binding motif allowing Aureochromes to act as blue light-regulated transcription factors by associating with an E-box like motif. The objective of my project is to create the constructs necessary to investigate the expression of Aureochrome proteins through the generation of transgenic tagged lines in Nannochloropsis salina. Thus far, I have attempted entry cloning the whole 'mini gene' and coding sequences of the three aureochrome proteins present in Nannochloropsis, as well as constructing the destination vectors. However, through attempting to create these constructs, I learned: the reasoning of molecular biology methods, how to research methods and topics through literature, the troubleshooting of molecular biology methods, the process in optimizing my own molecular methods, and the idea that molecular methods are overall more adaptable than initially thought. The constructs generated will be used to investigate the protein expression dynamics of the three N. salina Aureochromes under different environmental conditions. Furthermore, a mathematical model will be deciphered in order to explain light induced protein levels and light activation of proteins in hopes of attaining control of the process.

GUT MICROBES IMPACT ON ANXIETY, MOOD CHANGES,

Presenter(s): Bian Almjareesh
Cell Biology, Genetics & Genomics
Mentor(s): Zachary Blount (College of Natural Science)

Gut microbes, also known as gut bacteria or gut flora, refer to the trillions of microorganisms that live in the digestive tract. These microorganisms play a vital role in maintaining a healthy digestive system, and communication with the nervous and immune system, as well as overall health and well-being. They help to break down food, produce vitamins, and regulate the immune system. Dysbiosis, or an imbalance in the gut microbiome, has been linked to various health conditions such as anxiety, Mood, and Depression.

NOVEL DETERMINANT OF INTRINSICALLY CHEMORESISTANT ACUTE MYELOID LEUKEMIA

Presenter(s): Tam Vo Do Gia
Cell Biology, Genetics & Genomics
Mentor(s): Adriana Ponton Almodovar (College of Human Medicine), Sachi Horibata (College of Human Medicine)

Acute myeloid leukemia is a lethal heterogeneous and for decades, the standard frontline treatment for this disease has been 7+3 induction chemotherapy (cytarabine for 7 days followed by anthracycline for 3 days). However, up to 40% of the patients developed refractory disease after up to two cycles of frontline treatment, which calls for a better understanding of the disease to develop a new standard treatment. Previous transcriptomics studies from our lab of 154 treatment naïve AML patients identified four novel genes potentially involved in intrinsic resistance to induction chemotherapy: GUSB, ALDH3B1, AMOT, and RAB32. Therefore, it is important to study the role of these genes in causing refractory disease in AML patients. In this project, I was assigned to investigate the expression of RAB32 will be modified in an AML cell line, which can be confirmed with qPCR and protein assays. Then, the cells will be exposed to cytarabine and anthracycline following the standard treatment, and the survival rate of the cells will be analyzed and compare with the control cell line to determine the correlation between the presence of the target and the resistance to standard chemotherapy.

INTEGRATING MICROBIAL, GENOMIC, GEOLOGIC AND ACTIVITY DATA TO DESCRIBE MICROBIAL ACTIVITY IN 20 M DEEP LOESS SOIL

Presenter(s): Hansen Qian, Shannon Carraway
Cell Biology, Genetics & Genomics
Mentor(s): James Tiedje (College of Agriculture & Natural Resources), John Quensen (College of Agriculture & Natural Resources)

During the Wisconsin Glacial Episode 75,000 to 11,000 years ago, western Iowa's Loess Hills were formed by wind deposits of silt sized particles, with depth reflecting the age of the deposit. Two warmer periods 50,000 and 30,000 years ago allowed vegetation to return but these soils, termed paleosols, were subsequently buried by later deposits. Our Iowa partners drilled soil cores to 75-foot depth at two Iowa sites, Loess Hills State Forest and Hitchcock Nature Center and we determined the soil chemistry, microbial populations and their activity at different depths. At only 2 feet beneath the surface, organic soluble carbon becomes scarce, thus selecting for starvation resilience in local microbes. It is challenging to characterize these microbial communities through standard culturing methods as they are adapted to grow with such low organic carbon. The soils below the surface that were not paleosols had approximately 6350-76600 CFU/g, while the paleosols layers 98000 and 138000 CFU/g. These deep microbes immediately metabolized 14C-glucose to 14CO2 suggesting they are not dormant. From genome sequence and binning data, a novel phylum, GAL15, was found to be a dominant taxa in these deep soils, and completely different from native surface soil ecology at 0-20cm.

MEASURING THE GENETIC DIVERSITY OF GREAT LAKES BURBOT USING MICROSATELLITE GENOTYPING AND MITOCHONDRIAL DNA ANALYSIS

Presenter(s): Grant Bruninga
Cell Biology, Genetics & Genomics
Mentor(s): Jeannette Kanefsky (College of Agriculture & Natural Resources), Kim Scribner (College of Agriculture & Natural Resources)

In recent years, many fish species in the Great Lakes have experienced considerable declines in population abundance and distribution. Cold-water adapted fish species are particularly vulnerable to population declines due to rapidly warming waters in an era of rampant climate change and variability. Burbot (Lota lota) is a fish species of conservation and management concern because of its reliance on cold water to survive and reproduce. Microsatellite genotyping of 10 disomic loci and control region mitochondrial DNA sequences were collected and analyzed to describe the degree of reproductive isolation between populations of burbot in Lake Huron, Lake Michigan, and Lake Superior as a function of lake basin and geographic distance, and to understand the historic colonization of burbot into the Great Lakes following deglaciation in the northern United States. Data will be combined with previously collected data from 4 regions of Lake Michigan along the western coast of the state of Michigan. We hypothesize that burbot of different population refugia migrated and settled into different regions in the Great Lakes and locally interbreeded. Genetic results characterizing spatial variation in levels of diversity and degree of genetic distinction among populations in different geographic locations will be evaluated. Analyses showing highly differentiated populations of burbot will demonstrate to managers how to appropriately target areas of its habitat range where conservation and management resources should be allocated to support species recovery most effectively.

ROLE OF MIRNA-10B IN TREATMENT RESISTANCE OF PANCREATIC CANCER

Presenter(s): Sudhakar Samuel
Cell Biology, Genetics & Genomics
Mentor(s): Katarzyna Kempinska (College of Human Medicine), Lorenzo Sempere (College of Human Medicine)

The goal of our research project was to investigate the role of microRNAs (miRNAs) in mice models of pancreatic cancer. MicroRNAs play a crucial role in gene expression and regulate a large part of the mammalian genome. MicroRNAs are also involved in the initiation and progression of human cancers, where they can behave as either oncogenes or tumor suppressors. We specifically examined miRNA-10b as it is already known to be overexpressed in several cancer types, including breast and lung cancer. We utilize the 10bKPC mouse model, which has been genetically engineered to have a knockout of miRNA-10b. We are able to analyze the effect of miRNA-10b on pancreatic cancer by measuring the volume and growth of the tumor(s) over time and comparing the results to a control group of mice with miRNA-10b. We are able to visualize the mice through the use of a multi-mouse MRI, and a program called Horos, in order to view the MRI scans and digitally measure the volume of the tumor. Of our cohort, some of the mice are treated with Gemcitabine, which is the current standard of care for pancreatic cancer, while others were left untreated. Our current results indicate that the 10bKPC mice are living longer than the control mice, indicating that expression of miRNA-10b leads to a more aggressive and severe form of pancreatic cancer. Among the 10bKPC mice, the mice treated with Gemcitabine are living longer, showing that the treatment is effective in slowing the progression of the disease.

MSU SCIREVIEW

Presenter(s): Leah Meppelink, Olivia Wheeler
Cell Biology, Genetics & Genomics
Mentor(s): Geraldine Zeldes (College of Communication Arts Sciences)

MSU SciReview is a student run science journal and club that teaches members science literacy. Members are encouraged to write a literature review about their chosen topic to be published in our journal which is reviewed by both peers and a professor editorial board. By improving science literacy in MSU students, we facilitate educated decision making and curiosity in science.

INTRINSIC DIFFERENCES BETWEEN CENTRAL AND PERIPHERAL NERVOUS SYSTEM NEURITE OUTGROWTH

Presenter(s): Anna Grodsky, Jenny Dibley, Malhar Amin
Cell Biology, Genetics & Genomics
Mentor(s): Kyle Miller (College of Natural Science)

Extensive work on peripheral nervous system (PNS) neurite elongation has revealed that axonal materials flow anterogradely during neurite growth, and that this anterograde flow drives growth cone (GC) advance. In this study, we investigated the directionality of material flow in growing central nervous system (CNS) neurites, with a specific focus on mitochondria, ER, beads bound to the plasma membrane, and actin. We found, counterintuitively, that the majority of CNS neurites undergo retrograde flow, implying that as GCs advance, axonal materials move in the opposite direction. This phenomenon raises critical questions about the mechanics of axonal cytoskeletal forces and how those forces drive growth.

IDENTIFYING BIOMARKER CD44 IN A PATIENT-DERIVED HEPATOCELLULAR CARCINOMA CELL LINE

Presenter(s): Lillian Young
Cell Biology, Genetics & Genomics
Mentor(s): Shuo Feng (University of Michigan)

Hepatocellular carcinoma (HCC) is often detected in advanced stages when the tumor is unresectable and bears poor prognosis for patients. Limited diagnostic options and disease severity has placed HCC as the 3rd leading cause of cancer-related death globally with a 5 year survival rate of only 19.6% (Sung et al., 2021). New diagnostic methods are urgently needed to improve this global health crisis. Malignant hepatocytes overexpress the membrane biomarker cluster of differentiation 44 (CD44), which can be utilized as a binding target for image guided surgery and early cancer detection methods. My research goal was to identify biomarker CD44 in a novel cell line. First, A HCC cell line was derived from a liver resection sample provided by the University of Michigan Hospital. The cell line was then isolated in a subcutaneous PDX mouse model by other lab members. After isolating the cell line, CD44 expression was knocked down using siRNA transfection to eliminate false positive results. Immunocytochemistry and confocal imaging was performed to locate, identify, and quantify CD44 expression in individual cell layers. Western blot was also utilized to quantify CD44 expression and ensure proper siRNA knockdown. The existence of biomarker CD44 was proven and its expression quantified in this novel cell line. By doing this, the Wang Lab can confidently use this cell line for the development of their multimer peptide which binds biomarkers like CD44 and is utilized for HCC therapeutics and diagnostic methods by physicians.

THE ROLE OF TPPP3 IN OVARIAN TUMOR GROWTH

Presenter(s): Samuel Sanderson
Cell Biology, Genetics & Genomics
Mentor(s): Sachi Horibata (College of Human Medicine)

Ovarian cancer remains the deadliest gynecological disease in the United States today. One of the primary reasons for this is an increased rate of recurrence over 5 years post-chemotherapeutic treatment. Recently, we found that the Tubulin Polymerization Promoting Protein 3 gene (TPPP3) plays a role in cellular proliferation in ovarian cancer. To investigate this relationship in-vivo, several mice were injected with ovarian cancer cells overexpressing TPPP3 with the experimental group having the TPPP3 gene knocked out. Over 3 weeks, the resulting tumors were weighed, measured, and eventually dissected for staining via immunohistochemistry. We found that TPPP3 knockout results in reduced tumor growth, suggesting the involvement of TPPP3 in proliferation.

CHARACTERIZATION OF NEW CANCER DRIVER GENES IN LIVER CANCERS.

Presenter(s): Mitanshu Pandya
Cell Biology, Genetics & Genomics
Mentor(s): Christoph Adami (College of Natural Science), Yueqi Zhang (College of Natural Science)

Cumulating evidence suggests that diverse driver genescontribute to the initiation and progression of cancer. By learning molecular and cell biology methods for cancer research and techniques for mouse genetics. Using these techniques to characterize a newly identified cancer driver gene, called HCN3, in liver cancer development. This work should contribute to the identification a novel molecular mechanism underlying liver cancer development.

COMPARISONS WITH FRAGARIA VESCA ACCESSIONS

Presenter(s): Ava Fleming, Delaney Flavin, Maya Marina, Natalie Horton
Cell Biology, Genetics & Genomics
Mentor(s): Patrick Edger (College of Agriculture & Natural Resources)

Woodland strawberry (Fragaria vesca) serves the science community as the model organism for fruit crop research due to its relatively small genome size, ease of genetic manipulation and short generation time. Recent studies have shown that genes that encode enzymes that function in the same biosynthetic pathways may be physically clustered together within the genome, which are referred to as biosynthetic gene clusters (BGC's). Our research uncovered dozens of BGCs associated with the biosynthesis of various metabolites in multiple Fragaria vesca genomes and outgroup species. A goal of this study was to investigate the evolution of BGC's associated with the biosynthesis of various specialized metabolites across diverse Fragaria vesca subspecies. We will present our discoveries of both gene content variation, and gene expression patterns, of select BGCs in this species. We anticipate that these findings will serve as a framework for future genetic investigations into BGCs and guide future breeding efforts to improve overall fruit quality of this important fruit crop species.

THE BERRY BEST WAY TO ORGANIZE THE FRAGARIA GENUS

Presenter(s): Drew Johnson, Ella Morrow, Hope Dibiasio, Taylor Adams
Cell Biology, Genetics & Genomics
Mentor(s): Mackenzie Jacobs (College of Natural Science), Patrick Edger (College of Agriculture & Natural Resources)

Cultivated and wild strawberries (Fragaria sp.) are highly prized for their aroma and taste, including sweetness. This sweetness is due to a group of metabolites known as polysaccharides, including glucose, fructose, and sucrose. Recent studies have shown that enzymes involved in the biosynthesis of certain metabolites may be physically colocalized in the genome, referred to as biosynthetic gene clusters (BGCs). Our research identified BGCs for polysaccharides in diverse strawberry species, with gene content variation observed within these BGCs between strawberry species. An additional research goal was to investigate the evolutionary patterns of BGCs associated with various polysaccharides across wild strawberry species. These research findings will serve as a framework for future studies to understand and dissect the underlying genes associated with different taste profiles in both wild and cultivated strawberry species.

TOWARD THE PREVALENCE OF A DNA VARIANT ASSOCIATED WITH CLEFT PALATE IN FINNISH DESCENDANTS FROM MICHIGAN'S SAUNA BELT REGION

Presenter(s): Elison Daher, Josie Kleve
Cell Biology, Genetics & Genomics
Mentor(s): Brian Schutte (College of Osteopathic Medicine), Madison Patrus (Honors College), Paula Somohano (College of Human Medicine)

Unlike the rest of the world, Finland has a uniquely higher frequency of cleft palate only (CPO) compared to cleft lip and palate. Interestingly, a DNA variant associated with a higher risk of CPO was discovered in the Finnish population. This variant correlates with the regional distribution of CPO across Finland and is associated with altered expression of the IRF6 gene, which is essential for typical palate development. This association suggests that the variant contributes to the higher frequency of CPO seen in Finland. Significantly, 1% of the Finnish population carries this variant, but it has not been identified in any other part of the world. The region of Michigan along the southern coast of Lake Superior, known as the "Sauna Belt", is home to a significant number of individuals with Finnish ancestry. We hypothesize that this genetic variant will also be found in descendants of Finnish immigrants living in the "Sauna Belt." To test our hypothesis, we utilized the Michigan Neonatal Biobank to isolate DNA from 25 blood samples from babies of Finnish descent born with cleft palate in the Sauna Belt from 1987-present. Based on the penetrance of the

DNA variant in Finland, we expect about 10% of these samples to carry the variant. The results of this research will contribute to a better understanding of cleft palate in Michigan and help genetic testing and counseling services better provide support for individuals of Finnish descent born with cleft palate, as well as aid the discovery of novel therapies.

GENES THAT BOTH CAUSE AND CONTRIBUTE RISK FOR COMMON COMPLEX DISEASE

Presenter(s): Andrew Pai
Cell Biology, Genetics & Genomics
Mentor(s): Brian Schutte (College of Osteopathic Medicine)

Common complex diseases, such as birth defects, diabetes, heart disease, and cancer, are among the leading causes of morbidity and mortality worldwide. These diseases result from a complex interplay between genetic and environmental factors, which leads to a variety of inheritance patterns including the familiar Mendelian patterns (dominant and recessive) but also non-Mendelian forms that lack these clear patterns. Mendelian patterns are caused by DNA variants in genes that have a very high penetrance, whereas non-Mendelian result from the aggregation of DNA variants with low penetrance that contribute risk. Traditional genetic studies have identified the rare, highly penetrant DNA variants in genes that cause ~6000 Mendelian phenotypes. More recently, high-throughput omics technologies and genome-wide association studies (GWAS) have enabled the identification of genetic variants that contribute risk to ~10,000 non-Mendelian phenotypes. However, the biological mechanisms through which these variants influence disease development and progression are often poorly understood.

FUNCTIONAL CHARACTERIZATION OF KIT AND RARA ONCOGENES IN MMTV-MYC MODEL

Presenter(s): Caroline Downes
Cell Biology, Genetics & Genomics
Mentor(s): Eran Andrechek (College of Human Medicine)

Human breast cancer has been and continues to be a leading cancer type. The complexity of the interactions and pathways required for human cancer causes difficulties in studying the driving forces behind it. The mouse model overexpressing Myc [Mouse Mammary Tumor Virus Promoter (MMTV)-Myc] uses the oncogene myc attached to the hormonally inducible MMTV to control cell growth and tumor progression in the epithelium. Upon further study, 6 different tumor subtypes were observed in the MMTV-myc model: microacinar, papillary, squamous, Epithelial to Mesenchymal Tissue (EMT), solid, adenocarcinoma, and mixed. During recent laboratory experimentation, mutations in oncogenes c-Kit and RARA were observed in 5 of 9 samples and 4 of 9 samples respectively, with 4 of the 9 mutations overlapping in the microacinar subtypes. After preliminary sequencing of 14 papillary tumor samples, no mutations in either oncogene were observed. Further sequencing on alternative subtypes is being conducted to assess the prevalence of the mutations in histological subtypes. My hypothesis is that the mutations in KIT and RARA functionally activate pathways that lead to the observed histological subtype.

THE ROSACEAE FAMILY: DETERMINING EVOLUTIONARY DIVERSITY WITHIN METABOLIC GENE CLUSTERS

Presenter(s): George Hale, Jackson Den Houter, Katie McGrath, Leah Zajac
Cell Biology, Genetics & Genomics
Mentor(s): Patrick Edger (College of Agriculture & Natural Resources)

The rose family (Rosaceae), which includes over 4800 described species in 91 genera, contains a wide diversity of important horticultural fruit crops including strawberries, peaches, and black raspberries. Rosaceae species are of great economic importance to the United states with a combined farm gate value exceeding $60 billion USD annually. Cultivated and wild species are prized for their diverse aroma and taste profiles, and presence of various specialized metabolites associated with health promoting benefits. A compound in the Rosaceae of specific interest are Alkaloids, recognized for their antibacterial properties. Our research uncovered that the genes that encode the enzymes involved in the biosynthesis of Alkaloids are colocalized across the genome, referred to as biosynthetic gene clusters (BGC). An additional goal of our research is to investigate the evolution of BGCs that encode specific Alkaloids across the Rosaceae. We anticipate that the results will serve as an important foundation to guide future breeding efforts across the Rosaceae with the aim to produce more nutritious and flavorful fruits.

UNPACKING THE BACTERIAL RICHES OF DEEP LOESS SOIL: SEPARATING MIXED COLONIES

Presenter(s): Max Rybak, Shannon Carraway
Cell Biology, Genetics & Genomics
Mentor(s): James Tiedje (College of Agriculture & Natural Resources), John Quensen (College of Agriculture & Natural Resources)

Loess soil is fertile soil formed from wind-blown deposits of medium-sized particles (silt). In the Loess Hills of Western Iowa, they can be very deep being deposited during the Wisconsin Glaciation, ~75,000 to 11,00 years ago. Warming periods around 50,000 and 30,000 years ago allowed vegetation to return and new soil surface to form, but subsequently buried, i.e. paleosols, by later deposits. Soil cores were drilled by the Iowa Geological Survey up to 20 meters deep in two Iowa locations. The organic matter is extremely low meaning that native microbes are starved and must be adapted to extreme conditions. To isolate those microbes, water extracts of core samples were plated on agarose media with different minimal carbon sources. After checking for purity, the isolates were grown, their DNA extracted, and sent to Novogene for whole genome sequencing (WGS). The sequence was assembled, binned, and taxonomy identified. Of the 112 colonies that were sequenced, surprisingly only 12 were pure isolates and the other 100 were mixed. There were 34 cultures with two co-occurring MAGs, 28 cultures with three co-occurring MAGs, 17 with four, 10 with five, 1 with six, and 1 with seven. Taxonomy based on 16S rRNA sequence indicated that the most common genera were Bacillus, Methylobacterium, Methylopila, Microbacterium, Novosphingobium, Pseudomonas, Rhodococcus, and Variovorax. Phyla Proteobacteria and Actinobacteriota had the highest co-occurrence frequency. Perhaps the long-term starvation selected for codependencies. Selective media and conditions are being used to separate and understand the reason for so many co-cultures.

CHARACTERIZING EFFECTOR-METAEFFECTOR PAIRS IN LEGIONELLA PNEUMOPHILA

Presenter(s): Ethan Wolfe
Cell Biology, Genetics & Genomics
Mentor(s): Janani Ravi (College of Veterinary Medicine)

Bacterial effector proteins are virulence factors critical for parasitism in eukaryotic hosts. Metaeffectors - effectors that bind to and regulate the activity of cognate effectors - were recently discovered exclusively in Legionella pneumophila (Lp). Lp, which has co-evolved extensively with its natural host amoebae, is the etiological agent of Legionnaires' disease in humans. Upon infection, Lp injects ~330 effector proteins into its host cell through a Dot/Icm type IV secretion system (T4SS). In this project, we aim to functionally characterize 26 understudied effector-metaeffector (EM) pairs critical to bacterial virulence through the lens of evolution. We first characterize these proteins using their sequence-structural features, such as domain architectures, and delineate their evolution using MolEvolvR (doi.org/10.1101/2022.02.18.461833; jravilab.org/molevolvr). We also quantify the coevolution of all EM pairs across 102 Lp genomes to discover lone effectors (occurring without cognate metaeffectors) that could be cytotoxic to Lp itself. The domain/motif building blocks constituting these EM pairs will populate the first comprehensive EM feature repository that will enable the discovery of novel EM pairs in Lp and other understudied, emerging pathogens.

LOCAL ABLATION BY INTRADUCTAL INJECTION OF 70% ETHANOL PREVENTS BREAST CANCER IN MNU-INDUCED RAT MODEL

Presenter(s): Elizabeth Phelps
Cell Biology, Genetics & Genomics
Mentor(s): Erin Zaluzec (College of Human Medicine), Lorenzo Sempere (College of Human Medicine), Mohamed Ashry (College of Human Medicine)

In 2023, the American Cancer Society estimates there will be 297,790 new diagnoses of breast cancer (BC) in the United States. Approved prevention methods such as prophylactic mastectomy and systemic hormonal therapy are effective in reducing the risk of BC, but often result in intolerable side effects. Thus, new interventions to reduce the risk of BC and minimize deterrents are necessary. Intraductal injections of a 70% ethanol solution through the nipple into the ductal tree is a minimally invasive procedure that ablates mammary epithelial cells before they become malignant. This technique has been proven effective in an aggressive genetically engineered mouse model. To improve scalability towards clinical trials, increase injection volume, and study the impact of partial ductal tree filling, we utilized a chemically induced rat model of breast cancer. Two weeks after intraperitoneal MNU (carcinogen) injection, rats received full or partial injections of 70% ethanol (ablative agent), ethyl cellulose (gelling agent to reduce leakage), and Tantalum Oxide (nanoparticle contrast agent for visualization) into individual mammary glands. Rats were monitored for tumor formation from 2 weeks post injection until reaching euthanasia criteria. Fully injected glands had the highest decrease in tumor formation followed by partially injected glands when 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 study shows that ID injection of 70% EtOH with TaOx and EC is a safe, effective, and scalable technique for BC prevention.

USING GENOMICS TO EXPLORE THE BASIS FOR LIFE HISTORY DIFFERENCES IN AN IMPERILED FISH SPECIES

Presenter(s): Allie Zhang
Cell Biology, Genetics & Genomics
Mentor(s): Mariah Meek (College of Natural Science), Nadya Mamoozadeh (College of Natural Science)

Brook trout (Salvelinus fontinalis) exhibit a unique migratory life history endemic to the Lake Superior basin. While resident brook trout reside in streams and rivers tributary to Lake Superior for the majority of their lives, coaster brook trout migrate to and reside within Lake Superior. However, only a few coaster populations remain today, primarily due to overfishing and poor land use management in the 1800s. More recently, anthropogenic stressors pose an increasing threat to coasters, and there is a need for better informed management strategies to preserve this life history. In this study, we examined single nucleotide polymorphisms in the genomes of fifty brook trout from the Pilgrim River in the Michigan Upper Peninsula that were recently found to exhibit both resident and migratory life histories, suggesting a remnant population of coasters. We performed restriction site-associated DNA sequencing and analyzed the results to answer two key questions: 1) Is variation in life history accompanied by underlying genetic variation in Pilgrim River brook trout? and 2) If so, what specific genetic variation must occur to produce the migratory life history? This study offers the unique opportunity to compare genomic data with telemetry data from a previous study, allowing us to analyze individuals' genomes with the ability to infer their likely life histories using their migratory patterns. Our current study includes expanded sample sizes compared to preliminary work, facilitating more comprehensive insights that will inform the protection of this coldwater sentinel species and its unique life history in the Lake Superior basin.

THE ROLE OF ESR1 AND RAC1 IN UTERINE GLAND BRANCHING AND EARLY PREGNANCY EVENTS

Presenter(s): Laasya Koduri
Cell Biology, Genetics & Genomics
Mentor(s): Katrina Granger (College of Human Medicine), Ripla Arora (College of Human Medicine)

Uterine gland secretions are important for embryo development and survival. Glands usually stem off the lumen and branch during adulthood, and gland ducts elongate during pregnancy. Improper gland branching results in impaired organ function in branched organs. Estrogen receptor 1 (ESR1) is important for organ system growth and development. RAC1 is key to early embryo-uterine interactions for embryo implantation. RAC1 and ESR1 deletions' impact on the extent of uterine gland branching, gland branch elongation, and embryo implantation is uncovered. When

ESR1 is conditionally deleted using a neonatal PRCre or epithelial Pax2Cre, glands bud or elongate but fail to branch with no implantation sites. This suggests that ESR1 aids in gland growth. When RAC1 is conditionally deleted using PRCre, glands display a hyper-elongation phenotype suggesting that RAC1 inhibits gland branch length extension. To study the interaction between ESR1 and RAC1 for gland branching, different combinations of RAC1 and ESR1 conditional gene deletions were generated using Cre-lox recombination. Uterine horns from pregnant mice were evaluated at pregnancy day 4.5. Complete knockout of ESR1 using PRCre mice always resulted in gland buds irrespective of RAC1 deletion. Complete knockout of RAC1 with one gene of ESR1 using PRCre mice resulted in hyperbranched glands with fewer implantation sites similar to the deletion of RAC1 alone. ESR1 deletion using the Pax2Cre mice resulted in elongated glands but no branches. These models with genotypic variations provide an opportunity to understand gland structure-based mechanisms that are important for proper embryo development and survival.

USING COMPUTATIONAL AND EXPERIMENTAL METHODS TO IDENTIFY RIDD TARGETS

Presenter(s): Sardar Murtaza
Cell Biology, Genetics & Genomics
Mentor(s): Christina Chan (College of Engineering), Kevin Chen (College of Engineering)

The research is investigating role of IRE1 (inositol-requiring enzyme 1) in mediating palmitate's (PA's) effects on chemotolerance and cancer cell survival. IRE1 is a transmembrane protein in the endoplasmic reticulum that plays an important role in downstream signaling of XPB1 splicing and regulated IRE1-dependent decay (RIDD) activities. This computational project was conducted to identify possible RIDD targets that are degraded and mediated by PA's activation of IRE1a. This project involves the use of computational tools like JASPAR, Benchling, GeneCards and RNA WebServer which enables us to work with DNA and RNA sequences to help predict potential XBP1 and RIDD targets. Gene encoding enzymes such as ELOVL2/4/5, FADS2, SLC27A1-6, ECH1, as well as DNA repair genes BRCA1, BRCA2, RAD51, and RAD52 were analyzed for potential RIDD targets. This project will test the hypothesis that PA's activation of IRE1a can lead to the degradation of specific target genes, thereby affecting cellular processes and contributing to chemotolerance and cancer cell survival. The study provides important insights into the role of IRE1 in mediating PA's effect on chemotolerance and cancer cell survival and contributes to our understanding of the downstream signaling of IRE1 and the potential RIDD targets that are degraded and regulated by PA's activation of IRE1a.

USING GENOMIC ANALYSIS TO UNDERSTAND THE ECOLOGY OF A HYPERVIRULENT PATHOGEN OF PLANKTONIC CRUSTACEANS

Presenter(s): Zoe Haden
Cell Biology, Genetics & Genomics
Mentor(s): Nina Wale (College of Natural Science)

Determining metabolic functions using genetic analysis is important for the understanding of how organisms function in their environment as well as how their genes impact that determined environment. Spirobacillus Cienkowskii is a bacterial organism that has been studied since the mid-1900s, yet still has very little information known about it today. The genome of Spirobacillus Cienkowskii may be able to give insight into its metabolic functions to provide understanding as to where it survives and thrives, as well as why it is infectious to certain planktonic crustaceans. Kbase is a web-based platform created for the integration and comprehensive analysis of biological data. This platform contains a system called DRAM (Distilled and Refined Annotation of Metabolism), which provides comprehensive annotation of metabolic pathways using genomic sequences. This software will be used to annotate the Spriobacillus Cienkowskii genome to determine which metabolic pathways are present in the organism. These pathways and additional genes present will be analysed to determine specific survival mechanisms through metabolism, including what it uses as energy sources, as well as how it finds this food to convert to energy. This work provides evidence that Spirobacillus Cienkowskii and other organisms' genetic makeup can help determine their mechanisms for survival including reasoning for infection, by developing an understanding of what it feeds off and how it obtains those nutrients through genomic analysis.

ROLE OF NEUROGENIN 3A IN ZEBRAFISH ENTERIC NERVOUS SYSTEM DEVELOPMENT

Presenter(s): Tori Reinbold
Cell Biology, Genetics & Genomics
Mentor(s): Ann Davidson (College of Natural Science), Julia Ganz (College of Natural Science)

The enteric nervous system (ENS) is the largest part of the peripheral nervous system and consists of a network of neurons and glial cells embedded in the walls of the gut. The ENS is vital in its role for gut motility, blood flow, immune response, as well as many other functions. Zebrafish, Danio rerio, are an ideal model for studying ENS development due to their easy genetic manipulation, transparent larvae, fully sequenced genome, and fast development. A set of key genes are known to regulate ENS development, but identifying which genes regulate ENS development in specific areas of the gut remains to be determined. Previous work has identified a mutant allele sa211 that results in an early stop codon in the neurogenin 3a (ngn3a) gene. Preliminary data suggest that ngn3a mutant zebrafish larvae lack ENS neurons in the midgut. Thus, we hypothesize that ngn3a controls neuronal differentiation in a specific gut area. To test this hypothesis, we first established a genotyping assay for ngn3asa211. We then identified heterozygous carriers of the sa211 mutant allele. Currently, we are crossing heterozygous carriers to generate homozygous mutant embryos and are performing immunohistochemistry with the pan-neuronal markers Elavl and acetylated Tubulin to label ENS neurons. We will then compare ENS neuron numbers in homozygous ngn3asa211 mutant larval guts to their wildtype siblings along the entire length of the gut. This work will contribute to a better understanding of the genes that regulate ENS development in zebrafish.

BIOSENSORS FOR ALZHEIMER'S DISEASE BIOMARKER DETECTION

Presenter(s): Tunc Gozubuyuk

Cell Biology, Genetics & Genomics
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

Detection of multiple biomarkers is essential for correct diagnosis and studies on the multiplexed detection of several biomarkers are limited. Accurate and reliable detection of biomarkers in body fluid is also of paramount importance. Most research in this field is focused on the detection of AD biomarkers in cerebrospinal fluid. There are only a few studies on biomarker detection in human blood and urine. The blood test could serve as a diagnostic test to screen millions of individuals at risk of AD. In conclusion, I will be working on the detection of AD biomarkers in blood or urine which is a study that is needed by the industry.

DIETARY PRUNE INDUCED CHANGES IN MOUSE GUT MICROARCHITECTURE

Presenter(s): Shashank Ravishankar
Cell Biology, Genetics & Genomics
Mentor(s): Laura McCabe (College of Human Medicine), Narayanan Parameswaran (College of Human Medicine), Nick Chargo (College of Osteopathic Medicine)

Previous studies show associations between gut microbiota composition, barrier function and bone health. An important contributor to a healthy gut is the mucus layer, which covers the small and large intestinal surfaces. Prunes (dried plums) alter the gut microbiota and have beneficial bone effects in rodents and humans. We hypothesized that prunes would increase mucus in the gut. To test this, mice were treated with control or 25% prune diet for 8-weeks. To assess mucus, gut sections were fixed in Carnoy's solution, processed, and Periodic Acid Schiff stained. Ileum and proximal colon sections were imaged via light microscopy at 4x and 10x magnification and analyzed in ImageJ. To assess structural changes within the gut, height/depth, width, and area were calculated in ileum villi and crypts and proximal colon crypts. Goblet cells (which produce mucus) were counted within crypts and villi of ileum and proximal colon. Results demonstrate that 8-weeks of prune treatment led to region-specific changes in intestinal architecture. Although no significant changes were observed in the ileum, marked differences were found in the proximal colon. Prune diet significantly increased width of the proximal colon crypts (control: 21.10±0.58, prune: 24.56±0.48, p=0.0002) and increased the number of goblet cells/crypt (control: 23.47±1.41, prune: 27.30±1.21 , p=0.0539). Overall, our results demonstrate that long-term prune treatment alters proximal colon microarchitecture and increases mucus producing goblet cells. Further studies are needed to better understand the region-specific effect following 8-weeks of prune treatment.

INVESTIGATING GENETIC MODIFIERS IN A LARGE ANIMAL MODEL FOR RHD5-/- ASSOCIATED RETINOPATHIES

Presenter(s): Nastassia Benjamin
Cell Biology, Genetics & Genomics
Mentor(s): Laura Ford (College of Natural Science), Simon Petersen-Jones (College of Veterinary Medicine)

Retinol Dehydrogenase 5 (RDH5) is responsible for the final stage in the visual cycle, the oxidation of 11-cis-retinol to 11-cis-retinal. 11-cis-retinal then regenerates rhodopsin, the photopigment of rods, resulting in vision in night/dim conditions. In humans, mutations in RDH5 cause fundus albipunctatus (FA) which is characterized by night blindness and white-yellowish retinal lesions with a subset of patients also developing macular degeneration (MD). A mutation in RDH5 (p. Gly181Val) was identified in a closed colony of felines resulting in a phenotype resembling key features of the human RDH5 phenotype. RDH5 -/- felines have reduced rhodopsin regeneration resulting in night blindness with a portion of cats developing degeneration of the area centralis, a region analogous to the human macula. In the RDH5-/- colony, area centralis degeneration appears at different ages and severities despite identical RDH5 mutations, housing, and feeding. In humans, similar phenotypic differences, despite homogenous mutations have been proposed to be caused by modifier genes. In the presence of a disease-causing gene a modifier gene alters the phenotype, whereas in the absence of a disease-causing gene it does not affect the phenotype. In order to identify a potential modifier, various techniques including whole genome sequencing and variant calling analyses were used. Further understanding of the molecular processes involved in this disease and how modifiers are influencing these may aid in providing the foundational knowledge needed for potential therapies in human patients with these retinopathies.

FOXP2 GENE PRESENCE IN THE AMERICAN CROW AND HUMAN AIDS IN VOCAL RECOGNITION TO WARNING CALLS

Presenter(s): Jamie Marx
Cell Biology, Genetics & Genomics
Mentor(s): Douglas Luckie (Lyman Briggs College)

Many avian communication systems are vulnerable to deception due to competition for resources and mates. This makes vocal recognition abilities important, so animals are able to differentiate between alert calls from their own and outside species without prior exposure. Similarly, humans can distinguish between different sounds and languages, utilizing various brain regions to detect what is being said. The mechanism responsible for this vocal recognition in both the American Crow, Corvus brachyrhynchos, and Human, Homo Sapien, is the FOXP2 gene. We hypothesized that these two species, aided by their FOXP2 gene, would have the aptitude to differentiate warning vocalizations from within their species rather than being deceived by others' alerts. Two homologous experiments were conducted to test this hypothesis. In each, a beats pill speaker emitted alert vocalizations of multiple bird species (for the crow experiment) or languages (for the human experiment). After the vocalization, the return time for crows after fleeing and the time it took humans to return to normal behavior were recorded. To confirm gene presence, PCR was performed using primers designed to anneal to the FOXP2 gene. Then, gel electrophoresis was utilized to visualize and separate the DNA. Results indicated that the hypothesis was justified as humans reacted longer when hearing their own language, and the Crows fled sooner and for longer after hearing their own species' warning. These findings signify an ability to recognize the alerts of one's own species, which provides the tools for these animals to act accordingly in potentially dangerous situations.

MODE OF DELIVERY IMPACT ON ABUNDANCE OF HUMAN MILK OLIGOSACCHARIDE METABOLIZING GENES IN HUMAN INFANTS

Presenter(s): Annah Wilkinson
Cell Biology, Genetics & Genomics
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Infants who consume human milk contain in their gut microbiome specialized genes that digest human milk oligosaccharides (HMOs). The complex sugars are only found in milk produced by humans. HMOs are only minimally digested and absorbed by the infants themselves. Rather, HMOs act as food for microbes that play crucial roles in the development of the infant gastrointestinal and immune systems. Certain microbes, specifically Bifidobacterium infantis, digest HMOs, and exist in higher abundance in the guts of infants who were fed human milk. Previous studies have explored this relationship between HMO-metabolizing genes in infant stool and the primary feeding method for the infants - whether formula or human milk fed. Herein, I will explore whether mode of delivery is significantly associated with certain HMO-metabolizing genes in the infant gut microbiota at 1 month of age. Using existing genomic DNA isolated from infant fecal samples and quantitative real time PCR, I will investigate the presence of specific HMO metabolizing genes. Then, I will compare the abundance of those genes between infants delivered via C-section or delivered vaginally. I expect to find that mode of delivery does not significantly impact an infants' relative concentration of genes of interest, but rather, that exposure to human breastmilk (or lack thereof) is responsible for the varying concentrations of HMO metabolizing genes. If this holds true, these findings would suggest that each human infant is born with the ability to digest the HMOs produced by their mother after exposure to human milk.

HATCHING ENZYME EVOLUTION AND EXPRESSION IN SPOTTED GAR, A MODEL ORGANISM FOR VERTEBRATE EVOLUTIONARY DEVELOPMENTAL GENOMICS

Presenter(s): Daniel Do
Cell Biology, Genetics & Genomics
Mentor(s): Andrew Thompson (College of Natural Science), Ingo Braasch (College of Natural Science)

Hatching is an essential process for every vertebrate. It is a key developmental transition that allows the animal to break out of the egg envelope and become a free-living organism. While aquatic vertebrates use specific hatching enzymes that digest the egg envelope, the highly-complex evolutionary history and developmental characterization of this gene family is lacking in the spotted gar. Spotted gars are a species of ray-finned fish which are known as living fossils due to their slow rate of evolution. They are a good study organism that branches fish and other terrestrial vertebrates. The aim of this project is to identify the enzymes that spotted gar uses for hatching and locate the hatching gland. Teleost fishes such as Japanese medaka use highly derived metalloproteases as hatching enzymes to break down the egg envelope. Hatching enzyme gene candidates of spotted gar were identified by comparing metalloprotease genes from other vertebrates to the gar genome. A phylogenetic tree was generated using all metalloprotease genes identified in previous studies as well as more than a dozen gar sequences we identified to be members in this gene family. We compared these candidate sequences to gar transcriptomes to identify metalloproteases expressed during the gar embryonic pre-hatching stage. We identified several key gar genes closely related to teleost hatching enzymes for spatio-temporal characterization using RNA in situ hybridization on gar embryos to reveal the location of the spotted gar hatching gland.

PROTEIN-PROTEIN INTERACTIONS BETWEEN INTERLEUKIN-17 RECEPTOR A (IL17RA) AND THE SARS-COV2 ORF8 PROTEIN

Presenter(s): Jeannie Lam
Cell Biology, Genetics & Genomics
Mentor(s): Masako Harada (College of Engineering)

ORF8 is an accessory protein in SARS-CoV2 that affects the immune system in at least two ways: it leads to the down-regulation of MHC-I complexes from the surface of infected cells, making them less susceptible to killer T cells, and it triggers the interleukin 17 receptor A (IL17RA). IL17RA is a receptor involved in regulating the immune system, primarily its antimicrobial host defense. Besides binding to IL17RA, ORF8 has previously been shown to interact with two members of the ADAM/ADAMTS family of proteases, a large group of enzymes, some of which have various roles in inflammatory responses. In this project, our goal is to create recombinant plasmids containing engineered forms of IL17RA and various ADAMTS members to study the protein interactions between them and ORF8. We have used techniques such as polymerase chain reaction (PCR), gel electrophoresis, and gel purification for preparing ADAMTS members and IL17RA for cloning. Each insert was then combined with a mammalian expression vector backbone via Seamless Ligation Cloning Extract (SLiCE), a novel cloning technique that utilizes bacterial cell extracts to create recombinant plasmids in a single in vitro reaction. After generating ADAMTS and IL17RA constructs, we then sequenced them to verify the inserts. These plasmids will be transfected into mammalian cells to generate recombinant proteins to study the protein-protein interactions between the viral ORF8 and host IL17RA and ADAMTS family members, to advance our understanding of how SARS-CoV2 affects the immune response.

CHARACTERIZATION OF CDKN2A/P16 AS A TUMOR-SPECIFIC PROMOTER

Presenter(s): Harrison Nabors
Cell Biology, Genetics & Genomics
Mentor(s): Dohun Pyeon (College of Human Medicine)

Human Papillomavirus (HPV) is a known oncogenic virus and is the causative agent for over 5% of all human cancers. Notably, the incidence of HPV+ head and neck squamous cells carcinoma (HNSCC) has increased to epidemic proportions over the last 30 years. For this reason, the need for a non-invasive, effective, and specific therapy has become paramount. Our lab is developing an adenoviral vector-based immunotherapy to treat such diseases, and tumor specificity of the treatment stands as a critical component. p16, a tumor suppressor under the control of the CDKN2A gene, is highly upregulated in HPV+ HNSCC and serves as a standard diagnostic marker for HPV status. Therefore, its promoter serves as a candidate for tumor specificity. However, the promoter is not well elucidated. Previously, we identified a -144bp region of the mouse CDKN2A upstream region that is preferentially activated in HPV+ HNSCC cells compared to wild type. Here, we characterize the activity of the human CDKN2A promoter across cell types with differential expression of p16. The mouse -144bp region was analyzed in silico and hypothesized to be similar in the human region. Truncations of the CDKN2A upstream region were cloned into a luciferase reporter and assessed for activity, and a short region of preferential activity was identified. These findings further elucidate the human CDKN2A promoter and provide a potential tool for future use in our novel immunotherapy.

COMMUNICATIONS ARTS & SCIENCES

CHALLENGES OF RECRUITING NEW PARENTS FOR A DYADIC STUDY ON SUPPORTIVE COMMUNICATION

Presenter(s): Hailey Schulte
Communication Arts & Sciences
Mentor(s): Amanda Holmstrom (College of Communication Arts Sciences)

In our ongoing study about supportive communication surrounding heterosexual couples who are breastfeeding a newborn baby, the most time consuming challenge has been recruiting dyads with a newborn. Research consistently indicates the importance of social support for breastfeeding mothers to promote uptake and maintenance of breastfeeding. The end goal of this study is to identify the specific support strategies to help breastfeeding mothers, however we are still recruiting participants. Challenges to recruitment include (a) dyadic data collection; (b) a focus on the newborn period; (c) the longitudinal nature of data collection; and (d) validating the eligibility of survey respondents. To manage these challenges, we have developed thorough eligibility screenings and creative recruitment strategies. We are searching for participants through online support forms, breastfeeding groups, hospital flyers, and more. Data collection is still underway; however, the recruitment process itself allows for ample conversation.

THE EFFECTS OF ANGER ON INFORMATION SEEKING, ATTITUDES, AND BEHAVIOR: A SYSTEMATIC REVIEW

Presenter(s): Phoebe Tran
Communication Arts & Sciences
Mentor(s): Monique Turner (College of Communication Arts Sciences)

Anger is a complex emotion that arises from the perception of injustice or unfairness, manifesting in different behavioral forms and intensities that range from mild annoyance to intense frustration. Anger can trigger cognitive, psychological and behavioral responses that can be either constructive or destructive consequences. Some studies have shown that anger can lead to deeper persuasive message processing, heightened feelings of control, information seeking, and behavior change.

Although several meta-analyses have been conducted on the effects of anger, each meta-analysis focuses on one specific outcome variable and includes tight and rigorous inclusion criteria. No one has attempted to systematically review the vast literature and examine overall trends on the constructive (prosocial behavior) versus deleterious (prejudiced thinking) outcomes of anger. This study is a systematic review of the causal effects of anger on information seeking, attitudes, information processing, decision making and behavior. 11,427 articles were first identified based on the search terms. After duplicates, irrelevant studies, studies on clinical populations were removed, there were 94 experimental investigations that satisfied the inclusion criteria and were deemed suitable for analysis. These data indicated that anger can lead to increased information processing and decreased risk perception, but only in certain conditions.This review provides a rigorous and systematic evaluation of the existing evidence in this field and identify literature gaps that may need further exploration. Such examination will enable researchers to develop new hypotheses to guide future research on the effects of anger.

HOW BILINGUAL (SPANISH) NEWS OUTLETS IN MICHIGAN COVER NEWS

Presenter(s): Emily Komer
Communication Arts & Sciences
Mentor(s): Bruno Takahashi (College of Communication Arts Sciences)

The research project is on how bilingual news outlets in the state of Michigan report on environmental news. The bilingual language we focused on is Spanish. Spanish is a very common language and represents the Latino/Hispanic communities. It is important for these voices to be heard and for people to feel seen in a country where English is the first language, and not Spanish. The research can tell us how these communities feel about environmental issues.

HYDROPOWER AND THE RISK OF BLACKOUTS IN BRAZIL FROM A TV NEWS CODING PERSPECTIVE.

Presenter(s): Eduarda Paim Vieira
Communication Arts & Sciences
Mentor(s): Rachel Reis Mourao (College of Communication Arts Sciences)

This study investigates how the blackouts and the risk of blackouts have been framed by the mainstream media through a content analysis in three different periods. The analysis considered the two most watched Brazilian broadcasters: Jornal Nacional (Grupo Globo), and Jornal da Band (Grupo Bandeirantes de Comunicação).

THE VARIABILITY OF CHILDREN'S STUTTERING SEVERITY AND ADVERSE IMPACT

Presenter(s): Kendall Causley
Communication Arts & Sciences
Mentor(s): Bridget Walsh (College of Communication Arts Sciences)

People who stutter report that the severity of their stuttering varies greatly in different speaking situations, for example, talking to their best friend versus presenting in front of a large group of strangers. Stuttering variability has been linked to increased adverse impact in adults who stutter. Adverse impact includes experiences like negative thought patterns, reduced self-esteem, or anxiety/frustration when speaking. However, the relationship between stuttering variability and adverse impact has not been studied in children who stutter. The objective of this project is to examine the variability in children's severity ratings across different communication situations and its relationship with stuttering's adverse impact. We sent a Qualtrics survey to 112 children who stutter between the ages of 9-18 asking them to rate the severity of their stuttering across different speaking situations. As part of the surveys, children also completed the age-appropriate version of the Overall Assessment of the Speaker's Experience of Stuttering (OASES) which is a measurement of stuttering's adverse impact. We found a moderate correlation between the range of children's severity ratings across speaking situations and overall adverse impact of stuttering. We also found a strong correlation between the range of children's severity ratings across speaking situations and their perspectives on challenges encountered in different speaking situations. This project validates and amplifies the voices of children who stutter and has implications for stuttering treatment by clarifying the variability of communication challenges children face in their daily lives.

WHAT HIGH-SPEED IMAGING SAYS ABOUT VOICE: A COMPARISON OF DIFFERENT VOCAL MODALITIES

Presenter(s): Samantha James
Communication Arts & Sciences
Mentor(s): Maryam Naghibolhosseini (College of Communication Arts Sciences)

Adductor spasmodic dysphonia (AdSD) is a voice disorder in which spasms cause the vocal folds to close involuntarily. AdSD can be difficult to assess using acoustic and perceptual measurements alone, as its symptoms are often similar to those of other voice disorders. Using high-speed videoendoscopy (HSV), which allows us to record videos of the vocal folds' vibrations at high frame rates, we gathered data from several participants. This video data consists of recordings of six vocalizations of the vowel /i/ from each participant. Two vocalizations were produced at normal loudness and pitch, two were produced with a soft glottal attack (breathy onset), and two with a hard glottal attack. This study aims to analyze the glottal attack time (GAT) and glottal offset time (GOT) and how they are impacted by AdSD for several participants during these different vocal modalities. GAT refers to the time between the first oscillation of the vocal folds and their first contact at the beginning of a vocalization. GOT refers to the time between the final contact of the vocal folds and their final oscillation at the end of a vocalization. A rater analyzed HSV data frame by frame to determine the GAT and GOT measurements for each vocalization. The results of this analysis were compared between participants with and without AdSD, as well as between habitual, soft, and hard glottal attacks. The results of this study will reveal the differences between these measures in non-pathological and disordered voices, helping to better characterize AdSD.

COMMON TECHNIQUES USED BY PARENTS OF CHILDREN WITH AUTISM WHEN CLARIFYING MISUNDERSTOOD UTTERANCES

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

Many young children with autism have language delays, which can contribute to communication breakdowns with their parents and caregivers. Parents and caregivers use various techniques to repair these breakdowns. Understanding how parents clarify their misunderstood utterances to young children with autism gives us valuable insight into parent-child communication. Our research seeks to explore the different strategies that parents use when clarifying their own utterances for their child with autism and may inform what strategies are used in autism intervention. Interviews were conducted with twelve parents who have children with autism and information was gathered using an interview outline of standard questions. This data was transcribed and then coded based on patterns found in the interview transcripts. Research assistants analyzed the interview excerpts that contained codes related to clarification and looked for patterns among them. Strategies that were reported to be used by parents included gestures, expansion, engaging, getting on the child's level, and repetition. The most common strategy in the data was expansion and the least common strategy in the data was getting down on the child's level. This information is helpful to clinicians by making them aware of the different methods that parents are using to help their child better understand more complex situations and speech. These results also provide insight to parents about what methods are commonly being used by other parents.

BILINGUALISM AND ITS AFFECT VOICE ONSET TIME IN ENGLISH PRODUCTIONS

Presenter(s): Hannah MacDonald
Communication Arts & Sciences
Mentor(s): Lady Catherine Cantor Cutiva (College of Communication Arts Sciences)

Background: Previous research has shown that there is a significant difference between the voice onset time of native Spanish speakers and native English speakers. This study will look at 10 speakers. Five native English speakers from the midwest, and five Colombian Spanish speakers. Aims: To determine if there are differences in the Voice Onset Time (VOT) between bilingual English-Spanish speakers whose first language is English with those first language Spanish. Methods: Ten participants read a fragment of the Rainbow passage, and from this production we extracted the word "pot" to calculate the VOT using Praat software. The voice sample was uploaded to Praat. Then, the second production of the word "pot" was isolated in each of the samples. Beginning at the onset of the voiceless /p/ and by observing the first moment the wave crossed the x-axis the voice onset time was marked. This method was used for each voice sample. Results: There was a statistically significant difference for mean VOT between bilingual English-Spanish native English speakers and bilingual English-Spanish native Spanish speakers (104.63 ms for native English speakers and 47.86 for native Spanish speakers; Mann-Whitney U p-value <0.05). Conclusion: Bilingualism and native language are important factors that can affect voice onset time. This is an important consideration, as the United States has a large population of Spanish-English bilingual speakers.

WHAT DOES LITERATURE SAY ABOUT COMMUNICATIVE EFFORT, VOCAL EFFORT, TONGUE EFFORT, AND SPEECH EFFORT?

Presenter(s): Bella Neach
Communication Arts & Sciences
Mentor(s): Lady Catherine Cantor Cutiva (College of Communication Arts Sciences)

Aim: Describe bibliometric indicators on publications about communicative effort, vocal effort, tongue effort, and speech effort published in databases available in the library system of Michigan State University. Methods: Began by looking up the terms, communicative effort, vocal effort, tongue effort, and speech effort in the Michigan State University library website. From there, the abstracts of the articles were put into an excel sheet. Each group member was assigned an excel file with a certain number of articles/abstracts. If the abstract was not provided even after looking it up, the article was not included. The article was only included in the study if it had an available abstract, reported experimental research, was written in English, and reported explicitly any of the terms of interest (communicative, vocal, tongue, or speech effort). Results: 785 titles were at the beginning. After reading all titles and abstracts, 156 were included and 629 were excluded. Among those included, 41 explicitly stated vocal effort, 2 explicitly stated communication effort, 1 explicitly stated speech effort, and the rest described one or multiple of the terms. Conclusions: Most of the included publications covered topics related with vocal effort, which highlight a tendency and current research priorities in the field of voice.

INVESTIGATION OF VIRTUAL HEARING ASSESSMENT TOOLS

Presenter(s): Audrey Deising
Communication Arts & Sciences
Mentor(s): Maryam Naghibolhosseini (College of Communication Arts Sciences)

Thirteen percent, or 30 million, of Americans aged 12 and older have hearing loss in both ears. Hence, Hearing conservation is extremely important. It's important to test to maintain and protect remaining hearing. Due to the COVID-19 pandemic and other illnesses, going into a doctor's office to receive a hearing test is challenging. There is a risk of exposure, air filtration issues, cleaning issues, and more. There are a variety of websites and apps that allow individuals to conduct hearing tests on themselves at their homes. The goal of this study is to investigate if these websites/apps are reliable and valid for determining the hearing thresholds/presence of hearing loss. To test this, several individuals were asked to conduct hearing tests on themselves. Subjects were given instructions on how to properly conduct the hearing tests using several websites/apps. Using an audiometer, the actual hearing thresholds of the subjects were measured by a researcher. The measured auditory thresholds were compared with hearing assessment results of websites/apps. After analyzing the collected data, it was found that the results from the websites and apps did not align with the results from the audiometer. Therefore, the studied websites and apps are not accurate and reliable tools to measure hearing thresholds. There is still a need to develop online hearing testing tools that people can use at their home for a self-assessment of their hearing. Such tools can help individuals to decide when they need to go and see a doctor to get their hearing tested.

TO SHARE OR NOT TO SHARE? INVESTIGATING PRIVACY ATTITUDES FOR VR HEADSETS

Presenter(s): Zachary Schultz
Communication Arts & Sciences
Mentor(s): Alexander Lover (College of Communication Arts Sciences), Rabindra Ratan (College of Communication Arts Sciences)

As virtual reality (VR) technology continues to rapidly advance, privacy concerns surrounding this technology have become increasingly important. This study aims to investigate the effects of three independent variables: information order, sentence structure, and type of authorship endorsement on individuals' attitudes toward privacy policies for VR headsets. The study will employ a 2 (information order: pro first, con second vs. con first, pro second) x 2 (sentence structure: active vs. passive) x 2 (authorship of privacy policy endorsement: human-expert-authored endorsement vs. AI-expert-authored endorsement) design. Participants will be randomly assigned to one of the eight conditions. The experiment will be conducted online, and participants will complete a questionnaire that measures their attitudes toward the privacy policy scenario. The questionnaire will include items that assess their perceptions about intended willingness to share VR movement (including headset, controller, hand, arm, and leg motion), facial tracking, and VR headset exterior camera data. Additionally, the questionnaire assesses participants' perceptions of control, awareness, data intrusion, and disposition to value privacy. This study intends to elucidate how different communication strategies and message sources influence individuals' attitudes toward privacy regarding VR. The findings may help developers and privacy advocates to develop effective ways to communicate the risks associated with VR use and to promote privacy protection. Before conducting this online study and collecting data, we will seek IRB approval.

STREET TEAMS X THE CONSTELLATION CAT CAFE

Presenter(s): Carlina Pitello, Emily Paterson, Grace Cyporyn, Kaitlyn Kwon, Mariana Santos bittencourt de almeida, Mia Burghardt, Nicoline Bradford, Steph Ferrara
Communication Arts & Sciences
Mentor(s): JeanaDee Allen (College of Communication Arts Sciences), Madelyn Darbonne (College of Communication Arts Sciences)

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. Over the course of the fall 2022 and spring 2023 semesters, our team of students (Team Bloom) has worked with the Constellation Cat Cafe to effectively achieve a list of deliverables determined by a creative brief created by our team. Our team is currently working to create a brand guide, social media strategy guide, new pet information template, advertisement campaign for the cafe's recent relocation, and an assortment of new merchandise such as stickers and pins for the cafe. In our exhibit presentation, we will demonstrate the work we have created for our non-profit as well as the communication skills we have learned along the way.

OLD TOWN

Presenter(s): Elizabeth Burgess, Gabi Turner, Keely Broderick, Nolan Duff, Phoebe Tran, Phuc Nguyen, Sari Kellman
Communication Arts & Sciences
Mentor(s): JeanaDee Allen (College of Communication Arts Sciences), Madelyn Darbonne (College of Communication Arts Sciences)

My team is working with Old Town (Commercial Association) this year in hopes to attract a broader audience to the town's prominent features. We pitched a deliverable to Mr. Robert Doran-Brockway and are spending the rest of the semester as a team working on this deliverable. Our deliverables include (1) a custom template for Old Town's social media pages, (2) a bucket list listing things to do in Old Town, and (3) a video shot directly by our videographer team in Old Town. As for the details, I will leave them for our presentation. Our project has just started, but we cannot wait to see it come to life! My team is passionate about sharing our work that we are doing for the nonprofit organization. Further, we want to emphasize the success of nonprofit organizations as a whole.

DOCUMENTARY FILMMAKING: CREATING AND MARKETING PROCESSES

Presenter(s): Jennifer Barber, Sarah Smith
Communication Arts & Sciences
Mentor(s): Geraldine Zeldes (College of Communication Arts Sciences)

We joined a documentary film making team at the beginning phases of two different projects, "The First Lady of Boxing" and "Boogie Bob & Chuck Berry," in which we performed two different roles - reporter and producer, and website content creator. Jackie Kallen is the first and most successful female boxing manager, who has shaped many boxing champions. As a successful female in a very male-dominated industry, Jackie defies the odds and was also the first female to be inducted into the Michigan Jewish Sports Hall of Fame. Bob Baldori, known as "Boogie Bob" by his peers in rock and roll, is an eccentric musician and lawyer who was a member of the band The Woolies and toured with rock sensation Chuck Berry.

COMMUNICATION TACTICS FOR EFFECTIVE ROLE NEGOTIATION IN THE WORKPLACE

Presenter(s): Jillian Plant
Communication Arts & Sciences
Mentor(s): Scott Shank (College of Communication Arts Sciences), Vernon Miller (College of Communication Arts Sciences)

Alongside Dr. Vernon D Miller and Ph.D. candidate Scott Shank, I have been crafting a study to investigate the ways in which effective employees use communication to negotiate their roles in the workplace. We will utilize both interview and survey methodologies to collect contextual information surrounding one's neogtiation as well as the specific strategies, tactics, and methods that participants used that resulted in role change outcomes. We will likely collect data from a range of successful cases of employee role change to analyze how their approaches to communication influenced these outcomes. Much of our design is based upon a theoretical framework created by Dr. Miller that analyzes the communicaitve components of already-established role change conceptualizations.

GREAT LAKES ECHO: SCIENCE COMMUNICATION WITH THE PUBLIC

Presenter(s): Daniel Schoenherr, Genevieve Fox, Jack Armstrong, Nicoline Bradford
Communication Arts & Sciences
Mentor(s): David Poulson (College of Communication Arts Sciences), Eric Freedman (College of Communication Arts Sciences)

Major media outlets are struggling to adequately cover the environmental beat as climate change becomes a more impactful topic across the country. Great Lakes Echo is the solution to this news shortage, reporting on environmental stories within the binational Great Lakes region. This year, the Solutions Journalism Network is providing us with funding to take environmental problems and write about how people are working to solve them. In addition, our team of student reporters have been successful with adapting stories to other mediums, such as TikTok, in order to reach new audiences.

A DEEPER LOOK INTO CRITICAL PHOTOJOURNALISM IN THE DIGITAL AGE

Presenter(s): Subah Bhatia
Communication Arts & Sciences
Mentor(s): Judith Walgren (College of Communication Arts Sciences)

We see images that tell stories all around us, every day; on television, in magazines and newspapers, and with the growing popularity of social media, even on our phones. In this new world of unfettered access to both the creation and consumption of content and news, photojournalism finds itself at a crossroads as a profession. There are growing concerns about how to conduct ethical, conscious, and impactful photojournalism, and the new textbook, "Critical Photojournalism: Practice, Ethics, and Business," by Judith Walgren and Tara Pixley investigates this question. As a research assistant on the project, I listened to and transcribed interviews conducted with various media professionals and related experts on photojournalism for the book. This presentation will delve into some of the most pertinent and interesting themes that arose from this research, including the social impact of photojournalism, legal and ethical frameworks within which it should be conducted, the importance of trauma-informed photojournalism, and the business aspect of the skill in today's world.

TTTRWE URA EXPERIENCE

Presenter(s): Abby Sobutka
Communication Arts & Sciences
Mentor(s): Denise Acevedo (College of Arts & Letters)

Transforming Teaching Through Reflective Writing (TTTRWE) is a reacher portfolio led by Dr. Denise Acevedo and her team of participants. TTTRWE is designed to help individuals to utilize reflection in combination with partnership and communication to develop their role as educators. I have had the opportunity to work closely with Dr. Acevedo to develop and maintain the design, accessibility, and user experience of the website as well as keep it up to date. Specifically, I have designed layouts, converted file types, broken down information, in addition to the many other tasks I have completed in this position. As a Public Relations (PR) major this opportunity has been pivotal in my understanding of how to efficiently relay information, which is necessary for my future as a PR Specialist.

FOR PROSPECTIVE SPEECH-LANGUAGE PATHOLOGISTS, WHAT CAN WE EXPECT IN OUR VOICE-RELATED CASELOAD?

Presenter(s): Myrna Walters
Communication Arts & Sciences
Mentor(s): Eric Hunter (College of Communication Arts Sciences), Lady Catherine Cantor Cutiva (COLLEGE OF Communication Arts & Sciences)

A recent cross-sectional study surveyed speech-language pathologists in South America about the populations they most commonly serve. Data was obtained through the use of a Qualtrics survey that asked the clinicians several questions relating to the clients they work with and what their typical caseload is comprised of. In total, the populations that were the most commonly served on the speech pathologists' caseloads were individuals with swallowing problems and individuals who reported head and neck problems. The data obtained from this study allows prospective speech-language pathologists and current students to get an accurate idea of the populations they might work with as a clinician. With this information, individuals who are studying to become speech pathologists have the opportunity to gain a better understanding of the field of speech pathology which will allow them to further decide whether they are entering a field that is right for them and their interests.

WHY DON'T THEY LIKE ZOOM?

Presenter(s): Apichaya Thaneerat, Ky Chimrak, Nadiah Mohamed Hasnol, Viv Martinez-Sandoval
Communication Arts & Sciences
Mentor(s): Cheryl Caesar (College of Arts & Letters), Joyce Meier (College of Arts & Letters)

During the pandemic and shutdown, MSU made great strides in ensuring accessibility to online courses for all. But perhaps one overlooked category is the particular challenges MSU's international students face. For several years now, our team has been examining the difficulties faced by these students, doing research and creating videos on this topic for use in faculty workshops and scholarly publications. The main purpose of our study is to heighten faculty awareness of the challenges that international students face in their learning. Most recently, we are working on creating the new video "Why Won't They Like Zoom?" which turned our attention to online learning, and the specific challenges multilingual students face there- including, but not limited to, the speed of code- and language-switching from home to online class; internet connectivity; time zones differences, etc. Our presentation will share our progress on this latest video, as well as a reflection on our last three videos, including two signature events of the past year: a presentation at a national conference, and our publication of a scholarly article in Young Scholars in Writing.

PARASOCIAL RELATIONSHIPS AND REAL-LIFE RELATIONSHIP SATISFACTION

Presenter(s): Mya Smith
Communication Arts & Sciences
Mentor(s): Maria Molina Davila (College of Communication Arts Sciences)

This study seeks to assess the strength of the participant's parasocial relationship, as well as the level of satisfaction with their partner in their current relationship. We will then observe whether there is any correlation between a parasocial relationship strength and relationship satisfaction.

INVESTIGATING THE PHONEMIC CONTENT OF CONNECTED SPEECH FOR A SAMPLE OF HIGH-SPEED VIDEOENDOSCOPY DATA FROM ADDUCTOR SPASMODIC DYSPHONIA

Presenter(s): Zach Kam
Communication Arts & Sciences
Mentor(s): Maryam Naghibolhosseini (College of Communication Arts Sciences)

Diagnosing vocal pathologies requires analysis of successful uptake of vocal measurements that hint characteristics of the unique physiology of a patient's laryngeal system. These measures derive from movements of the vocal folds during the beginning and ending of vocalizations. The clinical practice of laryngology has a long history of utilizing endoscopic procedures to view these movements and collect information on vocal fold movements. Recently, high-speed videoendoscopy (HSV) has been investigated as a higher precision tool allowing a better view of the vocal fold dynamics during connected speech. To study vocal fold vibrations, connected speech passages have been used. The HSV data were obtained while the patients read these passages. The goal of this work is to study the vocal fold function at the beginning and ending of vocalizations for different syllabi. Measures of vocal fold vibrations will be discussed during connected speech.

GUIDANCE FOR MY FUTURE
Presenter(s): Audrey Richardson
Communication Arts & Sciences
Mentor(s): Judith Walgren (College of Communication Arts Sciences)

Through this opportunity I've had with Judith Walgren, I've been able to grow as a journalist immensely. Specifically, from an ethical standpoint, I understand the role of photojournalism a lot better and weight we hold as storytellers. This presentation will show some of my favorite things I've learned from journalists around the world and how I will be applying what I've learned to my own work.

CRIMINAL JUSTICE & LEGAL STUDIES

STRATIFIED SUFFRAGE: A CRITICAL ANALYSIS OF THE HISTORY AND POLICY OF FELON DISENFRANCHISEMENT IN THE UNITED STATES
Presenter(s): Casey Orr
Criminal Justice & Legal Studies
Mentor(s): Matthew Galasso (College of Social Science)

The present study conducted a critical analysis of the historical and contemporary policy of felon disenfranchisement in the United States. These policies have restricted the voting rights of convicted individuals since the Colonial Period and into the current day. Many scholars will claim that felon disenfranchisement is a necessary, traditional, and/or purely regulatory facet of the criminal justice system. Others will argue that it has punitive power and that voting rights are limited as a form of punishment for crime. However, the unabridged history of the policy proves otherwise. Through a comprehensive analysis of the history of the policy, felon disenfranchisement is shown to be a tool of oppression and social control used by various elite forces in the United States to perpetuate structural violence and further systemic disparities. After this review, it is clear that the policy should be abolished in favor of restoring voting rights and social programs that aim to increase voting accessibility and awareness.

REPORTING CRIME TO THE POLICE
Presenter(s): Allison Supanich-Goldner
Criminal Justice & Legal Studies
Mentor(s): Anna Gurinskaya (College of Social Science)

Crime is notably underreported in most countries. This presentation investigates the trends in and factors that influence crime reporting. To answer this question, I reviewed literature on global crime reporting trends, relationships with the police, and technological advancements that may play a role in crime reporting. I also conducted statistical analysis of secondary data collected in St. Petersburg, Russia in 2019 regarding Russian students' willingness to report crime to the police. I look at the gender and income differences in crime reporting patterns as well as at citizens' perceptions of the police that may have an impact on the decision to report. Findings and policy implications will be discussed.

WHY STUDENTS IN RUSSIA DO NOT REPORT SEXUAL HARASSMENT: FEAR OF RETAILIATION OR LACK OF INSTITUTIONAL LEGITIMACY?

Presenter(s): Andrea Lawson, Avery Underwood, Dhyey Dalal, Morrigan DeClerck
Criminal Justice & Legal Studies
Mentor(s): Anna Gurinskaya (College of Social Science)

This research project hopes to examine why students in Russian academia do not report sexual harassment. Two variables are analyzed: fear of retaliation and lack of institutional legitimacy. Early research indicates that lack of institutional legitimacy greatly influences if students report issues. If a university doesn't establish itself with concrete rules and consequences against crime and misconduct and legitimize its authority by punishing harassers early on, reports of sexual harassment become underreported despite students suffering continued incidents of sexual harassment, as reported by surveys we have gathered. Students themselves feel pressured to not report due to another variable, a fear of retaliation. This is often related to suspected consequences inflicted by the harasser as they are often a professor or an authority figure to the victim, as surveys further indicate. A student may fear that a professor will be more critical of them academically if they do not submit to sexual advances. If students are fearful of being "punished" in some form by rejecting sexual advancements, reporting drops significantly. The findings by the presenters reflect an ingrained distrust and fear within Russian academia when considering reporting crimes of sexual harassment committed by university faculty. Additional research revealed a perceived general lack of faith or justice by public and social authoritative institutions when handling cases of crime or misconduct and their reports thereof. An imbalance of social order and systems with little regard for student well-being perpetuate the dismissive manner of university conduct when addressing students brave enough to report.

SEVEN MONTHS OF LOCKDOWNS, YEARS OF POLICE MISCONDUCT: THE SOUTH AFRICAN COVID EXPERIENCE

Presenter(s): Eva Ott Hill
Criminal Justice & Legal Studies
Mentor(s): Em Hernandez (College of Social Science), Sanja Kutnjak Ivkovic (College of Social Science)

As apartheid ended in South Africa during 1994, efforts were made to reform the police service in accordance with the democratic principles, however police misconduct issues persisted, and still exist in present day. At the same time, various NGO reports suggest that police officers are not frequently held accountable either by their police supervisors or by external agencies of control. When the COVID-19 pandemic started, police agencies in many countries had been entrusted with the task of enforcing newly enacted COVID-19 rules and regulations, often with a lack of clear guidelines and adequate police training. In late March of 2020, South Africa entered one of the strictest lockdowns to slow the spread of the coronavirus. The enforcement of the lockdown laws was assigned to the South African Police Service (SAPS) and the military. This study seeks to examine how the police agency with a history ripe with examples of violations of citizens' rights and police misconduct has adjusted to these new conditions. In the study, we analyze various forms of police misconduct as documented 50 unique newspaper reports in the leading South African online portals during the first year of the pandemic (March 2020-June of 2021) when the most stringent measures were introduced. Articles reveal that police in South Africa participated in various forms misconduct including, murder, assault, and corruption, when enforcing lockdown regulations.

DIGITAL HUMANITIES

HANDLE WITH CARE: VISUALIZATION OF COMFORT OBJECTS USING TEXTUAL CONTENT OF SURVEYS

Presenter(s): Sania Sinha
Digital Humanities
Mentor(s): Parisa Ghaderi (College of Arts & Letters), Parisa Kordjamshidi (College of Engineering)

This work is a novel application of natural language processing and word representations in creating artwork that visualizes descriptions of people's comfort objects which potentially can help in regulating their emotions. We use natural language representation techniques to visualize the information collected. In a survey, we asked people from different relationship backgrounds to describe different qualities of a thing that gives them comfort in times of conflict, trauma, and distress. We used pretrained language models to get vector representations of participants' description of comfort. The results of the natural language vector representations are visualized in a 3D space and used as materialization of the idea of comfort for each individual. We include a human study to find out the effectiveness of various aspects of our visualization.

CREATIVITY IN THE TIME OF COVID-19: USING CREATIVITY TO DOCUMENT EXPERIENCES IN MEDICINE

Presenter(s): Emily Willerick, Grace Bonnema, Jacob Okulewicz, Marine Avequin, Neha Navathe
Digital Humanities
Mentor(s): JULIAN CHAMBLISS (College of Arts & Letters), Natalie Phillips (College of Arts & Letters), Soohyun Cho (College of Arts & Letters)

Our Mellon founded project, Creativity in the Time of COVID-19: Art as a Tool for Combating Inequity and Injustice, 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. Gathering stories of how individuals turned to creativity to get through the pandemic, this project culminates in a digital and in-person exhibition to explore how the shared space of collective artworks (and memories) may pave a path towards envisioning a more just future. Creativity, broadly defined, has 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, anxiety, and stress, but also expressed hope for the future and pride in their identities. Many of these survey responses came from people working in medical and medicine-adjacent fields. Physicians, nurses, physician assistants, technicians, and other people in healthcare have submitted their works of creativity and their associated stories. Through these submissions, we look to better understand the unique burdens that the pandemic has placed on these occupations. In addition, we look to observe the approaches used to cope with these burdens. This presentation examines how people-especially people who work in healthcare-use creativity, both individually and collectively, to address the pandemic, process trauma, archive, and remember.

NARRATIVE PROCESSING IN MUSIC COGNITION: ARE SPECIFIC THEMES AND STORIES LINKED TO INDIVIDUAL INSTRUMENTS?

Presenter(s): Gracie Rudolfi, Jacob Okulewicz, Sydney Logsdon
Digital Humanities
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 called "The Role of Narrative Listening in Music Perception." The study explores whether participants imagine or "hear" stories while listening to musical stimuli. One of the experiments had participants from the U.S. and Dimen, China listen to instrumental music and asked them to describe any narratives they may have heard. A surprising number of people perceived stories. There were many patterns in how participants responded, one of which involved how listeners, particularly western listeners, attributed particular recurring themes to specific instruments. For example, listeners would often associate Native Americans with excerpts including flute. Based on the largely single-instrument Chinese music chosen for listeners, we were inspired to design a "single instrument" study with western music. Our presentation will discuss this study. Preliminary data collection has already proven relevant to our inspiration for the study, as many responses directly mention specific instruments and instrument families. Pair this with the reoccurring narrative themes associated with each music excerpt (e.g., Christmas stories written while listening to bells, football games mentioned in snare drum-based narratives), and this study brings us one step closer to understanding the nuances of western listeners' enculturated perception of music alongside Chinese listeners' responses. This research also expands upon previous studies by asking respondents about memories they may associate with certain music, if they can recognize the instrument being played in each excerpt, and whether they have any musical or performing arts experience.

CREATIVITY IN THE TIME OF COVID-19: OUR RELATIONSHIP TOWARDS THE ART WE MAKE

Presenter(s): Paige Seidell, Quynh Tong, Sydney Logsdon, Tushya Mehta
Digital Humanities
Mentor(s): JULIAN CHAMBLISS (College of Arts & Letters), Natalie Phillips (College of Arts & Letters), Soohyun Cho (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 disproportionately affected populations are using creative outlets to foster healing and begin to push back against the systemic inequities exacerbated by the COVID-19 pandemic. Gathering stories of how individuals turned to creativity to get through the pandemic, this project culminates in a digital and in-person exhibition to explore how the shared space of collective artworks (and memories) may pave a path towards envisioning a more just future. Creativity, broadly defined, has 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, anxiety, and stress, but also expressed hope for the future and pride in their identities. This poster examines how people-especially marginalized populations-understand their preferred creative outlets by applying close reading methods to their self-written descriptions of their artworks and processes.

DIVERSITY & INTERDISCIPLINARY STUDIES

UNDERGRADUATE STUDENTS' INTERPRETATIONS OF COVID-19 DATA AND DATA REPRESENTATIONS

Presenter(s): Dorothy Zhao, Jesse Rayer, Sanjana Pingili
Diversity & Interdisciplinary Studies
Mentor(s): Louise Jezierski (James Madison College), Melvin Peralta (College of Arts & Letters)

Data are tools used to understand the world around us: they allow us to better educate others and ourselves. There have been 83,413 cases and 873 COVID-19 related-deaths in Ingham county since the COVID-19 outbreak. This study investigates undergraduate students' understandings of COVID-19 in Ingham county through the dissemination of a survey and the development of a corresponding data story. The survey was developed in collaboration with undergraduate students in a research seminar on data and data storytelling. The survey was given to undergraduate students in living-learning communities offered by the university. Both quantitative and qualitative questions were asked about the impacts of COVID-19 on education, including mask policies and changes in university level education. Survey results suggest that students who spend time processing graph results and meanings are three times as likely to keep their opinion the same as they are to change it. Students are also twice as likely to submit an answer that doesn't fit the criteria of the question in a survey as they are to carefully read the instructions. To make sense of our findings in ways that extend beyond traditional data analytical and representational techniques, we explore the data using a web-like data visualization through the medium of string, an approach that builds on the emerging field of data physicalization. This study can help shed light on the relationship between data and social issues in new ways and can contribute to the fields of data literacy, critical data studies, and data representation.

UNDERGRADUATE STUDENTS' INTERPRETATIONS OF SOCIOECONOMIC MOBILITY

Presenter(s): Amelia Marine, Delaney Jones, Elizabeth McDonough
Diversity & Interdisciplinary Studies
Mentor(s): Louise Jezierski (James Madison College), Melvin Peralta (College of Arts & Letters)

Data are intertwined in all aspects of people's lives, yet their relevance and appearance are often obscured. To progress as a society, we must understand how young people use data to understand evolving social issues. Concerns over the income gap and economic mobility as a social issue of and therefore, comprehending data in relation to this topic is crucial. This study investigates undergraduate students' understanding of the income gap and economic mobility through the dissemination of a survey and the development of a corresponding data story. Student researchers developed the survey as part of a research seminar on data and data storytelling and distributed the survey to select undergraduate students. The survey posed questions regarding students' comprehension of income gap graphs, their perception of economic mobility, and education's correlation with economic status. The survey revealed respondents' beliefs in a meritocracy and understanding of wealth distribution across the United States. A majority of respondents successfully interpreted the given data visualization. Further, results suggested that a majority of respondents believe that education contributes to economic mobility, though responses vary across demographic characteristics. Results were analyzed and represented through the development of a poster and TED Talk. Such data storytelling creates a way for discovering the economic literacy comprehension of young people as they prepare to enter the workforce. The study also contributes to the broader field of data and data storytelling, particularly as it concerns efforts to consider new possibilities for collecting, analyzing, and representing data in an undergraduate setting.

UNDERGRADUATE STUDENTS' INTERPRETATIONS OF SOCIAL ISSUES: FOOD INSECURITY

Presenter(s): Carlie Arnold, Isabelle Radakovich, Seraphina Thomas
Diversity & Interdisciplinary Studies
Mentor(s): Louise Jezierski (James Madison College), Melvin Peralta (College of Arts & Letters)

As students enter a world that yearns for influence, it is crucial to understand how they interpret data that provide them with new perspectives and a broader understanding of society. This study investigates undergraduate students' understandings and perspectives of food insecurity and data representation through the dissemination of a survey and the development of a corresponding data story. The survey was developed through a collaboration among undergraduate students in a research seminar focused on data and data storytelling. Through the survey, students enrolled in living-learning communities at the same university were asked about their opinions on U.S. involvement in domestic and international food insecurity after viewing varying forms of data visualizations. Quantitative and qualitative data analysis methods suggest that the majority of students surveyed felt the U.S. should put efforts into domestic food insecurity, and were less conclusive on the effectiveness of helping with international food insecurity based on the visualizations presented. The proposed presentation will focus on how data visualizations of international food insecurity influenced the perspectives of undergraduate students, and how data storytelling can help researchers understand such data in new ways. Contributions of the study include a greater awareness of how young people can seek to understand the kinds of resources that resonate with peers in order to effectively present data, particularly around issues of pressing social concern. As new technology presents a larger abundance of information, knowing how students respond to data is vital to establishing a literate society.

KEY FINDINGS RELATED TO THE ACCESSIBILITY OF VEHICLES FOR PERSONS WITH MOBILITY DISABILITIES

Presenter(s): Ryan Harth
Diversity & Interdisciplinary Studies
Mentor(s): Sloan Kanat (College of Engineering), Tamara Bush (College of Engineering)

There are an estimated 1.3 billion persons with disabilities worldwide which makes up 16% of the global population. For individuals with mobility disabilities, access to accessible transportation is a major issue that can negatively affect their everyday lives and limit their independence. The lack of accessible transportation options prevents persons with mobility disabilities from attending necessary medical appointments, grocery shopping, or socializing with friends. The goal of this study was to understand the requirements for accessible pick up and drop off (PUDO) zones for this group of individuals if there was an autonomous vehicle. Interviews were conducted with 25 persons with disabilities where a series of questions were asked regarding their experience with their current and past transportation situations, to determine the aspects of the PUDO zones that may be the most inaccessible. The data were analyzed and trends were discovered that showed the most common difficulties individuals with mobility disabilities faced in their daily lives related to transportation. Participants reported on their preference of a ramp or a lift when loading into vehicles. Overall trends show an even split in the number of participants that prefer a ramp to a lift. They also provided the rationale for these preferences which were most commonly associated with previous experiences. For persons with mobility disabilities, there is limited access to reliable, fast, and accessible on-demand transportation. The creation of autonomous vehicles equipped with accessibility tools will allow for more spontaneity and independence in the lives of persons with disabilities.

VARIABLE PATTERNS IN RISKS AND THEIR LEVELS AMONGST DIVERSE JUVENILES

Presenter(s): Alissa Hakim
Diversity & Interdisciplinary Studies
Mentor(s): Ashtaan Rapanos (College of Social Science), Caitlin Cavanagh (College of Social Science)

Juvenile risk assessments evaluate factors that relate to trends in juvenile offending risk and identify potential risk variables. The current research examines the relationship between race/ethnicity and risk levels/factors amongst juvenile delinquents in Ingham County. The Youth Level of Service/Case Management Inventory (YLS-CMI) assessment will provide pre-Covid (2015-2019) data for this research. The project expands on previous research which has found that risk scores for Black youth had a less significant rate of change compared to white youth. Areas of risk for Black youth were also higher than white youth in every variable. Past projects identified structural racism as a barrier that could influence these differences since adversity disproportionately affects minority groups and elicits biases (Kitzmiller, Paruk, Cavanagh 1344). Much of the literature indicated school settings as an area for concern, thus focusing on education, peer relations, personality and behavior, and attitudes and orientations may add to the conversation by illustrating racial/ethnic disparities in risks and risk levels. My hypothesis indicates that nonwhite youth in Ingham County will have the most significant differences in risk levels compared to white juveniles. This project aims to synthesize data with historical and contemporary discussions on juvenile justice to answer the question, "How are disparities in risks and risk levels between juveniles of diverse racial/ethnic background indicative of different needs?"

THE GOOGLY DRIVE

Presenter(s): Shannon Schollaert, Zachary Williams
Diversity & Interdisciplinary Studies
Mentor(s): David Biedenbender (College of Music), David McCarthy (Residential College in the Arts & Humanities)

Inspired by The Book of Joy, The Googly Drive aims to install low-budget and subtle art throughout the Michigan State University campus in an effort to spark joy and laughter in a recovering community.

STUDYING NEGATIVE SOCIAL EFFECTS AND MISCONCEPTIONS OF CYSTIC FIBROSIS OF PATIENTS AGED 17-24, PRELIMINARY DISCUSSION FOR PULMONARY ORGANOID DEVELOPMENT

Presenter(s): Destiny Kanning
Diversity & Interdisciplinary Studies
Mentor(s): Ashlee Price (College of Human Medicine), Ryan Thomas (College of Human Medicine)

An ongoing study discussing preliminary research for the purpose of motivational background for pulmonary organoid development with the intent to broaden understanding and outreach efforts to patients diagnosed with Cystic Fibrosis (CF) within university environments. Thanks to revolutionary medication substantially affecting life expectancy for those diagnosed with the disorder, these students are faced with a greater concern than that of the symptoms of cystic fibrosis itself. The misrepresentations and underrepresentation of students facing the extreme mental and physical effects of pulmonary disorders within university environments are primarily overlooked and misconcepted by both the campus community and faculty. Ranging from medical misinformation amongst faculty/staff to ill-preparedness and inaccessibility, students diagnosed with CF, becoming an ever-growing population seeking higher education, is a concern in the event that proper treatment is not upheld and understood between the student body and campus coomunity. Following approval by the IRB, survey data collected over the course of the past few months reveal extreme lack of understanding of the disorder and its effects amongst faculty, staff, and students alike, whilst equally highlighting the underrepresentation of those affected within the Michigan State University community, unlike those faced with similar disorders who are predominantly highlighted. This will discuss not only the concerns of misrepresentations but also underrepresentation amongst the diverse student body at Michigan State University and, as mentioned above, will encourage the development of research with a clinical focus prioritising organoid development in order to establish a baseline understanding of CF exacerbation triggers within standard university environments.

EFFECTS OF COVID-19 ON MIGRANT FARMWORKERS

Presenter(s): Abigail Rodriguez
Diversity & Interdisciplinary Studies
Mentor(s): Amanda Flores (College of Communication Arts Sciences)

This literature review examines the effects of the COVID-19 pandemic on Latinx migrant farm workers, with a focus on the disparities in health outcomes, access to healthcare, and labor protections. The COVID-19 pandemic has highlighted the vulnerabilities of Latinx migrant farm workers, a group that has long been subject to systemic inequalities and exploitation. The Bracero Program, a guest worker program that brought Mexican laborers to the United States from 1942 to 1964, provides historical context for the treatment of Latinx migrant farm workers and the subsequent creation of the H-2A program. Despite reforms to labor protections, the lack of legal status, language barriers, and limited access to healthcare many Latinx migrant farm workers are left at risk of COVID-19. The review highlights the need for policy solutions that address the structural barriers faced by Latinx migrant farm workers. These solutions include expanding access to healthcare, ensuring labor protections, providing language services, and addressing the systemic inequalities that have historically left Latinx migrant farm workers vulnerable to exploitation. By addressing the challenges faced by Latinx migrant farm workers during the pandemic, policymakers can work towards a more just and equitable agricultural system. Keywords: Pandemic; coronavirus; COVID-19; immigration; migration; immigration; migrant farm workers; pesticides; healthcare; healthcare inequities

SISTERHOOD: BUILDING TRANSNATIONAL RELATIONSHIPS

Presenter(s): Alissa Hakim, Marielena Silva
Diversity & Interdisciplinary Studies

Mentor(s): Sitara Thobani (Residential College in the Arts & Humanities), Tama Hamilton Wray (Residential College in the Arts & Humanities)

The RCAH Sister Circle is an organization that aims for the holistic development of undergraduate women of color professionally, personally, and academically. The current research project will analyze how transnational partnerships create a community of practice- virtually and in person. To do so, we will cultivate a space conducive to a reciprocal exchange of knowledge that integrates culture and community in a transnational partnership with the Young Women's Leadership Program at the University of Botswana. Through transcultural collaboration, we aim to foster connections with other woman-centered organizations thus building an environment of sisterhood. The concept of sisterhood has been central to feminist philosophy and organizing. Sisterhood is a connection that is not rooted in identity or physical classifications, but rather by a common struggle built around shared lived experiences and multiple social relations (Zaytoun and Ezekiel 196). Sisterhood is a relationship and a process that brings individuals together to envision a better future; thus, it is categorized as a community of practice. Our study examines the way participants create a community of practice under a framework of developing "meaningful relationships through the shared vulnerability of occupying the ambiguous liminal space" (Erickson 214). For the current research, we aim to answer the question: how do local, national, and global contexts create a community of practice between transnational organizations? We hypothesize that systemic issues, specifically racism and patriarchy, will have similar effects on both organizations but positionality will diverge because of local contexts.

TELEVISION NEWS AND THE (MIS)REPRESENTATION OF COCAINE AND OPIOID USERS: A SYSTEMATIC STUDY OF NBC NIGHTLY NEWS REPORTS

Presenter(s): Jonah Cumings, Sharmila Suresh
Diversity & Interdisciplinary Studies
Mentor(s): John Waller (College of Social Science)

It has become something of a cliché to assert that today's opioid users are depicted more sympathetically by the American media than were the users of cocaine, particularly in the form of crack, during the 1980s. The modern users of opioids, especially drugs like OxyContin® or synthetic opioids such as fentanyl, are widely said to be characterized as the unfortunate victims of a public health crisis while the users of cocaine in the 1980s were demonized as dangerous criminals who warranted harsh policing and incarceration. This project seeks to ascertain whether or not there is a factual basis for this widespread perception. We also evaluate the hypothesis that a differential framing of drug use can be at least partially explained by the association of cocaine use with African Americans in the 1980s and the association of opioid misuse with whites in the present. In order to evaluate these claims, we have coded online databases of NBC Nightly News broadcasts over two seven-year periods using a carefully-designed set of criteria. We provide compelling evidence that (a) depictions of cocaine use in the 1980s were significantly more negative and condemnatory than those of opioids in the 2010s; (b) Black use of cocaine in the 1980s was grossly exaggerated; and (c) the lack of sympathy for cocaine users expressed by NBC in the 1980s is to come extent explicable in terms of pervasive racist attitudes.

EDUCATION

COMPARING WHITE YOUTH, NON-WHITE YOUTH, & BLACK YOUTH: THE IMPACTS OF SCHOOL RISK FACTORS

Presenter(s): Jade Elder
Education
Mentor(s): Caitlin Cavanagh (College of Social Science)

The school-to-prison pipeline refers to the school policies and procedures that drive many of students from disadvantaged backgrounds or marginalized communities into a pathway that begins in school and ends in the criminal justice system. There is a distinct direction for children of color compared to white children based on the discrimination they experience from having higher levels of suspensions or representing a higher proportion in school sanctioned diversion programs. The present study will help to understand how to support youth who have been arrested overcome the STTP by understanding how school-related risk factors differ between youth of different races in a midwestern city. The present study will help to understand how to support youth who have been arrested overcome the STTP by understanding how school-related risk factors differ between youth of different races in a midwestern city. I will be focusing on data that is collected by the Juvenile Risk Assessment Team (JRAT) project to compare the impacts they have on youth of different races, specifically white youth, non-white youth, and Black youth.

WHAT GOES INTO A 4.0? DETERMINING ALIGNMENT BETWEEN ASSIGNMENTS AND EXAM SCORES IN LARGE SCALE COURSES

Presenter(s): Kate Schleusener
Education
Mentor(s): Caitlin Kirby (College of Arts & Letters)

Determining the appropriate workload and types of assignments for students to meet their learning outcomes is a challenge for instructors. This can be particularly challenging in large-enrollment courses designed for majors and non-majors. We conducted a survey with students from one such large-enrollment course in Fall 2022 (n=441) to explore the relationships between students' effort, time, and grade on various course activities and their final course grades. We also explored student perceptions of workload. Results will be used to modify the course design to ensure alignment between student assignments and exam questions.

STRIVING FOR VALIDITY: ANALYSIS OF QUALITATIVE METHODS USED TO EXPLORE EMPLOYER-DESIRED COMPETENCIES IN PROJECT-BASED GENERAL CHEMISTRY LABORATORY COURSES

Presenter(s): Priya Patterson-Lee
Education

Mentor(s): Brit Eggly (College of Natural Science), Lynmarie Posey (College of Natural Science)

Qualitative research has been historically questioned because of its reliance on individual experiences as the primary source and relying on coder interpretation for results. Modern science has been accepting of quantitative data because of its assumed validity based on the data collection and analysis methods used. These methods are generally seen as more reliable compared to qualitative collection practices. Studies following a qualitative methodology mainly discuss the results or outcomes, with a lack of transparency about the analysis practices utilized, further enhancing the disbelief in the use of qualitative methodologies. In this study, interviews were conducted to determine what skills students perceived as being needed for their future careers and how these were being developed through experiences within the general chemistry laboratory courses. The interviews were analyzed using qualitative software (MAXQDA) and inter-rater reliability (IRR) was measured using Brenan and Prediger's kappa. This poster will focus exclusively on the iterative nature of the coding process and the importance of collaboration between coders as evidence that qualitative is both rigorous and reliable.

SAY WHAT?!: HOW GROUP ENGAGEMENT IMPACTS LEVEL OF REASONING IN RESPONSE TO COMPLEX QUESTIONS

Presenter(s): Kate Wiacek, Margaret Stosio, Michael Demercurio, Travis Yang
Education
Mentor(s): Jennifer Doherty (Lyman Briggs College)

Group discussion is often a key component of class time, but how effective is this discussion in furthering students' understanding, especially in regards to complex questions? To address this question, we analyzed recordings of zoom breakout room discussions as students worked together to solve complex biology questions. We coded their discussions based on what kind of information each student was adding, how often students co-constructed answers, if students revised their answers, or if they asked further questions. We also coded each group's final answers to each question for correctness in an attempt to correlate discussion engagement patterns with conceptual understanding. Instructors will be able to use our results to guide classroom discussion to promote deeper understanding of complex topics.

ERROR CORRECTION IN AN ONLINE MULTILINGUAL COMMUNITY-BASED CLASSROOM

Presenter(s): Henry Vanfaussien, Mitchell Ernst, Vincent Guerrieri
Education
Mentor(s): Anara Akhmetova (College of Education), Sandhya Shanker (College of Education)

Error correction is a crucial aspect of the process of acquiring a second language. The use of corrective feedback has been shown to lead to successful learner uptake and results in learners successfully acquiring the target language vocabulary and structures. However, there has been considerable debate on what constitutes the most effective type of feedback for language learners (Ellis, 2006; Erlam & Loewen, 2006). Researchers are divided in their opinion between implicit and explicit feedback. The notion of interactional feedback was proposed to bridge both explicit and implicit error correction by using two major categories of feedback: reformulations and elicitations (Gass, 1997). Reformulations (or recasts) occur when teachers provide feedback that re-phrases the learners' erroneous utterances into a target-like form while elicitations seek to push learners to implicitly or explicitly reformulate their utterances into the correct form (Ahluwalia, 2019; Kim, 2018). In this project, the researchers seek to explore the efficacy of reformulation and elicitation approaches to see which one results in higher degrees of immediate learner repair (uptake) (Nassaji, 2007). The intervention will take place in an online community-based language program for students in grades 1-4 from a local school district. The program, led by MSU's Teacher Education candidates, is taught in three languages, German, French and Spanish, concurrently. The two strategies will be analyzed separately to compare the two different treatments. For each, error corrections will be tallied, and immediate uptakes will be noted as successes. The percentage of success will be compared between the two strategies.

LAND-BASED LEARNING AND LOCAL FOOD IN SCHOOL

Presenter(s): Maezie Nettleton
Education
Mentor(s): Aaron McKim (College of Agriculture & Natural Resources)

Students from two high schools in the Upper Peninsula participated in an authentic land-based problem and Land-Based Learning (LBL). LBL is a flexible process for building student-led teams that act on sustainability issues through four stages: (a) identification of a local phenomenon and partners, (b) understanding of place and connected systems, (c) place-based intervention to enhance sustainability, and (d) evaluation of changes in place, systems, and community. Students from each school developed a solution for how to incorporate more local food into their school's cafeteria and then proceeded to write grants in order to receive funding for their solution. Data was collected by interviewing students, teachers, food service directors, and a farmer who participated in the project in a focus group. The data collected was then analyzed following an inductive coding process. In coding we found that LBL promotes student agency and project legitimacy, LBL provided an educational approach which promoted student engagement in and ability to influence the local food system, and through LBL, students were provided with opportunities to engage in authentic leadership experiences.

THE ROLE OF DIGITAL MEDIA USE AND MOTHER EDUCATION IN PRESCHOOLERS' LANGUAGE AND LITERACY DEVELOPMENT

Presenter(s): Apoorva Chalasani, Grace Krajewski
Education
Mentor(s): Burcu Ozkum (College of Social Science)

Young children's digital media use has become increasingly prevalent in recent years (Turco et al., 2022). The widespread use of tablets, apps, etc., poses potential consequences for children's cognitive development in their most vulnerable developmental stages, making it important to understand the implications of these practices (Anderson & Subrahmanyam, 2017). This study aims to understand how children's digital media experiences at home are associated with their language and literacy outcomes. 182 preschoolers (ages 3-5) were assessed virtually on their language comprehension, vocabulary, phonological, and letter name and sound knowledge. The subgroup of parents (n=77) completed a questionnaire that examined the use of digital media technologies at home. T-tests showed that for some activities, children mostly engage in digital media more independently than together with an adult (See Table 1). We found no association between the frequency of children's digital media activities and their language and literacy skills [$R2=0.06$, $F(2, 64)=2.117$, $p=0.12$]. We expect that mothers' education level plays a role where children whose mothers have a higher level of education will have more advanced language and literacy comprehension. These findings provide insight into the influence of children utilizing digital media technologies throughout their early years and their mother's education level on language and literacy comprehension.

CHARACTERIZATION OF SELF-EFFICACY IN COMPUTATIONAL SCIENCE STUDENTS

Presenter(s): Paige Tourangeau
Education
Mentor(s): Patti Hamerski (College of Natural Science)

In the classroom environment, self-efficacy pertains specifically to being competent in the course material. It has also been shown to be a strong indicator of performance, feeling a sense of belonging in the classroom environment and material retention levels among students. Further understanding self-efficacy in the classroom would give educators an opportunity to tailor instructional methods and course material in ways that would better facilitate the development of self-efficacy in students at Michigan State. The development process began with conducting a literature review to ascertain the points of consideration that must go into designing a survey questionnaire. At the same time, previously gathered interview data was analyzed in order to formulate the main question, which guided the substance of the questionnaire and provided an understanding of the ways self-efficacy could be characterized. Both of these steps informed the design process in different ways. In the future, the developed survey can be used to assess self-efficacy in computational modeling students and highlight opportunities to help students further develop their self-efficacy for this type of learning.

DEMOGRAPHIC DISPARITIES IN MICHIGAN WRITING SCORES: A COMPARISON OF LOW-STAKES AND HIGH-STAKES ASSESSMENTS

Presenter(s): Ellie Friedman, Sam Bourgeois
Education
Mentor(s): Lindy Johnson (College of Education)

The sources of demographic group differences in literacy achievement are of great importance for a wide range of stakeholders. These sources include systemic barriers to high-quality instruction, schools, and community resources as well as bias in the assessment process. In one recent study conducted in Texas, Reed and Mercer (2022) compared the magnitude of difference in scores by racial demographic between different writing score types to identify forms of assessment that might reduce bias. In particular, they measured differences in interim assessments, which are low-stakes tests often administered and scored by teachers, and summative assessments, which are administered and scored by states and trained scorers. They found significant disparities between the two score types, reflecting broader patterns of "bias in evaluating students' writing performance" (Reed & Mercer, 2022). Essentially, interim assessments were found to be more biased against students of color, making them less predictable of ultimate achievement on state assessments. Our study replicates Reed & Mercer's methodology on a set of data in Michigan. Specifically, we examined grades 5 (n=173) and 8 (n=110) separately, comparing their English Language Arts MSTEP scores to their performance in a lower stakes curriculum-based measurement (CBM), measured through Correct minus Incorrect Word Sequences (CIWS). We compared the results of students who, based on the state's data collection system, identify as "Black or African American" (11 in grade 5 and 22 in grade 8) to other racial demographic groups. Overall, our findings reflect broader patterns of testing bias against minoritized racial groups. Our presentation will discuss implications of these disparities as well as suggestions for the elimination of this bias so that assessments, at every stage, can be used as an equitable instructional tool.

DIFFUSION REASONING CONSISTENCY AMONG UNDERGRADUATE STUDENTS

Presenter(s): Jasmine Parker, Joey Vieregge, Maya Shah, Zach Kam
Education
Mentor(s): Jennifer Doherty (Lyman Briggs College)

This investigation explores how undergraduate students reason about diffusion in various contexts. Two hundred and fifty students were given homework questions at the beginning and end of an introductory physiology course. Two of the questions were evaluated in terms of reasoning level, and compared to gauge consistency. The contexts of the questions were varied to determine if students may reason differently when presented with different biological scenarios (animal, plant, physics). The primary research question is: To what extent are students consistent in their diffusion reasoning across various item contexts? This investigation also examined students' incoming GPA as a demographic factor. Student responses were scored according to five levels: 1.1, 1.2, 2.1, 3.1, and 4.1. The findings of this study indicated that item context did not affect reasoning level or consistency. However, the level at which students reasoned on the first item impacted their consistency; level 2.1 students exhibited the greatest consistency (69%), and level 1.1 students exhibited the least consistency (32%). Additionally, incoming student GPA was positively correlated with reasoning level, but had no impact on reasoning consistency. Level 2.1 reasoning is defined by a high-to-low explanation of diffusion. Students who responded at this level were most likely to be consistent, which indicates that students will latch on to this form of diffusion reasoning. Thus, we propose that teachers and professors present diffusion as an emergent property of random motion so students can understand particle movement on the macroscopic and microscopic scale.

ASSESSING A CRITICAL MAKING PEDAGOGY

Presenter(s): Marieke Anderson
Education
Mentor(s): Isaac Record (Lyman Briggs College)

There is interest in interdisciplinary approaches to solving wicked problems, problems that defy easy definition or resolution. One methodology for integrating insights from multiple disciplines is "Critical Making," which combines traditional humanities and social science "critical thinking" research techniques with creative and constructive making. This study examines the use of Critical Making in a classroom setting by employing interviews, analyzing students' reflective writing, and pretest surveys to gain insight into student learning gains in methodology and content area, as well as attitudes toward Critical Making itself. Recommendations for future research and for improving classroom implementation of Critical Making pedagogy are discussed.

DOES FACULTY PROFESSIONAL DEVELOPMENT STICK? UNDERSTANDING THE IMPACT OF THE STEM FELLOWS PROGRAM ON SUMMATIVE ASSESSMENTS

Presenter(s): Dibakar Roy, Emily Zimmer
Education
Mentor(s): Ryan Sweeder (Lyman Briggs College)

In this project we analyzed the exam writing of ten chemistry faculty members across multiple institutions who participated in the STEM Gateway Fellowship, a multi-year professional development program designed to introduce faculty to 3-dimensional (3D) learning and assessments. In this program, supported by the NSF and the American Association of Universities (AAU), participants learned about the three dimensions of STEM learning (Science Practices, Core Ideas, and Cross-Cutting Concepts) as described in the Framework for K-12 Science Teaching. They also learned how and why to incorporate these three dimensions into their teaching and assessment practices. Using the 3-Dimensional Learning Assessment Protocol (3D-LAP) we analyzed the exams and quizzes from ten different program participants who teach chemistry courses. Comparing exams written both before, immediately after, and years after the program, we are able to identify changes in participants' use of 3D assessments to determine whether what they learned in the fellowship had a lasting impact.

HOW DO STUDENTS REASON ABOUT CA++ ACCUMULATION DURING MUSCLE CONTRACTION?

Presenter(s): Isaac Gollapalli, Kyli Denny, Samantha Tadian, Tushya Mehta
Education
Mentor(s): Jennifer Doherty (Lyman Briggs College)

Calcium ions are the essential secondary messengers in muscle activation. Cytoplasmic increase of calcium concentration initiates in response to the primary stimulus, leading to muscle contraction. However, students often struggle to understand the mechanism of calcium accumulation within the cytoplasm, which the principles of influx and efflux can explain. To investigate student reasoning about cytoplasmic calcium accumulation and their use of influx and efflux, we evaluated students' responses to interview tasks about changes in calcium concentration during muscle contraction. We developed a multi-level reasoning framework to effectively assess student responses and categorize students' ability to use mechanistic reasoning to reach a correct answer. The data illustrates several trends indicating diversity in reasoning levels. This can be observed throughout the participant pool. It should also be noted that students can answer different prompts with different reasoning levels. Our presentation discusses the different levels of reasoning in-depth and evaluates the role of instructor scaffolding in increasing the students' reasoning ability for a specific prompt. The poster points towards a model of student reasoning that biology and physiology instructors can use to develop more effective pedagogical strategies.

ENGINEERING, COMPUTER SCIENCE & MATHEMATICS

COMPOSITION OF METALS CAUSES DIFFERENT SKIN REACTIONS

Presenter(s): Melanie Valtadoros
Engineering, Computer Science & Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Why does some jewelry cause discoloration of skin and other jewelry does not? I wore two different rings for two weeks: one with a wave shape, one with a circle. The wave ring did not affect my finger while the circle ring left a green discoloration on my skin. Using energy dispersive x-ray spectroscopy (EDS) I looked at the composition of each ring. I found that both rings had high levels of carbon, aluminum, and nickel. However, the wave ring contained silver and the circle ring did not. I concluded that the wave ring did not leave a discoloration because it contains a silver coating which protects skin from the affects of the other elements. The circle ring lacked the silver coating needed to prevent this green mark and thus caused skin discoloration.

USING EXOSOME COATED PRUSSIAN BLUE NANOPARTICLES AS PHOTOTHERANOSTIC AGENTS FOR GLIOBLASTOMA TREATMENT

Presenter(s): Leila Mwangi
Engineering, Computer Science & Mathematics
Mentor(s): Taeho Kim (College of Engineering)

Glioblastoma is a type of brain cancer with a 5-year survival rate of 6.8%. FDA approved Prussian Blue Nanoparticles (PBNPs) have been investigated as a novel theranostic agent for the early detection and treatment of glioblastoma. They have been proven to have good photoacoustic imaging and photothermal ablation properties. However, due to their size, these particles are unable to pass through the blood brain barrier (BBB). To overcome this, there has been an inclination to use extracellular vehicles (EVs), such as exosomes and microvesicles, as drug/gene delivery vehicles do to their innate capabilites to cross the BBB. We have developed a way to coat PBNPs with U-87 exosomes (Exo:PB) to enhance the accumulation of the particles within glioblastoma tumors . Once the uniform Exo:PB particles are fabricated, they are characterized using TEM, NTA and DLS. The stability and cytotoxicity of Exo:PB particles were investigated by investigating the photothermal activity and MTT assay and compared to PBNP and U-87 exosome controls. In vitro studies were done and resulted in a higher uptake of Exo:PB and a local therapeutic effect when exposed to an 808nm laser. Comparatively, in vivo studies, which involved IV injection of exosome coated PBNPs, resulted in better accumulation of the particles in subcutaneous U-87 tumors as well as decreased tumor size after exposed to an 808nm laser. Ongoing studies include systemic brain targeting of our particles using photoacoustic imaging and their photothermal therapeutic efficacy in vivo using an orthotopic glioblastoma mouse model.

BEAM DESIGN GUIDED BY THE INTERNAL STRAIN FIELD

Presenter(s): Erica Morrissey, Joseph Gall, Joshua Bishel
Engineering, Computer Science & Mathematics
Mentor(s): Weiyi Lu (College of Engineering)

Our project was to explore advanced manufacturing and testing methods for beams, as well as to design beams that can carry much more load. After a semester of learning engineering principles, our team designed a basic rectangular beam on SolidWorks. We then 3D printed the beam and began testing to further understand how it reacted to an applied force using digital image correlation technique and GOM correlated software. From this, we identified where the basic rectangular beams underwent the largest stress, and through further testing we developed a stronger beam with a greater height in order to withstand more force. Throughout our research process we experimented with 3D printing, prototyping through SolidWorks, and digital testing using GOM. We researched this in order to further learn about the application and construction of beams in future civil engineering and other related design problems.

DIGITAL IMAGE CORRELATION ANALYSIS OF SMALL-SCALE 3D PRINTED STRUCTURES

Presenter(s): Andrea Lopez Diaz, Lina Miedema, Maggie Gaunt
Engineering, Computer Science & Mathematics
Mentor(s): Weiyi Lu (College of Engineering)

When creating strong structures, lightweight is not usually a quality that immediately comes to mind. Although lightweight may sound like a disadvantage, it has many advantages in the engineering and architecture fields. For instance, lightweight designs tend to use less material which saves costs and resources. Ongoing research in bio-inspired structures use bones as an example of why lightweight and stiff structures are favored. Afterall, a human's femur can take up to 4000N of force. Another method of creating lightweight structures is 3D printing, which utilizes lattice structures for strength while also having a semi-hollow inside making it lightweight. 3D printing has transformed the creation of prototypes, as it is less expensive and less time consuming. This project aimed to analyze the stress of 3D-printed stiff and lightweight beams with the aid of digital image correlation technique. The beams were put under a load while being recorded using GOM digital image correlation software which then allowed us to analyze the strain distribution. Through our analysis we were able to compare our results to the theoretical beam stress distribution and better understand how lightweight beams perform. Our findings will also guide the design of lighter but strong beams under mechanical loadings.

STRESSING SUPERALLOYS

Presenter(s): Andrew Koren
Engineering, Computer Science & Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

Grain size and variation of a material determines many important properties, including impact toughness and shear strength. It is important to identify how grain size is affected by the stresses a material undergoes during manufacturing and reforming. This project will strain various metals and alloys through rolling and impact, and observe how these processes affect the force necessary to fracture the metals. The change in material properties will be observed by Scanning Electron Microscopy (SEM) to determine how changes to the microstructure relate to material strength. The results of these studies will be evaluated with respect to previous literature findings.

MATHEMATICAL ANALYSIS OF TCHOUKAILLON

Presenter(s): Linda Komis
Engineering, Computer Science & Mathematics
Mentor(s): Robert Bell (Lyman Briggs College)

Mancala is a game that contains a board that has holes or bins and pieces such as marbles or stones. Mancala is the name generally used for sowing games. Sowing games consist of successively dropping the stones consecutively into each hole so that there are no remaining stones from the pile picked up. There are many variants of the game Mancala, including Tchoukaillon. Tchoukaillon is a variant of Mancala that utilizes sweep moves in which all the stones on the board can be picked up and distributed into all the bins until they all land in the ruma. The ruma is the largest hole at the end of the board. The board in the case of this research is a hypothetical board that can contain an infinite number of holes required to win the game. In this work, computing the initial set up for each board containing n stones; analyzing patterns of moves given a board; and predicting the nth boards given previous boards are shown and discussed. Finding the length of the board required to play the game given n stones as well as providing strategy to the player regarding playing the same was analyzed and described in this study. Methods such as playing the game and recording patterns that arise as well as un-playing the game were used to find the data and make an analysis based on the yielded results.

3D PRINTING AND DIGITAL IMAGE CORRELATION ANALYSIS OF STRUCTURES

Presenter(s): Ali Atoui, Enzo Ouriques Magalhaes, Julia Crane
Engineering, Computer Science & Mathematics
Mentor(s): Weiyi Lu (College of Engineering)

Digital Image Correlation (DIC) is a field of deformation analysis that aides in solving long-standing issues in gauging the effects of external factors on different materials. Due to the software's almost nonexistent limit of potential regarding structural analysis of a given material, it will undoubtedly prove to be an essential tool in the arsenal of scientists and engineers in the fields of Material Science and Civil Engineering. It may also be observed by the research the benefits of choosing lightweight materials that offer a suitable amount of stiffness. That, however, depends highly on the density and other properties of the material chosen, as well as the cross-sectional area of the structure being tested. Be what may, it is a continuous challenge in infrastructure to develop new materials, as well as remodel old ones, to further enhance the economic viability of the project. Pairing DIC with one of the most common additive manufacturing processes in 3D-printing will allow this research to combine the resources of two distinguished fields and ascertain each of their respective effectiveness in relation to one another. Using DIC, different materials will be evaluated on their physical reaction to an outside force. This project hopes to demonstrate the potential of DIC as a tool for evaluating the effects of stress and strain on a much smaller and accurate level, allowing for better precision in manufacturing, production and development of products containing new and old materials. Utilizing PLA will offer a suitable backdrop for the demonstration of this technology.

ELECTROSPUN GELATIN-BASED SCAFFOLDS: AN ALTERNATIVE PROCESS TO 3D BIOPRINTING

Presenter(s): Pranavi Gudi
Engineering, Computer Science & Mathematics
Mentor(s): Christina Wark (College of Engineering), Scott Calabrese Barton (College of Engineering)

Materials designed for cell viability have become an important factor in tissue engineering applications. Gelatin and some of its hybrid polymers have been shown to serve as a more readily available alternative to collagen while also improving cell viability. A common approach to creating a mesh of polymer for cell growth has been 3D bioprinting where hydrogel inks of polymer and cells are 3D printed into a matrix. However, extrusion printing can be too harsh on the cells which can cause death. In current work, we have begun to electrospin gelatin materials at various concentrations. Because providing sufficient oxygen to sustain cell survival is a challenging problem, calcium peroxide was incorporated into the electrospinning process. Electrochemical water splitting will allow for advanced tuning of oxygen presence. For a scaffold to act as an anode, a suitable material for an OER electrode is necessary. Carbon Black (CB) provides a high electrical conductivity, high surface area, and high porosity so it was also incorporated into the electrospinning process. Upon completion, we characterize the mats by thickness, weight, and fiber diameters

measured in SEM images. These measurements allow for estimation of area available for cells to be embedded.

DATA ANALYTICS FOR THE QMRA WIKI WEBSITE

Presenter(s): Kate Wernicke
Engineering, Computer Science & Mathematics
Mentor(s): Jade Mitchell (College of Agriculture & Natural Resources), Kara Dean (College of Agriculture & Natural Resources)

The QMRA Wiki is a community portal that shares current quantitative information and knowledge about Quantitative Microbial Risk Assessment (QMRA). The Wiki is an ever-evolving repository, and it's intended to be used as an educational resource and database for the microbial risk assessment community. This project aimed to analyze the content of the QMRA Wiki and to determine how the Wiki is being utilized in said community. The Wiki is composed of over 30 different case studies previously conducted by former QMRA workshop students, completed dose-response models from over 130 experiments, and hazard identification information for over 50 pathogens. To analyze the utility and function of the Wiki, this study 1) evaluated each case study to determine the most frequently evaluated pathogen groups and exposure routes; 2) quantified the number of times the QMRA Wiki is referenced in published literature, and 3) summarized the dose-response modeling gaps for current microbial risks of interest. The outcomes of this project provide the creators/editors of the QMRA Wiki with important website analytics and will help prioritize updates made to the website. Future work will include adding relevant peer-reviewed literature and data to the Wiki, streamlining the process of contributing to the Wiki, and making the Wiki more user-friendly.

ANALYZING FRACTAL DIMENSION PROPERTIES OF ABELIAN SANDPILES ACROSS DIFFERENT LATTICE GEOMETRY USING COMPUTATIONAL METHODS

Presenter(s): Benjamin Kohler, Landon Buskirk
Engineering, Computer Science & Mathematics
Mentor(s): Robert Bell (Lyman Briggs College)

The Abelian Sandpile Model is a useful mathematical framework in the study of self-organized criticality. It involves the incremental addition of sand grains to vertices on a lattice grid until a critical threshold is reached, causing a cascade of grain avalanches and the emergence of critical states. Our study provides insights into the fractal dimension properties of Abelian sandpiles on different lattice geometries. Fractal dimension, a measure of the degree of roughness or irregularity of an object or pattern, is of great interest in understanding complex phenomena. Sandpile clusters exhibit fractal dimension properties due to their unique composition of a hierarchical structure of smaller, similar structures that repeat at various scales. This intricate pattern of self-similarity results in sandpile clusters having a non-integer fractal dimension, which can be calculated by various methods such as box-counting or mass-radius scaling. Our primary objective is to investigate how the fractal dimension of Abelian sandpile clusters varies across different lattice geometries, providing valuable insights into the behavior of complex systems and facilitating the development of efficient algorithms for sandpile simulations.

STUDY OF PREMATURE BREAKDOWN FAILURE MECHANISMS IN DIAMOND SCHOTTKY BARRIER DIODES WITH TCAD

Presenter(s): Michael Dittman
Engineering, Computer Science & Mathematics
Mentor(s): Matthias Muehle (College of Engineering)

The extreme material properties of single crystalline diamond (SCD) make it desirable for a variety of electronic applications, especially power electronics. Recently, power electronic systems are expected to deliver and control more power, all while being smaller in size. Diamond has several unique qualities that make it a suitable material for the next generation of more powerful and smaller power electronic systems. One notable quality for development of future power electronic systems is its exceptionally large reverse breakdown electric field, previously reported to be approximately 13MV/cm. However, reaching the theoretical limit of reverse breakdown electric field for Schottky barrier diodes (SBDs) has largely been a question of the presence of defects. In this study, heavily and lightly boron doped diamond layers are epitaxially grown onto diamond substrates having a 3-degree offcut from the (100) orientation and are then processed into pseudo- vertical SBDs. The SBDs will be analyzed experimentally to obtain temperature dependent I-V characteristics and breakdown voltages (BVs). The experimental BVs are then compared to both the theoretically expected values of the BVs and TCAD simulations of the SBD geometry. Finally, cross sections of the SBDs will be created using focused ion beam processing, and analyzed using transmission electron microscopy (TEM) to obtain atomistic level resolution of the active device region. The C-V characteristics and TEM cross sections of the SBDs will then be analyzed to identify existence and type of defects, and gauge their effect on the observed BVs.

SANDPILES IN THREE-DIMENSIONAL SHAPES

Presenter(s): McKenna Roberts, Mia Kunath, Minh Chau Nguyen
Engineering, Computer Science & Mathematics
Mentor(s): Richard Edwards (Lyman Briggs College), Robert Bell (Lyman Briggs College)

A mathematical sandpile is a collection of indistinguishable chips distributed among the vertices of a graph. A vertex is considered unstable when the number of chips is at least as great as the degree of that vertex. An unstable vertex will topple by sending a chip to each neighboring vertex. Toppling at one vertex could cause additional vertices to become unstable. For each finite connected graph G, we can identify one vertex as the sink and ignore any chips that fall into that sink. The operation of addition and subsequent stabilization allows us to define the sandpile group K(G). We explore the behavior of sandpiles on graphs of various two and three-dimensional shapes with a vertex at each corner. By analyzing patterns in recurrent sandpiles, we learn about the identity sandpile for each K(G). It is known that for many graphs G, finding the identity element of K(G) is a non-trivial task, and this identity element often has a complicated structure. We hope that our explorations lead to a better understanding of the nature of these elements. SageMath and Python are the main resources used for this research. These tools are used to encode the graphs as well as simulate the topplings. In this presentation, we share the visual results of our ongoing research, discuss the recurrent sandpiles, and begin to draw conclusions on the structure of K(G) for various interesting graphs.

QUANTIFICATION OF THE MECHANICAL EFFECTS OF HYPERTENSION ON THORACIC AORTA AND PERIVASCULAR ADIPOSE TISSUE

Presenter(s): Sydney Bush
Engineering, Computer Science & Mathematics
Mentor(s): Dillon Mcclintock (College of Engineering), Nathan Tykocki (College of Osteopathic Medicine), Sara Roccabianca (College of Engineering), Stephanie Watts (College of Osteopathic Medicine)

Arterial stiffness is a clinically important parameter as an independent risk factor for heart disease, stroke, and cognitive decline. Increased arterial stiffness measured in aging and disease has been largely attributed to changes in the mechanics of the vascular tunicas. Changes in vascular mechanics come from remodeling of the load-bearing constituents in the vessels. Perivascular adipose tissue (PVAT) surrounds most vessels and has been shown to affect vascular mechanics. PVAT has primarily been included in models as a modulator of relaxation/active contraction of vessels via factors secreted by it. Thus, the particular focus of this study is to determine the contribution of PVAT to the mechanical properties of the thoracic aorta under healthy and hypertensive circumstances. To determine these effects, a custom built uniaxial mechanical stretcher will be used to complete tensile tests on thoracic aortas with and without PVAT. The stretcher is outfitted with a mirror in the chamber allowing both the top and side view of the thoracic aorta to be recorded simultaneously. This allows for the change in the cross-sectional area and length of the vessel to be measured to calculate the stress and strain during the test. The tests will be conducted using aortas from healthy rats as well as high fat diet induced hypertensive rats. Understanding the mechanical properties will allow us to create a mathematical model to express the effects of hypertension on rats thoracic aorta including the perivascular adipose tissue surrounding it.

REIMAGINATION OF THE INTERIOR ECOSYSTEM OF COMMERCIAL TRACTOR CABS

Presenter(s): Christina Berels
Engineering, Computer Science & Mathematics
Mentor(s): Sarah Swierenga (College of Communication Arts Sciences), Tamara Bush (College of Engineering)

On average farmers spend upwards of 12 hours a day during the season in the cab of their tractors. Like in a car on a long road trip, the cab can feel cramped and can lack the storage to make spending all day in it comfortable and enable the operator to perform well at their job. The Case IH brand within CNH International tasked an interdisciplinary MSU based team to reimagine the next generation of the interior ecosystem for Case IH tractor cabs. This project was started with a user-centered approach to determine how features within the cab meet the needs of the operators

and what areas could be improved. Background research was conducted to gain a working understanding of the current Case IH cab and the cab of competitors. A structured interview script was developed with three sections of questions asking about user background as a tractor operator, tractor cab use, and the farm environment. Eight in-depth interviews were conducted with both male and female operators ranging in age from 18 to 39. The interviews revealed common grievances with the interior of the tractor cab, including the operator's seat range of swivel, storage for beverages and coolers, and wasted space. The results of these interviews will be used to innovate on aspects of the cab interior and develop new design concepts.

DEEP LEARNING BASED MINUTIAE EXTRACTION

Presenter(s): Arhan Mulay
Engineering, Computer Science & Mathematics
Mentor(s): Steven Grosz (College of Engineering)

Fingerprint recognition is one of the most commonly used biometric authentication methods in use today. Most of the state-of-the-art fingerprint recognition systems utilize keypoints, called minutiae, for matching. Therefore, reliable, fast, and accurate minutiae extraction is a key component of the success of the systems. Traditionally, minutiae extraction methods have relied on hand-crafted computer vision techniques; however, more recent methods have moved toward leveraging state-of-the-art deep learning methods for this task. In this work, we analyze several deep learning based methods for minutiae extraction and compare and contrast the disadvantages and advantages of each based on defined indices. The results indicate that deep learning approaches are an effective method for fast and accurate minutiae extraction.

INVESTIGATING THE QUALITY OF JEWELRY THROUGH SEM

Presenter(s): Kaitlyn Tuttle
Engineering, Computer Science & Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

This project explores the quality of jewelry on a microscopic level, investigating the properties, damage, elemental composition, and appearance of a jewelry sample. Doing this makes it possible to determine the best quality per price point. Scanning electron microscopy was first used to investigate the microscopic view of each of the samples of different compositions in a backscatter view of the samples. This view describes the density of the samples. Secondary electron microscopy was then used to investigate the surface of the samples, identifying the selective choices of the manufacturer to cut or increase costs and the imperfections of the sample over time. Following this, EDS is used, scanning x-rays of the samples, making it possible to examine the elemental composition of the substances. To do this, the EDS identifies the certain energies of the electrons released from the sample and connects them to the periodic table. These energies are very specific for each of the elements, as an absorption or emission spectrum would show, then to determine the elements within a sample, the frequency of each of these energies is graphed. A combination of all these factors allows for determining the best possible jewelry choice for the time it is used. Then, with a comparison to the macroscopic view of the jewelry, justifications can be made based on which price points fits the quality of the jewelry. Therefore, it can be determined the exact amount of price a jewelry sample should cost versus the lifespan of the sample.

VISUALIZATION OF DIFFUSION RATES IN DYED CUBOID PEG HYDROGELS

Presenter(s): William Gaal
Engineering, Computer Science & Mathematics
Mentor(s): Allie Vanzanten (College of Engineering), Caroline Szczepanski (College of Engineering)

Hydrogels are cross-linked polymeric materials that exhibit hydrophilic behavior, meaning the network expands as it absorbs water. This behavior is desirable for applications such as drug delivery, fluid transport, and water collection. However, some hydrogel networks experience extreme, non-uniform strain during swelling, which leads to macroscopic material failure (e.g., cracking, rupture). The dynamics of such events are dependent on the specific relaxation limitations of the various hydrogel formulations tested. This phenomenon is not well described in the literature because obtaining accurate diffusion and swelling kinetic data is hindered by these fractures, as well as by the material's transparent quality. Here we show that observing a cross-sectional slice of PEG-based (poly-ethylene-glycol) hydrogels after swelling in a red-colored dye solution allows for experimental visualization and estimation of diffusion kinetics. This work aims to gain a fundamental understanding of how parameters like cross-link density, geometry, and swelling rate impact macroscopic instability. In addition, characterizing the diffusion rates reveals critical information about rupture dynamics. Probing the limits of hydrogel swelling will lead to new applications of hydrogels across various fields and enable higher levels of tunability. Engineering soft materials to absorb water at a desired rate will lead to more advanced drug delivery and fluid control devices, resulting in better health care in the medical field and improvements to other applications of hydrogels.

OPTIMIZING PARAMETERS OF QUICK SHIFT MODE-SEEKING ALGORITHM FOR SCIENTIFIC IMAGE SEGMENTATION

Presenter(s): Doruk Alp Mutlu
Engineering, Computer Science & Mathematics
Mentor(s): Dirk Colbry (College of Natural Science)

Introduced in 2008 by Vedaldi and Soatto, Quick Shift is a widely used algorithm for image segmentation which uses a concept called "super-pixels". SEE-Segment is a Python tool to help researchers search for image segmentation algorithms (and their hyperparameters), the search space currently consists of 9 image segmentation algorithms, and Quick Shift is one of those algorithms. However, the range of hyperparameters searched by SEE-Segment was not optimized effectively and most parameters selected by the search algorithm resulted in long runs of Quick Shift and ultimately poor segmentation. This work explores methods to constrain the search space and use more realistic hyperparameters without limiting the flexibility of the tool. Quick Shift algorithm uses two key hyperparameters;kernel_size (Width of

Gaussian kernel used in smoothing the sample density.) and max_dist(Cut-off point for data distances.). Previous work shows (Salem et al. 2014) that there exist ranges for kernel_size & max_dist which produce reasonable segmentation results for images of a given size. In a related article (Garreau 2022), it was shown that scaling these parameters with a scaling ratio would preserve the superpixel count of the images for different sizes. Applying what was learned from both of these articles a new search space was developed that takes into account both the image size and a reasonable scaling ratio. Preliminary results on the base dataset of SEE-Segment showed a significant decrease in fitness values of up to 93.8% for some images in our testing dataset.

PROPERTIES OF DIRECTED ABELIAN SANDPILES

Presenter(s): Celia Madrid Manez, Harshit Kandpal
Engineering, Computer Science & Mathematics
Mentor(s): Robert Bell (Lyman Briggs College)

This research project explores the abelian sandpile model. The abelian sandpile model consists of a graph that contains vertices and directed edges. Each vertex has a weight represented by a non-negative integer. A sandpile is considered unstable when the weight of each vertex is greater than or equal to its degree. If a vertex is unstable its weight will be reduced until that vertex becomes stable. The reduction or "firing" shares the weight of the unstable vertex to each of its connected vertices through the directed edges. This process terminates as long as there exists a vertex named as a "sink" where there is no maximum weight and therefore doesn't "fire". The research will compare properties from undirected graphs to those of directed graphs. The results are based on empirical evidence which was created using coding processes in SageMath to simulate graphs of the desired sandpiles. The research focused on "recurrent" sandpiles which are central to the underlying algebraic structure of a sandpile. Dhar's burning algorithm was also applied enhancing the methods to find a graph's recurrent sandpiles.

MAKEUP UP CLOSE

Presenter(s): Maggie Chen
Engineering, Computer Science & Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

As the beauty industry has grown to the widescale that it is now, the makeup business has grown right along with it. Countless different products have been released by hundreds of different companies for the consumer market. One of the biggest factors that is taken into consideration by consumers is the cost of the makeup products they intend to purchase. For example, a bottle of liquid foundation can range from Clé de Peau Beauté's $270 foundation to e.l.f. Cosmetics' $6 bottle. Except, what makes one bottle different from another to the point of upcharging by hundreds of dollars. The intention of my project is to take two powder blush products, one cheap and one expensive, and use an electron scanning microscope to take a deep look into the materialistic build and compare and contrast the two products.

DUCKWEED AS AN INDICATOR OF MICROBIOME PRODUCTIVITY: A REVIEW OF METHODS FOR DUCKWEED HEALTH ASSESSMENT

Presenter(s): Leah Jarmolowicz
Engineering, Computer Science & Mathematics
Mentor(s): Dawn Dechand (College of Agriculture & Natural Resources)

Duckweed is becoming increasingly crucial as a source of food, fuel, fertilizer, and bioremediation. As a model plant, duckweed is commonly used in research settings to assess aquatic toxicity, uptake, and metabolism of pollutants. Future research involving duckweed can reveal numerous purposes it might serve both inside and outside of the laboratory environment. The goal of this poster is to summarize our findings relating to our experience with growing, culturing, and sterilizing multiple species of duckweed within a laboratory setting. Additionally, information regarding the health assessment of duckweed through oxygen production rate, nutrient uptake, and alternative methods will be addressed. Non-sterilized duckweeds were cultured at room temperature in natural light in half-strength Schenk-Hildebrandt media. Duckweeds were also cultured axenically on plates in a growth chamber at a temperature of 24 deg C, a 8:16 light:dark cycle with 2000 lumen light bulbs. A health assessment of the duckweed was completed first by examining the oxygen production rate by different varieties of duckweed, which was then compared to results collected through standardized methods for duckweed toxicity assessments. The results of this research, in combination with an analysis of past research and findings from alternative sources, is expected to reveal the most efficient and effective methods to culture, sterilize, and understand the health of duckweed. The information collected is intended to assist future researchers by making methods regarding duckweed cultivation, sterilization, and assessment more accessible, and serves to make future research more efficient and straightforward.

GENERATION AND IDENTIFICATION OF ARABIDOPSIS HIGH ORDER MUTANTS

Presenter(s): Katy Evans
Engineering, Computer Science & Mathematics
Mentor(s): Deepak Bhandari Dharamchand Bhandari (College of Natural Science)

The model plant Arabidopsis thaliana provides an excellent system to study the effect of specific gene deletion on plant physiology and stress response. The genes encoding proteins for SALICYLIC ACID INDUCTION DEFICIENT GENE 2 (SID2, AT1G74710), TRANS-GOLGI NETWORK ASSOCIATED PROTEIN 1 (TGNAP1, AT5G16210), and NON-EXPRESSER OF PR GENES 1 (NPR1, AT1G64280) have important functions in immunity, trafficking, and stress signaling. However, the roles of these genes and their interaction in different stress responses has not been studied. The aim of my project was to generate a high order mutant comprising sid2-2 tgnap1-2 NPR1-YFP. The generated triple mutant would then be studied under different stress responses. Over the last eight months using mutants existing in the Brandizzi lab, I have generated and genotyped 450 plants and identified a minimum of two independent lines of the double mutant sid2-2 x NPR1-YFP; tganp1-2 x NPR1-YFP; and a triple mutant - tgnap1-2 x sid2-2 x NPR1-YFP crosses. The plants were genotyped to ascertain gene knockouts and observed for phenotypic differences and growth. A better understanding of how these genes affect the growth and development of the plant will be determined from how the combination of knockouts interact with each other in Arabidopsis under controlled stress conditions and observing the differences in growth, the importance of each gene in the response mechanism can be established.

ENHANCING ACCESSIBILITY FOR INDIVIDUALS WITH MOBILITY DISABILITIES: DESIGNING A CUSTOMIZABLE WHEELCHAIR CONTROL INTERFACE

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

Persons with mobility disabilities often rely upon medical devices, such as wheelchairs, to assist with performing activities of daily living and for positioning during those activities. The interfaces with these wheelchairs can be challenging to operate for some individuals with limited hand dexterity or strength, reducing the entire device's accessibility. Therefore, the primary objective of this project was to create a customizable, user-friendly interface that allows people with mobility impairments to easily control their wheelchairs. A Raspberry Pi single board computer was used with an Object-Oriented Programming (OOP) paradigm to develop the initial interface with Python code. OOP enables developers to model real-world objects as software entities to enable efficient interactions between multiple functionalities. Further, a custom circuit board was designed and built to interface with the wheelchair's positioning control system using a button panel. The control panel communicated with the Raspberry Pi through its General Purpose Input and Output pins to interpret the user's input. Using OOP, a program was created that communicated with the circuit board by interpreting button presses to trigger specific functions. These button functions included enabling a pre-programmed positioning algorithm to run, pausing the algorithm, allowing the user to select their position, and an emergency stop to ensure user safety. The final product was a cost-effective, robust, and customizable interface that can easily be adapted to various types of wheelchairs. The button panel can be utilized to suit the space around the arm or other areas of a wheelchair to allow flexibility during use.

WHICH WRITING UTENSIL GIVES THE BEST RESULT ON A MICROSCOPIC LEVEL OF A SHEET OF PAPER?

Presenter(s): Jordan Hunt
Engineering, Computer Science & Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

In this project, I will be conducting research regarding the comparison between different ink and lead samples used in various items, to determine which has the best adherence to the paper. The different types of samples that will be tested include: laser printed ink, metallic ink, regular ink, and pencil lead. This experiment will be me taking a much closer look at the samples, and determining which of the utensils we use in our everyday lives, has a better relationship with the paper. The SEM will be used to identify which sample looks like it is bound to be more permanent, or a better choice of daily use. As opposed to a regular microscope, the SEM will primarily be used to provide a higher magnification and resolution, which - in turn - will be used to show us things that we are not able to see with the human eye, or with a regular microscope. Through the magnification, I will be able to identify which sample proves better and more suitable for the paper.

THE DEVELOPMENT OF ART THROUGH MATHEMATICAL DISCOVERIES DURING THE RENAISSANCE

Presenter(s): Abigail Lippert
Engineering, Computer Science & Mathematics
Mentor(s): Richard Edwards (Lyman Briggs College)

Some of the most well known pieces of art were created during the Renaissance time period. These artistic works were unique from previous art eras in their realism, a trait that was largely informed through mathematical developments. In the time leading up to and during the Renaissance, new understandings in perspective, proportionality, and anatomical relationships were developed, paving the way for Renaissance art and architecture. In fact, many famous artists of the time were also considered mathematicians and scientists, leading to discoveries in the mathematical field naturally bleeding into the art world. The art style developed during the Renaissance led to over 400 years of primary art movements built on realistic portrayal, including Baroque Art, Rococo Art, Neoclassical Art, Romanticism, and Realism, all of which would not have been possible without the mathematical developments during the Renaissance. The role of mathematics in art cannot be understated, and many of the most iconic paintings of all time would not exist without mathematical discoveries made during the Renaissance.

ROOM AND HIGH TEMPERATURE ELASTIC MODULI ANALYSIS FOR CAAGSB(1-X)BI(X)

Presenter(s): Weeam Guetari
Engineering, Computer Science & Mathematics
Mentor(s): Alexandra Zevalkink (College of Engineering), Ashiq Shawon (College of Engineering)

Zintl compounds have shown great promise recently in the field of thermoelectricity, the study of materials that turn temperature gradients into electric voltage and vice versa. This class of materials has both covalent and ionic bonds, resulting in both a low thermal conductivity and tunable electrical conductivity, an ideal combination for thermoelectric materials. In this experiment, the properties of a promising thermoelectric Zintl, CaAgSb, are studied. CaAgSb, which crystallizes in the 3-D orthorhombic crystal structure, tends to transition to a 2-D hexagonal crystal structure upon alloying, in addition to forming vacancies. To probe the impact of this structural transition on the macroscopic properties, we alloyed CaAgSb with Bi. Compounds with the stoichiometry CaAgSb1-xBix (x = 0.0, 0.1, 0.3, 0.6, 1.0) were synthesized through powder metallurgical route, using high-energy ball mill and subsequent Spark Plasma Sintering. The sintering resulted in dense pucks with relative densities higher than 94%. Formation of target phases were confirmed using x-ray diffraction and the lattice parameters were calculated using Rietveld refinement. Laser-flash analysis was conducted to determine the total thermal conductivity. Resonant ultrasound spectroscopy (RUS) is a technique that uses the resonance frequencies of a material to calculate the speed of sound and the elastic moduli. Using the room temperature RUS measurements for the different compositions, we were able to map the impact of 3-D to 2-D transition. The high temperature RUS state was used to collect temperature-dependent data, which revealed nearly linear softening of bonds with increasing temperature for all studied compositions.

CORROSION RESISTANCE AND BIOCOMPATIBILITY OF MGZNCA ALLOYS USING PLASMA ELECTROLYTIC OXIDATION (PEO)

Presenter(s): Emily England
Engineering, Computer Science & Mathematics
Mentor(s): Carl Boehlert (College of Engineering)

Metals possess desirable mechanical properties that allow for common use in biomedical settings. However, inertness and unwanted longevity-especially in the case of temporary implants-can limit the applications of many metals. Biodegradable biomaterials are an area of interest due to the decreased risk of medical complications pertaining to implant removal, and they present the opportunity to induce bioactivity, or the material-induced facilitation of biological growth, during the degradation process. In this project, plasma electrolytic oxidation (PEO) is investigated as a coating method to improve both the corrosion resistance and the biocompatibility of magnesium (Mg) alloys containing zinc (Zn) and calcium (Ca). Degradation rates were assessed using simulated body fluid (SBF) and biocompatibility was evaluated using Saos-2 osteoblast cells. Significant improvements were seen in the biocompatibility of the MgZnCa alloys, but further research is needed to slow the degradation of the samples.

YEAST SURFACE DISPLAY OF H3N2 INFLUENZA HA MUTAGENESIS FOR VACCINE DEVELOPMENT

Presenter(s): Tessa Versace
Engineering, Computer Science & Mathematics
Mentor(s): Daniel Woldring (College of Engineering)

Protein engineering is rapidly advancing that studies modification and synthesis of proteins by substituting selected amino acids. These substitutions allow optimization of protein function, especially in the capacity of binding affinity. This has various applications in the field of biotechnology and medicine. In annual influenza vaccine synthesis, the new vaccine is typically formulated with the antigens of multiple influenza strains substantial recent prevalence in recent years. By developing libraries, populations of a protein where one or more amino acid is substituted to alter function, of H3N2 influenza viruses, we can identify mutants with highly pathogenic potential before they naturally occurring, preventing possible pandemics. In this experiment, the head region of the hemagglutinin (HA), the antigen in influenza viruses, is first encoded in a plasmid, which is transformed into bacteria for amplification then transformed into yeast for expression. In addition to the wildtype HA, libraries are generated using Polymerase Chain Reaction (PCR) in which degenerate codons encoded in 19 forward and backward primers allow for selected positions to be substituted with all 20 amino acids. Following library generation, the mutants are evaluated on binding affinity using yeast surface display and flow cytometry based on binding to six biotinylated glycans. The results of binding affinity and corresponding mutations will further increase classification of binders by machine learning algorithms created by Wei Gouwei's lab at Michigan State University. Computationally, a more comprehensive view of the most dangerous influenza mutants can be developed.

AN OPTIMIZATION OF EULER CHARACTERISTIC TRANSFORM COMPUTATION ON EMBEDDED GRAPHS

Presenter(s): Nathan Willey
Engineering, Computer Science & Mathematics
Mentor(s): Elena Wang (College of Natural Science), Elizabeth Munch (College of Natural Science)

The Euler Characteristic Transform (ECT) has been shown to be a powerful topological descriptor of network data due to its cheap computational cost relative to other methods in Topological Data Analysis. It is composed of Euler Characteristic Curves (ECCs) of input data computed from different directions. Previous theoretical results have stated that knowledge of the full ECT gives a faithful representation of data. However, this a priori requires computation of an unaccountably infinite number of ECCs and leaves open the question of computation in finite time. We analyze specifically the ECT on embedded graphs in the plane. We prove that we can represent the graphs faithfully with a finite number of ECCs. We further provide a computationally efficient algorithm for doing so and show both theoretically and empirically that the run-time is much faster than naive computation methods.

AUTONOMOUS VEHICLE'S CRASH PREVENTION ABILITY

Presenter(s): Ashton Vogel, Emma Borden, Noah Vermeulen
Engineering, Computer Science & Mathematics
Mentor(s): Peter Savolainen (College of Engineering)

Every year 13 million car crashes happen in the United States. With the increasing presence of autonomous vehicles, their ability to reliably prevent car crashes has become a focal point of their integration into the vehicle fleet. Autonomous vehicles utilize numerous sensor types, or a combination of sensors, such as RADAR (radio detection and ranging), monochrome cameras, stereoscopic cameras, and sensor fusion of two or more of the three sensors. The intent of the sensors is to identify possible collisions so they can engage crash prevention mechanisms. The purpose of this research is to identify which sensor, or sensor fusion, is most effective at this goal. Full vehicle autonomy is not available in today's market; however, low level autonomy is offered. Analysis and comparison of test track data from differing vehicles of various driver assistance features, at speeds of 20 km/h and 40 km/h can provide insight into the ability of autonomous vehicles to prevent an automobile-pedestrian collision. Crash prevention mechanisms installed on the vehicle were forward collision warning systems and automatic emergency braking systems. Considered measurements to this solution are whether an impact occurred, and in the case of a collision, the speed of the impact.

SURVEY OF CONTACT DETECTION OPTIMIZATION METHODS FOR DISCRETE ELEMENT MODELS USING SUPER-ELLIPSOIDS

Presenter(s): Thinh Nguyen
Engineering, Computer Science & Mathematics
Mentor(s): H. Metin Aktulga (College of Engineering)

Computational science in regards to modeling allows researchers to simulate natural systems that are deemed impractical to conduct manually due to their size and complexity. Examples are weather modeling, urbanization modeling, molecular dynamics, etc. In our case, we use discrete element modeling (DEM) to simulate systems consisting of particles interacting with each other, and a majorly computationally expensive component of such a model is the collision solver due to the large number of particles in a typical DEM simulation. As a result, it is desirable to create efficient collision solvers. In regards to this specific survey, super-ellipsoids are the particles of interest in which their properties allow the creation of non-spherical shapes that would be required for some simulations. The contact detection of super-ellipsoids is solved using mathematical optimization in which there is an objective function to minimize. Different optimization methods have their strength and weaknesses, so this survey aims at testing a variety of popular optimization methods to find the most optimal one using several metrics such as the number of function evaluations and total time elapsed. Having an efficient optimization method contributes towards a more scalable and high-fidelity model as a larger number of particles can be simulated with less time.

GENETICALLY ENGINEERED MAGNETOTACTIC BACTERIA NANOROBOTS

Presenter(s): Paulina Bies
Engineering, Computer Science & Mathematics
Mentor(s): Jinxing Li (College of Engineering)

Micro/nanorobots made from living materials and microorganisms are emerging as one of the most promising robotics for medical use in vivo. Particularly, magnetotactic bacteria have demonstrated great potential in drug delivery and cancer therapy. So far, all the magnetotactic bacteria are based on wild-type bacteria, which show limited controllability and actuation. Magnetotactic bacteria produce magnetosomes, with properties similar to those of synthetic superparamagnetic iron oxide nanoparticles, and these can be modified by mutating biosynthetic genes. Here we show that magnetotactic bacteria with mamJ deletion, which leads to mutant magnetotactic bacteria containing clustered magnetosomes instead of typical linear chains, show much faster speed through actuation with an oscillating magnetic field. Furthermore, the mutant magnetotactic bacteria nanorobot can serve as a much better living contract agent with improved signal and resolution using magnetic particle imaging. Such genetically engineered bacteria nanorobot with enhanced actuation imaging performance will lead to new exciting and grand opportunities for biologically engineered micro/nanorobotics.

MAGNETICALLY ACTUATED DRONES WITHOUT ON-BOARD POWER SUPPLY AND CIRCUITRY

Presenter(s): Kalyn Vanwormer
Engineering, Computer Science & Mathematics
Mentor(s): Jinxing Li (College of Engineering)

Small flying robots and drones have incredible locomotion ability and maneuverability, which are getting increased attention in recent years. However, the small size and compact structure mean high energy consumption, which inevitably brings the disadvantages of high heat generation, low endurance, and restricted operation time. Some small propeller designs have been presented to bio-mimic wind-dispersed or winged seeds which reduce energy consumption; however, these nature-inspired designs do not have a passive stable autorotation, and working against this unsteady aerodynamic behavior increases the difficulty of robot design and fabrication. Here, untethered meso-scaled flying robots (Mesoflyers) are achieved with designs inspired by Leonardo DaVinci's original helicopter design. Furthermore, the Mesoflyers are actuated with external rotating magnetic fields which allow for dynamic locomotion in multiple fluid environments such as air or water. Theoretical analysis and experimental results also show that the proposed flying robot has impressive passive attitude stability, durability, and carrying capacity when eliminating the need for on-board power supply and real-time feedback control, which results in its immense potential for various applications in therapeutics, drug delivery, surveying, and manufacturing.

AN ETHNOGRAPHIC STUDY OF REACTIONS TO TROLLEY PROBLEM SCENARIOS IN SELF-DRIVING CARS

Presenter(s): Jacob Rutkowski
Engineering, Computer Science & Mathematics
Mentor(s): Josh Siegel (College of Engineering)

Advances in automated vehicles bring with them questions regarding the ethics and moral correctness of these vehicles' intentions and behaviors. One problem in need of exploration is Trolley Problems, which typically involve moral dilemmas where a participant assumes the role of conductor for a trolley barreling towards a fork in its tracks. Each branch typically results in negative outcomes, such as the death of humans caught on the tracks, leaving the choice to the conductor of whether or not it is more appropriate to switch tracks to go the opposite direction at the split or to do nothing and keep on the intended course. Our goal is to understand how ethnography influences people's moral judgments in the Trolley Problem scenario as applied to self-driving cars. We explore this idea by developing a gamified Trolley Problem scenario generator and having participants use it to explore their perception of Trolley Problem scenarios. In doing so, we connect the participants' choices with their ethnographic background to discern if any patterns arise. We believe that there will be significant differences in people's moral judgments in the Trolley Problem scenario based on their ethnographic background.

MICROBIAL SOURCE TRACKING MARKER PERSISTENCE IN SURFACE WATERS

Presenter(s): Stephanie Nomoto
Engineering, Computer Science & Mathematics
Mentor(s): Jade Mitchell (College of Agriculture & Natural Resources), Kara Dean (College of Agriculture & Natural Resources)

Pathogens in surface waters can be ingested when waters are used for recreational water activities and as a source for drinking water treatment plants. Indicator organisms are used to monitor pathogens, however, they may decay faster than pathogens, leading to possible under-estimated health risk from ingestion. Microbial source tracking (MST) refers to methods used to identify host-specific markers in microbial populations, allowing for the identification of the source of pollution. Pathogens may persist in water, which is why it is important to analyze how long pathogens, indicators, and MST markers survive in water matrices. A systematic literautre review was conducted using two databases, Web of Sceince and Science Direct, to identify available MST marker persistence datasets for mining and analysis.

A REGRESSION ANALYSIS COMPARISON OF HUMAN DRIVEN VEHICLES VERSUS AUTONOMOUS DRIVEN VEHICLES

Presenter(s): Kelly Couvreur, Maxwell Cook
Engineering, Computer Science & Mathematics
Mentor(s): Peter Savolainen (College of Engineering)

There are over 6 million car accidents each year in the United States, including 46,000 fatalities each year. Over the recent years, autonomous vehicles have gained popularity since they are marketed as a safter alternative to traditional, human driven vehicles. Although Autonomous vehicles don't get into car accidents as frequent as human driven vehicles, they frequently receive lots of public attention and media coverage, which can distort the viewers opinion of autonomous vehicles. By comparing autonomous vehicle crashes against human driven vehicles, we created a data set that details various contextual factors about both types of crashes. This includes variables such as time of day, weather conditions, and crash severity which allows for a comparison of differences in the percentages of both types of crashes that occur under various scenarios of interest. We aim to create a solution where hypothetical variables can be entered into the data set. The response would then produce the percentage that one would get into a car accident in an autonomous vehicle versus a human driven vehicle. This study will provide important insights as to the precipitating factors associated with autonomous and human-vehicle crashes. This will allow for an assessment of potential concerns and mitigation measures in the trasition period where we will have a mix of both types of vehicles.

INDIRECT EVAPORATIVE COOLING SYSTEM FOR ENERGY EFFICIENT AIR CONDITIONING

Presenter(s): Ryan Atkinson
Engineering, Computer Science & Mathematics
Mentor(s): Maddalena Fanelli (College of Engineering)

The focus of this study is to build and test a small-scale indirect evaporative cooler, a lower-cost and more energy-efficient process than a traditional air conditioning unit. Evaporative cooling decreases air temperature by evaporating water. When dry air is blown over a saturated substrate, moisture from the substrate evaporates into the dry air stream, saturating the air stream to achieve equilibrium. The energy lost in evaporating the water leads to the cooling of the system. An example of this process is the cooling feeling when one steps out of the shower and the water evaporates off their skin. In the most common type of evaporative cooling, a direct evaporative cooler blows the cooled air, with the evaporated water, directly into the target area. The indirect evaporative cooler built and tested in this study is more complex, as cooled humidified air is used to cool a secondary air stream using a heat exchanger. This process avoids the addition of moisture to the supplied air. A key to efficient evaporative coolers is ensuring proper water distribution to completely saturate the substrate material. This study focuses on designing and constructing a working cooling box, creating a uniform distribution of water along the internal cooling rods.

COMPARISON OF GUITAR STRING TONES TO THEIR MICROSTRUCTURE AND COMPOSITION

Presenter(s): Lorenzo Thrasher
Engineering, Computer Science & Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

The array of sounds that are created by different guitar strings are directly correlated to the mass, length, gauge, and even the tightness of the string. In addition to these unique components, the base materials that are used to construct a guitar string, as well as its topography, play heavy roles in the tone it produces. With the help of Scanning Electron Microscopy (SEM), I intend to display the significant relationship of the particular materials used to manufacture a guitar string, as well as its specific construction, to the tone it will produce. My project aims to compare the shape and topography of flat wound strings as well as round wound strings, and relate this data to the difference in their tones. An elemental analysis of each string, these being chrome, phosphor bronze, and nickel wound, is also performed to determine the significance that the chemical makeup has on the tone of a guitar string. Both secondary and backscattered electron images are used to help me reach valid conclusions regarding my research. The secondary electron images will be utilized primarily to determine the topography of each sample. The backscattered electron images, however, exhibit the density variance throughout each string. In addition to these imaging techniques, Energy Dispersive X-Ray Spectroscopy (EDS) is used to collect a rough chemical analysis of the samples. This congregated data is employed to show the major correlation between the makeup of each guitar string and the respective tones that they produce.

QUANTIFYING HAND TORQUE APPLICATION IN CHILDREN AND OLDER ADULTS

Presenter(s): Christina Berels
Engineering, Computer Science & Mathematics

Mentor(s): Tamara Bush (College of Engineering)

The number of child deaths from accidental poisonings in the U.S. occurred in staggering numbers until a year after the enactment of the 1970 Poison Prevention Packaging Act (PPPA) which resulted in a 50% reduction in deaths. Child resistant packaging (CRP) required by the PPPA must be designed to be significantly difficult for children under 5 years of age to open within a reasonable time. Studies have shown that CRP is not only difficult for children to open, but also poses a challenge for older adults. The purpose of this research was to quantify hand torque application in children under 6 years old and adults over the age of 65 on a simulated set of packaging treatments that limit the amount of functional surface area available. A torque sensor with 60 Nm capacity was used in a custom-developed hand-held test set up to simulate a medication bottle and obtain torque data. A total of 49 participants were tested, 25 children and 24 adults. Each participant was asked to complete 8 trials, twice with each variation of the medicine bottle lid. Average torque applied in the opening direction of the untreated lid for the adult group was 21.41 lbf-in and the average for children was 7.83 lbf-in. All three variations of functional surface area resulted in a significant difference between the two groups maximum torque application. This information can be used to assist in the design of a more effective CRP that is also accessible to older adults.

A STUDY OF COINS FROM TWO DIFFERENT COUNTRIES

Presenter(s): Suryansh Singh
Engineering, Computer Science & Mathematics
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

The objective of this research is to use an electron microscope to evaluate the differences in microstructure and surface properties of coins from two different countries. The two countries chosen were chosen for their historical relevance and well-established currency systems. The coins were initially visually inspected before being photographed using an electron microscope at various magnifications.The study's aim is to shed light on the disparities in coin manufacturing procedures between countries, as well as to better understand the elements that determine coin microstructure and surface features. The electron microscope is a powerful equipment that can produce high-resolution images of coins, allowing for a thorough investigation of their microstructure and surface details.The study's findings have notable significance for the field of numismatics, as well as for a larger understanding of material science and coin manufacturing methods. This work emphasizes the significance of employing electron microscopy to analyze the microstructure and surface features of coins, as well as the possibilities for future research in this field. Overall, this project provides a wonderful chance for college sophomores to obtain hands-on experience with electron microscopy while also developing an awareness of the variations and significance of coins from various countries.

TRACTOR SPATIAL IMPROVEMENTS

Presenter(s): Nathan Wright
Engineering, Computer Science & Mathematics

Mentor(s): Sarah Swierenga (College of Communication Arts Sciences), Tamara Bush (College of Engineering)

Currently, in America, each farmer feeds 168 people. Farmers are an essential part of the economy and are fundamental to the American lifestyle. Despite the importance of farmers, it has been recorded since 2000 that the number of farmers decreases every year. In this same period, the American population has grown by more than 57 million people. This study was conducted to understand tractor cab shortcomings, optimize storage, and improve the comfortability of tractor operators while inside the cab. Interviews were conducted to determine what current tractor operators need to increase productivity and efficiency. From these interviews, designs, and proposals were created to assist in these areas. One area of importance was food storage such as coolers providing a place to store food/beverages. By improving tractor operators' equipment, they will be more productive and able to work longer and more efficient hours. This will allow them to produce more crops and provide for more Americans in the growing population.

AIRBAG EFFICACY IN VARYING COLLISION SCENARIOS

Presenter(s): Kenna Morgan, Tung Hoang
Engineering, Computer Science & Mathematics
Mentor(s): Peter Savolainen (College of Engineering)

Airbags, often considered a life-saving essential in cars, are incredibly helpful in minimizing the number and the severity of injuries in automobile crashes. However, there is substantial variability in the effectiveness of airbags based on factors such as the type of collision, impact speed, and design characteristics of the airbag systems. This study aims to determine in which scenarios specific types of airbags will be more effective in minimizing the degree of injury to occupants. We will use data from Michigan police crash reports to examine multiple crash-related and contextual factors, such as the type of collision (e.g. rear-end, head-on) and road conditions (e.g. wet or icy pavement) as a part of the analysis. We will also be comparing frontal, side, and rear airbags' efficacy across these categories of collisions and scenarios. We aim to provide insight on when and where airbags are most and least effective in terms of injury outcomes.

USING THE SCANNING ELECTRON MICROSCOPE TO COMPARE THE SURFACE OF DORM AC FILTERS AND HOME AC FILTERS

Presenter(s): Shriya Desai
Engineering, Computer Science & Mathematics
Mentor(s): Per Askeland (College of Engineering)

The purpose of this research project is to view the surface of an AC filter of a school dorm versus an at-home AC filter for dust mites, mold, and other possible growths to understand the differences in health and hygiene in both environments. I obtained the AC filter from the AC in my dorm room, and Professor Askeland brought the filter from the furnace in his house for my research. I had a total of 3 different observation samples: the front and back of my dorm AC filter and the same for the furnace AC filter. Using the magnification and focus lenses, I analyzed the front of the dorm AC filter and mainly found tons of synthetic fibers that could have been from the rug in my dorm. As I continued to analyze the back of the dorm AC filter, I found what appeared to be the wings of an insect. These wings were scattered all over the back of the AC filter and could only be viewed at very high magnifications. The furnace filter showed lesser dust and synthetic fibers, and had no insect wings. My findings lead me to believe that either the dorm AC filters have a certain technology that may be harmful to the insects, or the area outside our rooms are not sanitary and have a lot more bugs present.

SOME REMARKS ON DIOPHANTINE TRIPLES

Presenter(s): Amiri Walker, Curtis Chou, Meyhar Dudeja
Engineering, Computer Science & Mathematics
Mentor(s): Aklilu Zeleke (Lyman Briggs College)

A set of three positive integers, (a,b,c), is called a Diophantine triple if ab+1, ac+1, bc+1 are all perfect squares. One example is (1, 3,8) . In this direction, we will explore if an infinite sequence of Diophantine triples exist and if so, what recurrence relation will generate them. We will present several classes of Diophantine triples and their corresponding recurrence relations. We will also discuss the extendibility of these sequences to Diophantine quadruples. One example in this direction is (1,3,8,120).

GENERALIZED GOLDEN NUMBERS

Presenter(s): Amiri Walker, Curtis Chou, Meyhar Dudeja
Engineering, Computer Science & Mathematics
Mentor(s): Aklilu Zeleke (Lyman Briggs College)

The famous Fibonacci sequence which is generate by the recurrence relation $a_{n+1}=a_n+a_{n-1}, a_0=a_1=1,$ has the asymptotic behavior $\lim_{n\to\infty}\frac{a_{n+1}}{a_n}=\phi=\frac{1+\sqrt{5}}{2}$. Where ϕ is called the golden ratio. Mathematicians have studied the golden ratio's properties since antiquity. In this project we will explore generalizing the golden ratio concept. We will generalize the recurrence relation that generates the Fibonacci sequence and investigate the asymptotic behavior of the resulting sequences.

PATTERNS IN THE RECIPROCALS OF PRIMES

Presenter(s): Julia Zera
Engineering, Computer Science & Mathematics
Mentor(s): Preston Wake (College of Natural Science)

The decimal expansion of the fraction 1/p, where p is a prime other than 2 or 5, is a repeating decimal. Since there are infinitely many digits which repeat periodically, we can meaningfully take the average of these digits. The current known maximum such value occurs for p = 59,281. It is conjectured that this is the maximum over all p. In order to predict when this value may be particularly large or small, we generalize the problem to all bases. The expansion of 1/p in a general base b, for a prime p which does not divide b, is also repeating. We take the average of its digits and divide by the maximum possible digit, which is b-1, to obtain a value between 0 and 1. This allows for results to be easily compared across bases. This project aims to find the supremum of such values over all primes p and bases b of this average and determine whether that supremum is achieved.

CAN CLOSING A ROAD, LEAD TO BETTER TRAFFIC?

Presenter(s): Meyhar Dudeja
Engineering, Computer Science & Mathematics
Mentor(s): Richard Edwards (Lyman Briggs College), Robert Bell (Lyman Briggs College)

The title statement is difficult to believe. However, this has been observed at multiple times and at different places. This paradox is known as the Braess's paradox. The explanation behind it makes a lot more sense though. Basically, when a short route exists between A-B then every person will most probably take that route. This will increase the congestion on the road and the shorter route's net time might become greater than the time taken on the alternative routes taking away the advantage of the shorter route. This concept is based on the Nash equilibrium concept. Nash equilibrium states that in a large mass if a strategy is popular, a person who does not use that strategy might be at an advantage. The reason for this is that in nash equilibrium state the strategy employed by a player is the best strategy they can use as an answer to other's strategy to maximize their output and the same Is true for the other player. So when it comes to traffic your strategy might be the best to take shorter route however you rival also has the same strategy which causes harm to both of you. This project will simulate the existence this paradox in real life scenarios.

DECISION MAKING IN THE FACE OF UNCERTAINTY: A "DEAL OR NO DEAL" APPROACH

Presenter(s): Emilie Fremder
Engineering, Computer Science & Mathematics
Mentor(s): Albert Cohen (College of Natural Science)

Decision making under uncertainty is a challenge we all face. For example, there are common elements in deciding when to stop playing a game or when to sell an asset. In this presentation, we analyze decision strategies in the game 'Deal or No Deal' that are based on an individual's current wealth, demographics, and mathematical knowledge. We evaluate the effect of expected utility theory and prospect theory on individuals by synthesizing the opinions of 24 individuals with a variety of backgrounds. We measure participants' willingness to cash out vs. continue playing the game, a strategy to determine individual risk aversion. We consider optimal stopping theory and compare reality to other unique theories related to the decision-making process. Based on the respondents' wealth level, we calibrate elements of optimal stopping theory to our observed player behavior and conclude that risk-aversion is wealth dependent for our group. Using our results, we determine how various individuals make decisions in scenarios similar to the game 'Deal or No Deal.

RULE-BASED DECISION-MAKING FOR AUTONOMOUS ROBOTS IN THE PRESENCE OF AN ADVERSARY

Presenter(s): Ishwari Kapale
Engineering, Computer Science & Mathematics

Mentor(s): Sandeep Banik (College of Engineering), Shaunak Bopardikar (College of Engineering)

Motion planning and control is a critical task for autonomous vehicles like ground vehicles and UAVs(Unmanned Aerial Vehicles). Typically, trajectories in multi-agent settings are planned by assuming fixed trajectories for any neighboring agents. Such assumptions fail to capture the intentions of neighboring agents and any perturbations in changed trajectories. There has been increasing security lapses due to the presence of adversaries impacting the system performance, disruption of service and causing potential loss of life. In a given environment, a certain vehicle or system may contain single or multiple agents operating in the presence of other agents and systems, referred to as adversaries or ego-players. Neighboring or connected agents may or may not be cooperative, thus creating the need to develop tools and framework so that a given agent can operate in a safe and efficient manner. In this project, we aim to develop a framework to reason about motion planning and control in a multi-agent setting.

USING WIRELESS PHYSIOLOGICAL SENSORS TO DETERMINE DROWSY DRIVING

Presenter(s): Kosta Sergakis
Engineering, Computer Science & Mathematics
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

According to the CDC, "over 3,100 people were killed and about 424,000 were injured in crashes involving a distracted driver in 2019" in the U.S. alone. Drivers are taking their eyes off the road to give their attention to distractions such as phones, technology, and passengers. Similarly, sleep deprivation is the root cause of "up to 6,000 fatal crashes each year". My solution to the overwhelming statistics lies in an algorithm-based solution that can communicate with vehicle systems to ensure the driver is responsible behind the wheel of a moving vehicle. I created the following criteria: it needed to detect whether a driver is keeping their eyes on the road, whether a driver is getting drowsy, and function across multiple environments. My research led me to OpenCV - a Python library for computer vision. Within my project, I demonstrated how a Python program could utilize a camera to ensure safety on and off the road. This involved mapping the driver's face, pinpointing the driver's eyes, and contrasting the pupils with the whitespace of both eyes to determine a direction. I found difficulty in finding the optimal contrast as the brightness of the surrounding environment was a calibration flaw. However, by automating the calibration process, I could optimize multiple environments. Next, I shifted my focus to the driver's grip (pressure) on the steering wheel by measuring the scatter between two inductor plates. I transmitted the sensor data through a Raspberry Pi API for wireless access over the network.

ENVIRONMENTAL SCIENCE & NATURAL RESOURCES

ARE 1930S ERA CONIFER PLANTATIONS A POTENTIALLY IMPORTANT RESOURCE FOR OAK RESTORATION EFFORTS IN SOUTHERN MICHIGAN?

Presenter(s): Christian Tibaudo
Environmental Science & Natural Resources
Mentor(s): David Rothstein (College of Agriculture & Natural Resources)

Widespread inadequacies in oak regeneration presents many threats to natural communities in the eastern United States. Research in northern Michigan has found that 1930's era conifer plantations provide better sites for oak regeneration than forests currently dominated by an oak overstory. Although not widely recognized, similar conifer plantations were also established in southern Michigan during the same period. I set out to determine the extent of conifer plantations on public lands in southern Michigan and to assess their suitability as sites for oak regeneration. First I analyzed aerial imagery to assess the proportion of upland areas occupied by conifer stands. Next, I visited a sample of putative conifer stands and adjacent upland forests to ground-truth my cover type classification and to quantify the overstory, understory, and ground layer oak regeneration. I estimated there to be 400 acres of conifer cover in Waterloo State Recreation Area, and 245 acres of conifer cover in Island Lake State Recreation Area. Following ground-truthing, 92% of the sampled stands had been accurately identified as conifer plantation. Using a mixed effects linear model, I determined that mean oak seedling height was significantly higher ($p = 0.021$) under conifer plantation than under adjacent oak forest, but seedling density showed no apparent differences ($p = 0.955$) between the two. This suggests that while cover type may not have an effect on the initial establishment of oak seedlings, the survival and growth of oaks into larger size classes is significantly higher underneath pine plantation than under an oak canopy.

HOW WOLVES IMPACT THE GREATER YELLOWSTONE REGION: AN ETHNOGRAPHIC STUDY OF A 20 MILLION ACRE ECOSYSTEM AND THE SURROUNDING GATEWAY TOWNS

Presenter(s): Isabella Riem
Environmental Science & Natural Resources
Mentor(s): Steven Fraiberg (College of Arts & Letters)

In 1926 Yellowstone National Park's last wolf was killed due to rising concerns over wolves leaving the park boundaries and taking livestock as prey. The decrease in the wolf population prompted the species to be listed as endangered. As the nation progressed, the importance of balanced ecosystems became clear, showing the need to reinstate the wolves into Yellowstone. The Endangered Species Act of 1973, which aimed to help conserve America's threatened wildlife, made it possible by legally requiring the park to reintroduce the wolves. As a result, many controversies and questions surrounding their reintroduction arose. Farmers became worried about their livestock, hunters about the abundance of the elk, and ecologists wondered how the species' absence disrupted the ecosystem as well as what might change with their reintroduction. To investigate these changes in the relationship between

the wolves of Yellowstone on the ecosystem and surrounding communities various ethnographic methods were used. Artifacts were collected and triangulated along with recorded semi-structured interviews with a park ranger and a tour guide. Most of the community surrounding and within the park have split opinions on the reintroduced wolf presence in Yellowstone; through this presentation, the reasons behind their conflicting opinions will be shared.

HERPETOFAUNAL MONITORING AT COREY MARSH ECOLOGICAL RESEARCH CENTER (CMERC)

Presenter(s): A. Proudfoot
Environmental Science & Natural Resources
Mentor(s): Alexa Warwick (College of Agriculture & Natural Resources)

Long-term monitoring of organisms is an important way to track changes over time in the species present in an area. For this project we are focusing on herpetofauna (herps) at CMERC; a group of organisms that includes reptiles and amphibians. Many Michigan herp species (6 amphibians, 10 reptiles) are listed as threatened, endangered, or a species of special concern. Currently, amphibians are undergoing a mass extinction crisis globally; thus, developing long-term data on amphibian populations is especially important. Conservation efforts rely on a better understanding of the distribution and abundance of such species. Beyond simply knowing which species inhabit an area, tracking the same individuals over time also informs our understanding of population demographics. Finally, because amphibians especially are often very sensitive to environmental changes, monitoring their population changes can serve as an indicator for environmental health. In 2022, we conducted salamander and snake cover-board surveys, turtle mark-recapture using hoop and promar traps, and frog and toad acoustic call monitoring through passive frog logger devices to establish baseline monitoring data. To date, we have been analyzing species call patterns in relation to environmental data such as temperature, rainfall, and time of day.

INVESTIGATING DEEP SUBSURFACE MICROBIAL COMMUNITIES IN GAS-RICH ROCK-HOSTED AQUIFERS: RELATIONSHIP BETWEEN MICROBIAL BIOMASS AND DEPTH

Presenter(s): Nicole Smith
Environmental Science & Natural Resources
Mentor(s): Matthew Schrenk (College of Natural Science)

The deep subsurface biosphere is sometimes referred to as the "Dark Energy Biosphere", due to dependence of microbial communities on chemical energy to fuel their growth rather than light. High pressures and temperatures combined with low permeability and nutrient availability challenge subsurface microbes with extreme conditions deep within the Earth's crust, leading to questions concerning how deeply these organisms permeate into subsurface environments (Sahu 2021). In this study, drill cuttings from a hydrogen exploration well drilled to 11,000 feet in Nebraska were utilized to uncover the relationship between depth, geochemistry, and the abundance and biodiversity of microbial communities. Total genomic DNA was extracted and purified from 10g samples; the DNA extracts were quantified fluorometrically before being tested by PCR amplification using bacterial specific primers. Through the quantified DNA (ng of DNA per gram of sample), it was shown that as depth increases, there is a decrease in the abundance of biomass and microorganisms. These data are being used to identify correlations between the geological composition of the subsurface and microbial diversity and cell density. These data will help to understand nutrient and gas utilization by subsurface microbes within the deepest levels of the biosphere.

IMPACT OF HABITAT CONNECTIVITY ON MOTH ABUNDANCE AND PROBOSCIS PRESENCE

Presenter(s): Shriya Deshmukh
Environmental Science & Natural Resources
Mentor(s): Alice Puchalsky (College of Natural Science)

The Corridor Project is a landscape-scale experiment, located in the Savannah River Site in South Carolina, USA, designed to investigate the effect of habitat connectivity and edge effects on ecological communities. This experiment has shown that connectivity affects species diversity, but not much is known on how connectivity affects abundance. However, temperature is known to have a significant impact on moths. Additionally, not much is known about how habitat connectivity impacts moth diversity. Moths do important work as pollinators, and the impact of various factors such as connectivity, weather conditions, and presence of a proboscis play a role in their efficacy in that function. Moth samples were collected from the Corridor Project to determine the impact of habitat connectivity on moth communities. I used R to determine if moth abundance correlated more closely with temperature or connectivity and if the proportion of moths with proboscis varied with patch types. The connected patches were shown to have a higher proportion of moths with proboscises, compared to the unwinged and winged patches.

AN ANALYSIS OF CORN COB BASED PLASTIC FILLER FOR DEVELOPMENT OF PLASTIC BIOCOMPOSITES FOR FOOD PACKAGING

Presenter(s): Polly Fitzgerald
Environmental Science & Natural Resources
Mentor(s): Eva Almenar Rosaleny (College of Agriculture & Natural Resources)

Traditional plastics often end up in landfills and release toxic chemical and greenhouse gasses into the soil and air and harming wildlife and potentially human health. Due to this, there is a need to replace with biodegradable packaging materials. This research aims to explore the use of corncobs (CC) as a resource through incorporation into a bio-composite with a biodegradable plastic, Polylactic acid (PLA). Despite corn being the most produced crop worldwide, with over one billion tons generated annually, the cobs pose a significant challenge for proper disposal and have negative environmental impacts. Therefore, by using CC/ PLA bio-composite, the negative environmental impact of traditional plastics and corncob can be significantly reduced. The process of incorporating corncobs into PLA involves cryo-milling the corn cob to reduce particle size, sieving to separate particle sizes, creating a masterbatch, mixing it in a Brabender, and pressing it in a heating press to create films (170 C for 4 min).. These films, comprising of varying particle sizes of CC

(<45, 45-75, 75-105µm) and concentrations (0%, 5%, 10%) of CC filler in PLA. , underwent rigorous mechanical property testing, including tensile stress, tensile strain, and elongation at break. The research findings indicate that smaller particle sizes result in increased mechanical strength. Additionally, the oxygen and water vapor permeability of each concentration were examined at each particle size and concentration to determine the effectiveness of its barriers. This research provides valuable insights into the viability of a CC/PLA bio-composite and offers promising potential for sustainable packaging.

SPATIAL AND TEMPORAL EPIDEMIOLOGY OF HEMORRHAGIC DISEASE IN INDIANA'S WILD WHITE TAILED DEER POPULATIONS

Presenter(s): Cameron Brown, Katie King
Environmental Science & Natural Resources
Mentor(s): Sonja Christensen (College of Agriculture & Natural Resources)

Epizootic hemorrhagic disease (EHD) is a vector borne virus transmitted through biting midges in the genus Culicoides, which can cause high mortality events in white tailed deer (WTD). In order to predict disease trends and target future management strategies, we need to understand how the disease has behaved in the past. Throughout this project, we will analyze this data to record the spatial and temporal trends of EHD across the state of Indiana in order to help inform managers on potential high risk locations for outbreaks and allow for targeted EHD surveillance. The objectives of the study are to characterize the frequency and intensity of current and past EHD outbreaks in wild WTD, and illustrate spatial trends of EHD across the state of Indiana. We received county-level data for all counties in Indiana from 1985 to 2022 (excluding 1986, 1989, 1991, 2003), and township level data from 2019 to 2022. Using this data, we will run a space time permutation model to identify high risk areas of EHD within the state of Indiana, and perform spatial analyses to identify EHD hotspots by county. We predict that we will see heightened disease presence around bodies of water where vector presence is highest, a spike in cases around the late summer and early fall, and outbreak events occurring every 5 years or so. Information gathered through these analyses can allow managers to target locations and times where their surveillance and management actions will be the most effective.

THE CLEANER CONSCIENCE INITIATIVE: AN ATTEMPT TO REDUCE WATER USAGE AT MICHIGAN STATE UNIVERSITY BY LESSENING AVERAGE TIME SPENT IN THE SHOWERS BY UNDERGRADUATES

Presenter(s): Denis Selyuzhitsky, Kayla Tracey, Shruti Elango
Environmental Science & Natural Resources
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 fuels. Thus, we designed a study to find out if we could encourage students to take shorter showers, with the hope to achieve 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 with a view to using 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 egg 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 be able to present more data next year on the efficacy of messaging strategies. Ultimately, we hope to extend the methods used in this study to other institutions and universities to motivate a general decrease in water usage.

PETROLOGICAL OBSERVATIONS FROM THE PLIOCENE VOLCANIC EVENTS OF THE TURKANA DEPRESSION

Presenter(s): Jack Piper
Environmental Science & Natural Resources
Mentor(s): Tyrone Rooney (College of Natural Science)

The East African Rift System (EARS) is a magma-rich and active continental rift. Within the EARS, the Turkana Depression has been identified as one of the loci of strain. This study is focused on the magmatic events that began in the Pliocene (ca. 4 Ma), known as the Stratoid Phase, that marked the recommencement of magmatic activity in the Turkana Depression after a ca. 5 Ma hiatus. This phase began with a basaltic pulse known as the Gombe Stratoid Series and was later followed by activity in the form of shield volcanoes. The purpose of this study is to identify key components of the petrography and characterize the differing magma flows of the Gombe Stratoid series and the overlying shield volcanoes. The Gombe Stratoid series is characterized by an evolved composition with glomerocrysts that take the shape of a clinopyroxene phenocryst with a "bowtie" like structure of plagioclase. The overlying shield volcanoes have little to no glomerocrysts, contain more mafic phases such as olivine, and have an overall more primitive petrology. We suggest that due to these petrographical differences, the Gombe Stratoid series had a complex magma plumbing system, whereas the shield volcanoes had a less efficient system. Further research will consist of analysis of mineral phenocrysts from these events to better understand and compare their magmatic systems.

AN INVESTIGATION INTO THE POTENTIAL OF THERAPEUTIC GARDENING AS A TOOL FOR NATURE PRESERVATION

Presenter(s): Veona Cutinho
Environmental Science & Natural Resources
Mentor(s): David Biedenbender (College of Music), David McCarthy (Residential College in the Arts & Humanities)

Therapeutic gardening showed tremendous benefits during the coronavirus pandemic prompting researchers to investigate the influence of activities of therapeutic nature on an individual's behavior. Gardening was shown to decrease psychopathological distress in a study by a team of psychologists led by A. Theodorou. Theodorou's study identified gardening as an instrument for self-reflection and meditation. One of the benefits of self reflection includes honing critical thinking skills which can lead individuals to develop strategies to tackle issues of urgent attention. A predominant global issue having detrimental effects on various fields is the rapid decline of environmental and climate health as a result of uncontrolled human activities. Many scientific approaches have been tried to mitigate environmental damage and control climate change. This project takes on an interdisciplinary approach to investigate whether therapeutic gardening could be a potential tool to nurture feelings of climate concern and urge individuals to be aware of their carbon footprint. In a collaborative effort with the Beal Botanical gardens, volunteers in the project will participate in the making of a terrarium. Alongside a community of garden and plant enthusiasts, the project aims to imbibe in the participants a feeling of awareness about the importance of preserving the environment. Following the activity, each participant will be video interviewed to share what they gained from the experience and if it influenced them to take actions to actively reduce their carbon footprint. The interview responses will be used to evaluate the effectiveness of therapeutic gardening as a tool for environment preservation.

WILDFIRE EFFECTS ON LAKE WATER QUALITY IN NORTHEAST MINNESOTA

Presenter(s): Andrea Paul
Environmental Science & Natural Resources
Mentor(s): Ian McCullough (College of Agriculture & Natural Resources)

Wildfires are a growing concern following climate change. Few wildfire effects on lake water quality have been studied in the Midwest. In 2021, the Greenwood wildfire ignited and became one of the largest wildfires in Minnesota's history. It burned a portion of the Superior National Forest along with areas around numerous lakes. We traveled to the burn site and sampled 30 lakes using various field sampling techniques from boats and canoes. Using statistical and mapping programs, we analyzed the physical, chemical and biological responses of the lakes following the Greenwood wildfire. In this presentation I will describe how wildfires influence nutrient concentrations, carbon, sediment, water clarity and acidity in lakes and affected lakes differently based on hydrologic connectivity. Understanding the effects that wildfires can have on the ecology of lakes is very important for protecting water quality, ecosystem services and cultural activities with an ever-changing climate.

DEVELOPING EARTHISMYHOME.ORG

Presenter(s): Adriana Sanders, Heet Barot, Jessica Tran, Matt Baylis, Nikolas Powell, Tia Lin
Environmental Science & Natural Resources
Mentor(s): Katherine Alaimo (College of Agriculture & Natural Resources)

Earth is distressed and we, humans, can take action. Many people are aware that there are environmental crises happening around them, but they do not know or understand how to prevent or solve the issues. The Earth Is My Home Initiative's objective is to be a global leading source for nature-based action education, training, organizing, community, gratitude, and joy. Combining the skills of back-end database, front-end user-experience, marketing, and management, we have designed and developed a website that empowers people to start conversations, create communities, formally appreciate each other, and take action -- to love, protect, treasure, and restore nature. Specifically, we created a Statement of Work and GANTT chart to achieve set goals and deadlines; Designed web page wireframes using Figma; Developed a website using WordPress with multiple functional plug-ins such as RegistrationMagic for user management and UpdraftPlus to backup the database; Integrated search engine optimization analysis through Yoast WordPress plug-in.We have also conducted a focus group with 5-8 college students to get a better understanding of their environmental-protection norms and expectations for the website. The focus group questions focused on boosting awareness, digital marketing, and keeping users engaged. The audio recording of the focus group was transcribed and analyzed using Atlas.ti. We hope that this website will be helpful with educating people about nature-preserving actions and creating environmental friendly norms within communities.

ASSESSING THE GAPS IN ARCTIC MARINE MAMMAL DATASETS AND ORGANIZING DATA FOR USABILITY

Presenter(s): Natalia Portales
Environmental Science & Natural Resources
Mentor(s): Jianguo (Jack) Liu (College of Agriculture & Natural Resources)

The Arctic is a remote region that can be difficult to access. A lack of consistent data collection and methods means the region is missing data in various areas across many years. This poses a problem for researchers investigating the distribution and abundance of marine mammals in the region. In this study, a synthesized research database on existing marine mammal occurrence data in the Pacific Arctic Region was created to identify the extent of surveying in this region over space and time. The species of focus is the Pacific walrus (Odobenus rosmarus divergens) and was chosen because it is a species of subsistence importance to the local Indigenous communities who heavily rely on marine resources for food. Walrus occurrences were isolated over 10 years from 2010 to 2019 and divided by season: summer (from June through August) and fall (September through November). Summaries and maps were created to visualize where these data have been collected, where data are missing, and to identify overlaps. This study is important for identifying possible data gaps in marine mammal occurrences such as insufficient data collection in sections of the region of focus when compared to established range maps of the species. The compiled occurrence data and analysis from this project will inform future analysis on the distribution of marine mammals in the region. Additionally, this work will support the development of a habitat suitability model to predict the suitability of this region's environment over time for marine mammals of subsistence importance.

ASSESSING USER EXPERIENCES OF CLIMATE ACTION APPS

Presenter(s): Caitlin Green, Erin Vimr, Grace Regan, Julianna Adams, Wes Kim
Environmental Science & Natural Resources
Mentor(s): Katherine Alaimo (College of Agriculture & Natural Resources)

The climate and nature crises continues to progress faster than solutions. One of the major difficulties of initiating environmentally conscious and sustainable behaviors is that action is required at a global scale which is discouraging for individuals. Many existing climate change projects fail to create a sense of urgency towards actions promoting sustainability possibly because they don't create a sense of community or establish social norms. Our project will assess features of smartphone apps that encourage people to do pro-environmental behaviors to determine best practices for development of a new website and app: Earth Is My Home. Qualitative data will be collected from approximately 30 volunteer participants via a digital Qualtrics survey. Participants will be advised to briefly assess three smartphone applications that have also been created to raise awareness and suggest actions to address climate change. Survey questions will assess difficulty, feasibility, acceptability, continuity, transferability of the apps' features as well as additional actions in the areas of Food, Home Energy, Transportation, Land Use, Water, and Waste. Surveys will be analyzed to determine common and disparate themes. The results are anticipated to best features as well as challenges and facilitators for participants to adopt and use smartphone apps and websites to encourage pro-environmental behaviors. Our research will help assess behaviors and attitudes of the public to implement and maintain environmentally conscientious habits on individual and community-wide levels. Creating awareness to adopt and maintain pro-environmental behaviors has the power to influence and potentially help mitigate the climate and nature crises.

MOLECULAR BASED ASSIGNMENT TESTS IDENTIFY TRIBUTARIES OF ORIGIN FOR LAKE STURGEON IN NEAR-SHORE LAKE MICHIGAN HABITATS

Presenter(s): Jessica Beach
Environmental Science & Natural Resources
Mentor(s): Kim Scribner (College of Agriculture & Natural Resources)

Lake sturgeon (Acipenser fulvescens) are a potadromous species native to the Great Lakes that occupy open-water lake environments and tributaries at different times of their lives. Due to their complex life histories, individuals produced from several tributary spawning populations can occupy different lake habitats for extended periods of time. Great Lakes habitats are subject to perturbations due to pollution, infrastructure development, and other sources of mortality that put lake sturgeon at risk of extirpation. In this study, we utilized molecular techniques to genotype individuals sampled off the coast of Lake Michigan near the Ludington Pumped Storage Plant, a water intake source for the hydroelectric power plant, to determine natal stream of origin. Field sampling consisted of tagging, biological data collection, and tissue sample collection for laboratory analyses. Laboratory analyses consisted of molecular techniques; including DNA extraction and quantification, PCR amplification of twelve microsatellite loci, genetic sex determination, and subsequent

statistical analyses. We compared the multilocus genotypes of sampled individuals with baseline population genotype data to identify tributary of natal origin. We quantified proportional contributions of natal streams, and discussed the implications of how the relative abundance of members of each tributary differ in body size and sex. Characterizing potential differences is important because findings may indicate which natal streams may be differentially susceptible to mortality events associated with plant operation.

ENVIRONMENTAL EDUCATION

Presenter(s): Ezra Montero
Environmental Science & Natural Resources
Mentor(s): Lisa Duke (College of Agriculture & Natural Resources)

The importance of environmental education through the lens of the kellog bird sanctuary.

ANALYZING IMPACTS OF LONG-TERM WETLAND PLANTS ON INFILTRATION IN ESTABLISHED SITES AND DEVELOPMENT OF FUTURE CITIZEN SCIENCE RESEARCH

Presenter(s): Ella Harrell, Sebastian Hawkes
Environmental Science & Natural Resources
Mentor(s): Dawn Dechand (College of Agriculture & Natural Resources)

Infiltration rates of soils are important for determining water management practices in both agricultural and urban areas. For example, the effectiveness of urban Low Impact Development practices like bioretention basins and stormwater wetlands are substantially impacted by the fraction of water that infiltrates and the dominating treatment processes. Previously conducted studies on the role of plant roots in affecting infiltration have yielded conflicting results on which root type is more conducive to infiltration. Additionally, research has largely utilized new bioretention and wetland columns and sites; therefore, the effects of wetland plants in the long-term is largely unknown. Our project aims to clarify the influence of vegetation on infiltration in established bioretention and wetland sites while developing methods for a citizen science approach to assessing infiltration rates due to plants. Using four different infiltrometers, infiltration rates over three types of vegetation and bare soil will be measured for each site, including one bioretention basin and one wetland that are both older than 10 years. Plants will represent a range of root types. Based on preliminary results, we expect to see an increased rate of infiltration when plant roots are present, with the greatest infiltration rates being in the presence of tap roots. Furthermore, we will compare the quality of data obtained with different infiltrometers. We will also investigate the use of sensors to assess infiltration rates. Ultimately, this research will characterize plant root impacts on infiltration, which allows for more detailed infiltration models to be built based on plant type.

MDARD EDUCATIONAL OUTREACH

Presenter(s): Peyton Burch
Environmental Science & Natural Resources

Mentor(s): Eva Farre Prokosch (College of Natural Science), Tammy Long (College of Natural Science)

The Michigan Department of Agriculture and Rural Development (MDARD) is a governmental agency that has different agriculture and rural development related divisions. The division that this presentation will focus on is the plant pest and diseases division. This division utilizes communications with growers and natural resource specialists to research plant pests and diseases that are plaguing Michigan food crops, ornamentals, and native plant species. MDARD also works with other Michigan governmental agencies. This presentation will discuss the intricacies of MDARD and how it assists growers through plant disease testing, inspections, and surveys to keep detrimental plant pathogens at bay. MDARD uses specific processes to accomplish this task and to make sure it is researching and focusing on the most detrimental plant pests and diseases. This presentation will also discuss where certain professionals and student assistants assist in these processes.

EPIDEMIOLOGY & PUBLIC HEALTH

CAREGIVER BURDEN AND MENTAL HEALTH OUTCOMES

Presenter(s): Anjali Desai
Epidemiology & Public Health
Mentor(s): Kipling Bohnert (College of Human Medicine)

As the US population undergoes a demographic shift due to a rapidly aging population, informal caregiving by friends and family members is becoming more prevalent and imperative. This role can be highly demanding and contribute to a decline in both the physical and mental health of the caregiver. Existing literature on this subject defines caregiver burden as the strain perceived by a caregiver caring for their loved one over time, and caregiver mental health is a demonstrated critical issue. This study aimed to examine the potential differences in the number of poor mental health days experienced per month between caregivers and non-caregivers using data from the national CDC Behavioral Risk Factor Surveillance System (BRFSS) data set. In our proposed model, the exposure variable of interest is caregiver status and the outcome variable is the number of poor mental health days in the last month. Potential confounders include age, household income, and health insurance access. Univariate analysis will examine the demographic distribution of the sample. Potential confounders will then be evaluated using multivariable linear regression to determine their role in the relationship between the exposure and outcome variables. These findings will be used to inform much-needed interventions and guide future work to improve caregiver burden and mental health outcomes.

THE IMPACTS OF RESIDENTIAL SEGREGATION ON RACIAL DISPARITIES IN SEXUALLY TRANSMITTED INFECTIONS: DETROIT METROPOLITAN AREA 2015-2019

Presenter(s): Bhavya Thotakura
Epidemiology & Public Health

Mentor(s): Nicole Dear (College of Social Science), Sue Grady (College of Social Science)

Rates of sexually transmitted infections (STIs) are on the rise in the United States accounting for approximately 2.5 million reported cases of Chlamydia, Gonorrhea, and Syphilis in 2021. Pregnancy complications are a common result of sexually transmitted infections, directly impacting birth outcomes and neonatal health. Underdiagnosed and untreated STIs can also result in long-term health consequences including reproductive health issues. Health disparities are directly tied to residential segregation that isolates groups of women to specific neighborhoods that lack sufficient healthcare resources. Previous studies have shown that Black women have a higher likelihood of STIs. This study will further understand the relationships between residential segregation and racial disparities in STIs among women in the Detroit Metropolitan Area, between 2015-2019. Racial residential segregation is measured using the index of dissimilarity at the township/city level and an isolation index at the census tract level. Pregnant women with a STI or treated for an STI at the time of her infants' birth were obtained from the Michigan Vital Statistics Birth Records. The mother's residential addresses were geocoded and spatially joined to the segregation measures to assess exposure to racial segregation. Descriptive frequencies and generalized linear multilevel models were estimated to investigate the residential segregation and STI relationships. It is hypothesized that in highly segregated neighborhoods, STIs will also be elevated, and this relationship will in part be explained by limited healthcare services. The findings from this research will be used to inform the state of Michigan's program on racial disparities in STIs.

RELATIONSHIP BETWEEN HAIR CORTISOL AND PERCEIVED STRESS AMONG LOW-INCOME FAMILIES

Presenter(s): Samantha Riordan

Epidemiology & Public Health

Mentor(s): Jiying Ling (College of Nursing), Wachira Suriyawong (College of Nursing)

Limited research has been conducted to examine the relationship between hair cortisol and perceived stress in low-income families. Therefore, this study analyzed the data from 112 Head Start parents (mean age=29.85) and preschoolers (mean age=4.8) to examine the relationship between hair cortisol and perceived stress. Parents completed the 10-item Perceived Stress Scale to assess their perceived stress via Qualtrics. Participant hair samples were collected at Head Start Centers in Michigan and processed by the University of Massachusetts Amherst Center for Neuroendocrine Studies. The parents were 58.0% White, 28.6% Black, 8.0% mixed-racial, and 6.4% other. About 46.4% of parents were single, and 53.6% reported an annual family income <$20,000. Among the 112 parents, 27.7%, 57.1%, and 14.3% reported low, moderate, and high levels of stress, respectively. In children, mean cortisol levels for perceived low, moderate, and high stress were M=37.78, M=66.38, and M=44.06. In parents, a similar relationship was observed with mean cortisol levels of M=8.46, M=15.84, and M=4.46. Using Spearman's correlation test, parents' and children's hair cortisol levels were positively correlated (p=0.42, p=.001). The study's results indicate a u-shape correlation between hair cortisol and perceived stress in low-income families, this may be due to adrenal suppression (inadequate cortisol production as a result of suppressed hypothalamic-pituitary-adrenal axis) contributed to continuous exposure to high level of stress. The positive relationship between parents' and children's cortisol level supports the intergenerational transmission of stress, so assisting parents to effectively cope with stress can be beneficial to the mental well-being of the entire family.

CHILDREN'S CHRONIC STRESS SUPPRESSED INTERVENTION EFFECTS ON IMPROVING HEALTHY EATING BEHAVIOR

Presenter(s): Lizzie Kompus
Epidemiology & Public Health
Mentor(s): Jiying Ling (College of Nursing)

Eating patterns and stress levels are very critical when it comes to one's health. Families with low socioeconomic status are pre-dispositioned to higher stress levels and the COVID-19 pandemic dramatically increased stress, specifically in families with young children. "Happy Family, Healthy Kids" was a 14-week healthy eating and stress management program to improve eating behavior among low-income parent-child dyads in both rural and urban areas. The purpose of this one-group quasi-experimental study was to evaluate the program effects and explore the influence of baseline hair cortisol on the study's effects. Participants included 53 parents (mean age=29.19 years) and children (mean age=47.55 months). Block survey was used to assess dyads' eating behavior, and chronic stress was assessed by hair cortisol. Among participating children, 11.3% were Hispanic, and 22.6% were Black. Among parents, 37.7% were single, and 43.4% were unemployed. After the program, both parents' and children's fruit/vegetable intake increased significantly (Cohen's d=0.30, 0.23). Children's baseline hair cortisol had a negative relationship with both their own and their parents' fruit/vegetable intake change (r=-0.38, -0.18), while parents' baseline hair cortisol only had a small positive correlation with their own fruit/vegetable intake change (r=0.18). The results support the efficacy of the program on improving low-income families' dietary intake. The intervention suppressing effects of children's chronic stress indicate the importance of integrating a stress management component in healthy lifestyle promotion programs, especially targeting young children's stress.

COVID-19, OLFACTORY DYSFUNCTION, AND NEURODEGENERATION

Presenter(s): Elizabeth Cordill, Kyleen Hall
Epidemiology & Public Health
Mentor(s): Honglei Chen (College of Human Medicine)

It is well known that olfactory function plays a critical role in health and behavior. In several neurodegenerative diseases, such as Parkinson's disease and Alzheimer's disease, olfactory dysfunction is one of the initial symptoms appearing before motor symptoms and cognitive decline. Olfactory dysfunction as a clinical marker for neurodegenerative diseases is helpful to characterize the early stages of these diseases, early diagnostic strategies, differential diagnosis, and could potentially predict treatment success. Since the onset of the COVID-19 pandemic, various research has been done to discover possible long-term consequences of the pandemic. In acute infection, one of the most common symptoms experienced by a wide variety of patients is anosmia, or the loss of smell. Recent studies have also begun to investigate the phenomenon termed "long-COVID", which is when various physical symptoms persist past the acute stage of the disease. Olfaction dysfunction is also among the most prevalent long-COVID symptoms, along with other symptoms such as fatigue, depression, brain fog, and memory issues. We therefore are interested in understanding the connections among COVID-infection, olfactory dysfunction, long-COVID, and potential neurodegenerative consequences. We hereby reviewed the literature, evaluated current empirical evidence, and identified potential knowledge gaps. Given the scope of this global pandemic and the strong connections between olfactory loss and neurodegenerative, such research will have significant public health importance in older adults.

ASSESSMENT OF TELEMENTAL HEALTH RESOURCE USAGE AND SATISFACTION AMONG UNDERGRADUATE STUDENTS

Presenter(s): Trinity Dalton
Epidemiology & Public Health
Mentor(s): Megan Mulheron (College of Human Medicine), Mieka Smart (College of Human Medicine)

In previous years, the rise of mental health concerns in undergraduate students has become a major public health concern. These issues were further compounded by COVID-19, as many college students were left without access to mental health professionals and resources. Therefore, colleges turned to virtual forms of mental health resources as an intervention against these mental health concerns among undergraduate students. Uwill, a telemental health resource offered at MSU, is an online mental health platform used to connect students with trained professionals and provide wellness videos to assist in creating healthy habits. Past studies have demonstrated students' openness to try virtual therapy and resources; additionally, telemental health has shown success in assisting patients' mental health. However, few studies have reviewed the intervention among college students after its adoption and implementation. In order to assess the program, we designed an anonymous survey for distribution to undergraduate students. Our goal was to 1) assess Uwill's usage and satisfaction among undergraduate students at MSU and 2) evaluate its effectiveness in helping MSU students. We created an anonymous survey composed of 29 questions that will be administered to students across MSU. First, the survey will question students' familiarity, uptake, and usage of Uwill. Students who have used Uwill will be identified and asked a series of questions to understand their experiences with the program and the likelihood of continued use. The results will outline a brief assessment of undergraduate students' uptake and satisfaction with telemental health resources.

IMPACTS OF GUT MICROBIOTA ON CHILD DEVELOPMENT: A DESCRIPTION OF THE STUDY POPULATION

Presenter(s): Anushree Ravi
Epidemiology & Public Health
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. We have currently recruited 45 participants for this study, who have sent in a stool sample of the child. I will describe the age, height, weight, water source, dietary intake, antibiotic exposure, and other covariates of current participants. My work will inform the analysis plan for the primary aims of the project.

ASSOCIATIONS OF RACE AND VAGINAL MICROBIOMES OF PREGNANT WOMEN

Presenter(s): Dana Nzerem
Epidemiology & Public Health
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Women of color are more likely to experience poor perinatal outcomes, which have also been associated with high bacterial diversity of the vaginal microbiome. Current literature suggests that the vaginal microbiomes of women of color are more likely to harbor unfavorable microbes but the underlying mechanisms have not yet been determined. Thus, the objective of this research is 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. We anticipate the detection of behaviors that differ by race. Further, we expect these behaviors may also be associated with differences in vaginal microbiome composition. Such relationships can be analyzed in future work to determine if specific behaviors impact the vaginal microbiome and result in poor perinatal outcomes.

IMPACTS OF EXPOSURE FROM PER- AND POLYFLUOROALKYL SUBSTANCES ON THE INFANT GUT MICROBIOME

Presenter(s): Megha Pratapwar
Epidemiology & 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 that are widely used in consumer products that can lead to adverse effects on health in exposed humans. Exposure usually occurs through dust, drinking water, and food. These chemicals break down very slowly and therefore can cause long-term contamination in both humans and the environment. Some possible health effects of PFAS are decreased fertility, developmental delays in children, increased risk of some cancers, reduced immunity, and interference with hormones. PFAS levels in human milk have been positively associated with decreased diversity in the gut microbiome of 1 month old infants. To study the impact of PFAS contamination in Michigan, 50 mother-infant dyads provided samples of human milk/formula, stool, and water. Participant survey responses were analyzed to estimate level of PFAS exposure. DNA will be extracted from infant stool samples, and sequencing of the v4 region of the 16S ribosomal RNA will be performed to characterize the bacterial alpha and beta diversity to be analyzed via the software R. Regression will then be performed to determine if PFAS exposure is associated with these microbiome characteristics. Since the infant gut microbiota membership is established early in life, understanding the exposures which can alter the composition of this microbiota will enable a clearer understanding of the mechanisms by which compounds, such as PFAS, impact health.

THE IMPACT OF HIV ON BLACK WOMEN LIVING IN RURAL COMMUNITIES

Presenter(s): Jasmine Parker
Epidemiology & Public Health
Mentor(s): Dawn Misra (College of Human Medicine)

There has been a steady increase in the number and proportion of Black women suffering from HIV in rural communities compared to urban communities. Care for HIV is also challenging for Black women to access in rural communities. The methodological approach was a systematic literature review using PubMed and additional sources such as reports from government agencies and research institutes. The identified literature documented that Black women in rural areas experience a wide range of barriers that include limited transportation, a lack of insurance coverage, a shortage of sites for any health care, and substandard care for HIV. The historical impact of racism on access to and delivery of medical care generally and for HIV is also discussed. In order to improve HIV care for Black women in rural communities, we must address a wide range of factors that may be unappreciated in urban settings.

MAGNETIC NANOPARTICLE-AIDED RAPID ESTIMATION OF LIVE VS DEAD SALMONELLA CELLS

Presenter(s): Katherine Heinecke

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

Each year in the United States, Salmonella contamination results in an economic burden of approximately $4.1 billion. Major sources of Salmonella contamination result from poultry facilities and slaughterhouses, which lack adequate access to rapid, accurate, and inexpensive Salmonella detection methods. With the development and implementation of an efficient and cost-effective test, the ability to detect Salmonella early will be readily available. This project aims to develop a simple way to estimate Salmonella load using a magnetic nanoparticle (MNP)-based biosensor. The biosensor works based on the interaction between the MNPs and Salmonella cells in a buffered solution. The hypothesis is that in the presence of Salmonella cells, the MNPs form a spread pattern. In these experiments, the Salmonella culture is centrifuged and serially diluted before MNPs are added to each dilution. When placed near a magnet, and the supernatant is pipetted out, MNP-Salmonella pattern is observed. Preliminary experiments showed that at different dilutions, the interaction between MNPs and Salmonella cells produced a unique spread pattern. A difference was also observed between the MNP patterns created by live and dead cells. This MNP-based biosensor can potentially be used for applications that require a rapid estimation of bacterial load of a sample throughout the food industry and for water testing. Implementing this biosensor will increase the frequency, speed, and accuracy of the testing.

COMMUNITY GARDENING AND PHYSICAL ACTIVITY: RESULTS FROM QUALITATIVE INTERVIEWS

Presenter(s): Veronica Wirth
Epidemiology & Public Health
Mentor(s): Katherine Alaimo (College of Agriculture & Natural Resources)

Gardening is an activity requiring a range of activities through numerous gardening tasks. A review of the literature suggests that gardening can serve as a strong motivator for reducing sedentary days, while improving exercise rates and physical functioning. However, few studies have been randomized controlled trials (RCTs). To further understand the impact of community gardening on physical activity, an RCT of community gardening was conducted in Denver and Aurora, CO, USA: Community Activation for Prevention Study (CAPS). CAPS was conducted 2017-2020 in partnership with Denver Urban Gardens. Study participants (n=291) were randomly assigned to receive a garden plot in a community garden, seedlings and seeds, and a gardening class (intervention), or be placed on a waitlist (control). Control participants were offered the gardening intervention after their participation in the RCT was completed. A subset (n=34) of intervention and control participants completed qualitative interviews after their first season of gardening. Interviews were analyzed using Atlas.ti software to investigate the influences of community gardening on physical activity. Many gardeners viewed the community garden as a motivation for physical activity, noting that gardening felt like an enjoyable form of exercise, one that did not feel like a requirement. Some participants walked or biked to their gardens, and felt like they exercised more as a result. Additionally, participants felt stronger and more flexible by the end of the season. This study demonstrated that gardening can improve physical activity outcomes over a gardening season. Community gardening is a community-based avenue for physical activity.

CHEMICALS IN CLEANING PRODUCTS

Presenter(s): Rebecca Rabideau
Epidemiology & Public Health
Mentor(s): Ankita Bhattacharya (College of Agriculture & Natural Resources), Courtney Carignan (College of Agriculture & Natural Resources), Rachel Bauer (College of Agriculture & Natural Resources)

Phthalates, quaternary ammonia compounds (QACs), and other semi-volatile organic compounds (VOCs) are in many household cleaning products and can be reproductive toxicants. Higher exposure is expected during the use of such cleaning products and in homes where they are used, as they can persist in indoor air and dust. However, it is unclear how much home exposure there is, and how much it could harm a person's overall health. Therefore, we collected data from a community in southwestern Michigan to investigate cleaning frequency and products used as well as differences by age groups and sex. Our results will inform future estimation of exposure and risk.

DEPRESSION-ASSOCIATED SUICIDE THOUGHTS AND PLANS: HYPOTHESIZED SUBGROUP VARIATIONS

Presenter(s): Olivia Leblanc
Epidemiology & Public Health
Mentor(s): James (Jim) Anthony (College of Human Medicine)

Aim & Background: During a decade of increased depression prevalence, I aim to derive epidemiological estimates for the occurrence of suicide thoughts and ideas that form among adolescents who have experienced a brief depressive spell (BDS). In this diversity-inspired research, I compare estimates for males and females stratified by ethnic self-identification. I also am trying to estimate the degree to which the BDS experience might be complicated by suicide thoughts, taking an age- and birth cohort-specific approach known as the 'epidemiological mutoscope'. Materials & Methods: Nationally representative multi-stage probability sample surveys of 12-to-17-year-olds have been conducted each year, 2008-2019, for the US National Surveys on Drug Use and Health (typical unweighted annual sample size of >2500 at each age, with >75% participation). Standardized audio computer-assisted self-interviews assessed ethnic self-identification and depression-related experiences. I already have initial estimates based on conventional meta-analyses, combining estimates from each year's successive new and independent NSDUH sample. I apply analysis weights with Taylor series linearization for variance estimates that address varying selection probabilities and interdependent observations caused by a complex multi-stage sample design. This year, I am trying to extend the conventional meta-analysis estimates based on Fisher's frequentist approach with novel corresponding estimates based on a Bayesian posterior inference approach, implemented with R-scripts created in 2022. Results, Discussion, & Conclusions: Being readied for presentation at URAAF 2023.

ADOLESCENT-ONSET ALCOHOL INVOLVEMENT BY SOCIAL POSITION IN SCHOOL

Presenter(s): Mary Gallagher
Epidemiology & Public Health
Mentor(s): James Anthony (College of Human Medicine)

Aims & Expectations: Pre-clinical lab evidence suggests social position in dominance hierarchies can influence endogenous dopaminergic endpoints (e.g., receptor density) and subsequent behavioral pharmacology outcomes. Studying human underage drinking behavior, I specified social position in an age-by-grade matrix. I now derive age- and grade-specific epidemiological incidence estimates for starting to drink alcoholic beverages and whether drinking occurs quickly after the first full drink. I began with incidence estimates for persons in the age-normative grade as my 'expected' values. I surmised that within age strata, persons in lower grades (e.g., due to being held back) might experience larger than the expected incidence values, with larger and smaller contrasts for 12-to-14-year-olds and 15-to-17-year-olds, respectively. Materials & Methods: Nationally representative multi-stage probability sample surveys of 12-to-17-year-olds have been conducted each year, 2002-2019, for the US National Surveys on Drug Use and Health (typical unweighted annual sample size of >2500 at each age, with >75% participation). Standardized audio computer-assisted self-interviews assessed 'completed grade' and alcohol experiences. I can now present initial estimates on precocious alcohol onsets based on conventional meta-analyses and Bayesian posterior inference approaches combining estimates from each year's successive new and independent NSDUH sample. I apply analysis weights with Taylor series linearization for variance estimates that address varying selection probabilities and interdependent observations caused by a complex multi-stage sample design. Results, Discussion, & Conclusions: Being readied for presentation at URAAF 2023.

INTEGRATING NATURE INTO A MEDITATIVE PRACTICES PROTOCOL: METHOD AND PROCEDURES

Presenter(s): Grace Caldwell, Sophie Delahaye
Epidemiology & Public Health
Mentor(s): Gwen Wyatt (College of Nursing), Rebecca Lehto (College of Nursing)

With the growth of home-based hospice care, family caregivers (CGs) are increasingly relied upon to support cancer patients at end-of-life. Following death, CGs face bereavement which affects quality of life (QOL). The purpose of this work is to integrate nature with standardized meditative practices for the proposed restorative benefits to bereaved CGs . Strong relationships exist between nature exposure and overall health. Providing nature-based meditation allows CGs to calmly focus inward in a restorative manner. Guided by the Bereavement Framework and past research, the protocol uses nature scenes from virtual reality (VR) programs to create audio-meditations with nature imagery. Scripts for three meditations were created: 1) guided body scan with ocean beach imagery; 2) breath-meditation with

green meadow imagery; and 3) gentle movements amidst imagery of falling leaves in autumn. Utilizing the scripts, 10-minute audio recordings will be created by an expert with recording auditory imagery experience using a soft voice. The audio messages will be pilot tested for feasibility/acceptability with five bereaved hospice CGs over a one-month period with daily use recommended. If the audio-recordings are found both feasible and acceptable via participant surveys , the study will be expanded to 50 bereaved hospice CGs. Bereavement QOL will be measured both pre-and-post nature meditations and evaluated using t-tests. Audio-recordings are highly accessible to CGs not wanting to be away from home during bereavement. Supporting home-based CGs through the integrated nature-based meditative practices intervention may benefit CG QOL, while also addressing health equity issues related to decreased access to supportive resources.

EPIDEMIOLOGICAL QUESTIONS AND NEW EVIDENCE ABOUT ADOLESCENCE AND BRIEF DEPRESSIVE SPELLS, UNITED STATES, 2004-2019

Presenter(s): Anne Jansen
Epidemiology & Public Health
Mentor(s): James Anthony (College of Human Medicine)

Last year, I studied time trends of year-specific estimates for United States (US) population subgroups of 12-to-17-year-olds with a focus on cumulative attack rates for Brief Depressive Spells (BDS) and transitions to Major Depressive Episodes (MDE). As expected, these adolescents showed an increased occurrence of the mood disturbances during the interval from 2012 through 2019 that followed the US economic recession of 2008-2010, with some evidence of female-male variation. I now return to a more fine-grained look at these estimates quarter by quarter within each year. In January 2023, I was able to show results from 'joinpoint regression modeling' of the quarter by quarter estimates in order to pin down more carefully when the uptick occurred during or soon after the recession years. My materials and methods are from large nationally representative multi-stage probability sample surveys of 12-to-17-year-olds, conducted each year since 2002 for the US National Surveys on Drug Use and Health, typically with an unweighted annual sample size of >2500 adolescents at each age, and participation levels above 75%. Each year since 2008, the standardized audio computer-assisted self-interviews have included depression module items on BDS and MDE. In addition to my analysis-weighted estimates, I use Taylor series linearization for variance estimates to address interdependencies from the complex multi-stage sampling approach. This year, I hope to extend the conventional survey estimates based on Fisher's frequentist approach with novel corresponding estimates based on a Bayesian approach, implemented with R-scripts created in 2022.

A DESCRIPTIVE STUDY OF EMERGING ADULTS' SOURCE OF HEALTH CARE INFORMATION AND STI RATES

Presenter(s): Hannah Kulp
Epidemiology & Public Health
Mentor(s): Emma Schlegel (College of Nursing)

Background: Emerging adults (18-25 years; EAs) account for more than half of newly occurring sexual transmitted infections (STIs) and utilize online and peer sources for health information at high rates. While it is clear how EAs receive health information, little is known about the relationship between source of information and sexual and reproductive health (SRH) outcomes, including STI status. Purpose: To explore if EA women (and persons who menstruate) that get their health information primarily from a healthcare professional have lower STI rates than those that get their health information from another source (lay person, internet/social media). Methods: Data were obtained from an IRB-approved cross-sectional survey, open between September 2022 to November 2022. As part of the demographics section of the online survey, respondents were asked about their primary source of SRH information and if they had ever tested positive for an STI. Chi-square analysis was performed to examine differences in the proportion of previous STIs between groups. Results: Of 191 sexually active EA persons who responded to both questions, 11.5% with a non-healthcare professional primary source (n = 16) and 19.2% with a healthcare professional primary source (n = 10) reported a previous STI. The chi-square test showed that there was no significant difference between groups. Conclusion: In this sample STI status did not vary by primary source of SRH information and support. Healthcare professionals should continue to provide high quality SRH education to emerging adults. Improvements to online resources for emerging adults should be considered.

SCREEN TIME IN RELATION TO STRESS AND BLOOD PRESSURE IN LOW-INCOME MOTHERS

Presenter(s): Tara Mathur
Epidemiology & Public Health
Mentor(s): Jiying Ling (College of Nursing)

During this investigation, the goal was to examine the relationship between screen time and stress in diverse low-income communities. Beginning 2021, 57 low-income mothers were recruited from multiple Head Start centers in Michigan to assess their screen time, perceived stress, blood pressure, and hair cortisol. Cortisol is a hormone released under stress by the adrenal glands. High cortisol levels are indicative of high stress. Screen time equates to the number of hours mothers spent looking at screens such as tablets or computers over a 30-day period. Participant ages ranged from 21-48 years old with 12.3% Hispanic, 47.4% White, and 38.6% Black. About 54.4% were single, 66.7% had annual family income <$20,000, and 49.1% were unemployed. On average, mothers engaged in 7.61 hours of screen time per day. Among the 57 mothers, 31%, 60.3%, and 6.9% had low, moderate, and high levels of stress, respectively. Screen time had a small positive relationship (σ =0.27) with hair cortisol, and a negative relationship with systolic (σ =-0.28) and diastolic (σ =-0.24) blood pressure. Moreover, hair cortisol has a small positive relationship with systolic (σ =0.24) and diastolic (σ =0.14) blood pressure. The results indicate that increasing screen time was related to mothers' increased release of cortisol, but a causal relationship between the two variables is unclear. Since more research is needed, the positive relationship between hair cortisol and blood pressure should be further investigated to understand stress sources.

SERUM FATTY ACID ANALYSIS AND ESSENTIAL FATTY ACID DEFICIENCY PREVALENCE AMONG 6-18-YEAR-OLD UGANDAN CHILDREN

Presenter(s): Dharshini Senthilkumar, Olivia Bartunek
Epidemiology & Public Health
Mentor(s): Jenifer Fenton (College of Agriculture & Natural Resources)

In low to middle-income countries (LMICs), stunting and poor cognition due to malnutrition are prevalent. Recently, the westernization of diets in LMICs makes the population prone to malnutrition, both under- and over-nutrition. Fatty acids are imperative for health and growth during critical periods of development in children, and essential fatty acid deficiency (EFAD) is associated with adverse developmental outcomes. Blood fatty acid levels of children in LMICs, notably Uganda, are understudied. The objective of this study is to characterize serum fatty acid levels and determine the prevalence of EFAD among Ugandan children. A cohort of 626 Ugandan children aged 6-18 years were enrolled in this study, and serum samples were collected at baseline. Serum fatty acid levels were measured using gas chromatography-mass spectrometry (GC-MS). Mean total saturated fatty acid (SFA) was 50.12% (SD: 7.59%), polyunsaturated fatty acid (PUFA) was 34.72% (SD: 14.66%), and monounsaturated fatty acid (MUFA) was 15.15% (SD: 7.89%). The mean T:T ratio was 0.032, which is greater than the clinical threshold of 0.02 used to diagnose EFAD. Consequently, over half of the study population (~57%) has EFAD. These results showcase a higher amount of endogenous SFA than PUFA, which is undesirable for overall growth, development, and cognitive function, as well as a high prevalence of EFAD among Ugandan school-aged children and adolescents. This study provides reference fatty acid levels for a wide age range of Ugandan children, which can be compared to those of other child populations and analyzed for associations with growth and cognitive outcomes.

INTERDISCIPLINARY FILMS

MEDIA PROMOTING STEM

Presenter(s): Zackery Garcia
Interdisciplinary Films
Mentor(s): Amol Pavangadkar (College of Communication Arts Sciences)

In order to stay in the lead in science, organizations need to promote diversity and cultivate interest in the field. We began by pitching three promotional videos to the College of Natural Sciences focusing on diversity in science, why science is cool and major developments at NATSCI. After months of adjusting our concepts, interviewing faculty, and getting B-roll, our videos still struggled to reach non-scientist. In order to make these videos more appealing to the public, we merged our concepts of major developments in NATSCI and why science is cool. This change provided the opportunity to talk in great detail about the science that was happening at the college in a fun way; the faculty members were able to explain why their research is cool as opposed to using extensive scientific jargon. The final promotional videos use interviews and clips taken from around the university to focus on the experiences of university faculty and students in STEM to show why people should be interested in STEM and why diversity is so essential.

THE EPIC RAP BATTLE OF SYNCHRONY: ASYNCHRONOUS VS. SYNCHRONOUS LEARNING

Presenter(s): Mia Burghardt
Interdisciplinary Films
Mentor(s): Rabindra Ratan (College of Communication Arts Sciences)

Lives changed forever in 2020 when learning became reliant on digital technology. With faces behind screens and voices turned on and off by the click of a button--virtual, synchronous learning became the closest thing to normalcy. Another side to the virtual learning coin was asynchronous learning. This alternative offered a structured academic course with no interactive environment between persons at one time. Three years post-pandemic, both modes of learning remain prevelant, and multiple research articles have been published regarding the psychological impacts that these modes of communication have on learning. This demonstration showcases the creative approaches the media team at SPARTIE-Lab took to convey this information to the public.

MICHIGAN PROHIBITION

Presenter(s): Elena Sheperd, Hannah Calender
Interdisciplinary Films
Mentor(s): Geraldine Zeldes (College of Communication Arts Sciences), Troy Hale (College of Communication Arts Sciences)

This film is one of the Documentary Production Capstone Class projects. This film is about the Prohibition Era, and its legacy/impact on today. It focuses on the Lansing area and how women were influential in this piece of history. Featuring information about the movement as a whole, Lansing centric information, and places/items from history around the Lansing area, this film provides a well-rounded educational and entertaining experience.

MENTAL HEALTH OF STUDENT ATHLETES AT MSU

Presenter(s): Nora Curley
Interdisciplinary Films
Mentor(s): Judith Walgren (College of Communication Arts Sciences)

This short film looks at the mental health of student athletes at Michigan State University. It dives into the resources available to student athletes and how athletes from different sports, as well as coaches and other staff, deal with mental health challenges that arise. The unique mental health challenges that are experinced by student athletes require additional time and effort to help them, and my research helps to determine if students feel the necessary tools are available to them in order to overcome these challenges. The research also looks at what more can be done, from the perspectives of student athletes as well as their support staff.

DOCUMENTING BARRIERS AND BENEFITS IN LANSING'S FARMERS' MARKETS

Presenter(s): Amina Darabie, Ari Andres
Interdisciplinary Films
Mentor(s): Eddie Boucher (College of Social Science)

For all the benefits that local farmers markets can provide, there are certainly challenges that come with them. Each farmers market becomes a culture in and of itself, and this established culture is not always open to diversity, equity, and inclusion around the areas of socio-economic, cultural, and ethnic pluralism - creating a barrier of access or participation and often to the very people who could most benefit by the local and nutrient-rich produce that is generally available at farmers markets. With a simple and expansive research question, we ask: What are the benefits and challenges for stakeholders in the Lansing area's surrounding farmer's market community? Collecting qualitative data from participant interviews and observations of local farmers, market managers, patrons, and musicians, we worked to explore our research through the form of a documentary film with lenses focusing on food accessibility and the experience architecture of market spaces.

INTERSECTIONAL FEMININITY

Presenter(s): Nel Robinson
Interdisciplinary Films
Mentor(s): LeConte Dill (College of Arts & Letters)

The journey to finding my inner peace and being comfortable in my own skin is not yet over. The message of the project is to portray that everyone's definition of femininity and masculinity can look different. It is important for all people, especially queer people, to know that they can define their gender and sexual expressions on their own terms. My understandings of the theory and practice of "Intersectionality" have helped this project to expand. By the use of a sonic introduction, my project is my personal explanation of who I am and who I want to be. I put this sonic introduction together using excerpts of audio from some of my favorite songs by Kendrick Lamar, voiceovers of myself talking about how I identify, short audio cuts of close friends answering some questions related to how they see view me, poems, both original and from other poets that are recited by myself or by the original authors, and pictures and videos of myself for audience members who listen better with visuals. The result of this project is a video about who I am as a person and what I want in my future as I allow myself to heal, learn, and explore. Coming to the realization that I do not have to conform to societal norms is new territory, and this project should be seen as an introduction into myself redefining who I am. I am who I want to be, and that will always be authentically me.

THE UNTOLD SIDE OF FILM

Presenter(s): Nolan Duff, Zackery Garcia
Interdisciplinary Films
Mentor(s): Amol Pavangadkar (College of Communication Arts Sciences)

While in preproduction for the short film Cultivar, we aimed to run the film like a major league film while still addressing the common mistakes that students make in their filming. In the camera department, we addressed these mistakes by testing the equipment we had. We conducted tests on each piece until we were sure we could get the exact image we wanted in any situation. While in testing we learned that we were granted access to film on industry-level cameras which forced our camera team to double down and learn new camera systems that we wouldn't actually be able to use until production week. Having spent countless hours studying videos and the Red Digital Cinema website and having gotten certified to use these cameras, our team felt ready. In the meantime, we continued to test with the equipment we had in every location we had access to before production week. One of our locations had lights that caused our cameras to read skin tones incorrectly; when testing some solutions we deduced that we needed blue light to correct the skin tones. Hence, we engineered frames with a blue-colored film and light diffusion that we could attach to the grid holding the lights and position them in between the light and our subject to give us the blue light we needed. In producing Cultivar, our team learned that with a little creativity and perseverance, you can overcome a variety of unique challenges on set.

GLOBAL & AREA STUDIES

WAR ON SYRIA: A WAR THAT NEVER END

Presenter(s): Zeyu Li
Global & Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters), Russell Lucas (James Madison College)

The Syrian civil war from 2011 to the present is not only a Syrian domestic problem but also a world crisis. For Syria, at least 300,000 people have died in the civil war, decades of economic development have been destroyed, and half of the population has been displaced. The massive displaced Syrian refugees account for a third of the world's refugees. They are flooding into Turkey, Jordan, Lebanon, and Europe putting pressure on the local economy and society. Because of these serious consequences, we need to look more deeply into the Syrian civil war and try to find a solution. Based on existing studies of the Middle East, I try to analyze the political sides, interests, and goals of various countries in the Syrian civil war based on the real interest perspective. I also hold a meeting with a displaced Syrian refugee in Turkey weekly to obtain first-hand information and then adjust possible misunderstandings. In Syria, America, Russia, Iran, Saudi Arabia, and other countries are trying to shape the Middle East in their favor, and both ISIS and the Kurds are taking advantage of the chaos to seek statehood. Turkey chooses to contain the Kurds to prevent the domestic Kurdish problem from worsening. Because of the multi-national involvement, the Syrian government and opposition forces do not dominate. Without a compromise made by those countries, the Syrian civil war will be difficult to end.

THE ISLAMIC ROOTS OF MODERN MEDICINE

Presenter(s): Elena Toomajian
Global & Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

The Middle East is responsible for many innovations in technology that unfortunately have been discredited as larger empires popularize these ideas. The aim of this research is to explore the beginnings of medicine's consideration as a science during the Islamic Golden Age in the Middle East. Looking mainly at Ibn Sina and Al-Razi to follow the first connections between the mind, body, and science. This project will emphasize the intelligence that can be seen in the Middle East, and its role in how medicine has taken shape today despite the single story of violence. Examples of this include double meanings such as Ibn-Sina's name being latinized. It resembles his importances to medical textbook structure, while also disregarding his origin. Large ideas such as scientific method, disease theory, immunity, and control variables were developed by these Persian physicians. It is important to know where these concepts come from, how they have been developed over time, and acknowledge reasons for why they aren't always easily traced. With war and other disputes in the Middle East there is very little recognition of knowledge and improvements, therefore this research is important in emphasizing impacts and disproving the perspective of the Middle East as backwards and violent. Through recognition now, we can value current discoveries so that they can be implemented and making differences in medicine earlier. It is up to us to put faith and belief in this hard work when it has started and acknowledge the unspoken intelligence in the Middle East.

WHAT IS A WOMAN? AN INSIGHT AND APPLICATION OF SIMONE DE BEAUVOIR'S GENDER PHILOSOPHY TO MODERN FEMINISM

Presenter(s): Sky Young
Global & Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters)

Simone De Beauvoir's most famous feminist theory on western societal gender hierarchy was dissected to critique and compare against modern western feminist discussions of intersectionality and anti-globalization. Her life's work "The Second Sex" and late-published novel "Inseparable" were read to gain perspective on the roots of Beauvoir's feminist theory in relevance to her own cultural background as a white, upper-class, French woman in the early 1900s. This Philosophy was then compared to modern western feminist discussions taking place in America. These discussions were categorized through the most popular news articles, journals, speeches, and activities of feminists of the past decade. These modern issues were used to better understand how one of the most famous feminist theories is still relevant today, but also note where it falls short. Aiding me in my analysis is the concept of intersectionality of identity. Beauvoir's most famous question was said to be "what is a woman?" Now it is time to ask the follow-up question: "what is a feminist?"

CHILD LABOR IN SYRIA

Presenter(s): Laila Todd
Global & Area Studies

Mentor(s): Camelia Suleiman (College of Arts & Letters), Russell Lucas (James Madison College)

After the occurrence of the Arab Spring a lot of unrest has emerged in the country with political and economic disputes. The real GDP has decreased by -36.5% and families are beginning to feel the effects of the economic circumstances. Due to the difficulty of the situation children have taken on the responsibility of supporting their families financially, neglecting their education and health. Child labor has drastically increased in Syria due to the war, more than 75% of households have children working. This has resulted in a fear among those watching the issue of the possibility of a lost generation. Children are putting their bodies through dangerous working conditions and not devoting much of their time to their education. Children who work are more likely to stop pursuing their education. There are already 2.7 million children currently out of school as more and more children are feeling obligated to put food on the table for their families. A surge in neoliberalism is also a factor in the increase of child labor. Neoliberalism promotes a less restricted market with few if any regulations, but this often does not protect the welfare of workers causing the long demanding hours and other poor conditions. We as a society have a part to play in this issue due to the world's consumption of child labor products. To analyze the impacts of child labor within Syria sources have been pulled from journals published, world factbook data, and conversations with those from Syria.

FAMILY STRUCTURE AND PATRIARCHY IN SYRIA: SUMMER WITH THE ENEMY

Presenter(s): Nicholas Walker
Global & Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters), Russell Lucas (James Madison College)

My research focuses on an analysis of the book "Summer with the Enemy," by Shahla Ujayli, a Syrian writer from the city of Raqqa. Specifically my research delves into patriarchy and family structure within the book and how it affects the three main women the story centers around. While this book is fiction, the author Ujayli calls upon her personal experiences to describe the setting and takes inspiration from her own life in order to build realistic interactions between the characters. Ujayli dedicates the book to the "Raqqa of my memory," and much of the first half of the book focuses on building the setting and detailing the intricate, everyday lives of the characters. I decided to focus on the three main women in the story and the struggles that they face in order to create a connection to the audience. With the protagonist, Lamees, I focus on her desire for affection and longing, with Lamees' mother, Najwa, I focus on her needs, and with Lamees' grandmother, Karma, I focus on her ability to keep control. By showing these examples to the audience I hope to create an understanding that while constructs such as orientalism and the single story tell us that Middle Eastern people are savages and need saving, the problems they face are no different than the issues that we face in the Western world. While the Syrian war has put their issues on pause, their struggle is an uniquely human experience, not an uniquely Middle Eastern experience.

WHERE WE WORK, PLAY, AND LIVE: BROADENING THE NARRATIVE OF ENVIRONMENTALISM IN THE DOMINICAN REPUBLIC THROUGH PARTICIPATORY RESEARCH

Presenter(s): Gianna Mendez German
Global & Area Studies
Mentor(s): Lissy Goralnik (College of Agriculture & Natural Resources)

"Where we Work, play, and live" is how I titled this research project program with the objective of providing a lens through which people from different geographic, social, and economic backgrounds can share their meaning of the 'home' and 'nature'. This act of public reflection and sharing elicits the interaction between place-based cultural and natural values and illuminates ways that traditional and local knowledge might be called upon to build place-based resilience. By highlighting and exploring this, I aim to show the different ways in which environmental stewardship can reflect itself. This study is an exploration of place attachment in the Dominican Republic, specifically the emotional impacts of climate change on its residents. It uses photo-elicitation methods to explore place attachment in three regions of the Dominican Republic better to understand the emotional impacts of climate change across sectors.

HOW NEOLIBERALISM LED TO THE COLLAPSE OF SYRIA'S ECONOMY AND ITS EFFECTS ON THEIR BUSINESSES

Presenter(s): Amani Kayat
Global & Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters), Russell Lucas (James Madison College)

For my UURAF project, I am going to be researching how neoliberalism has affected Syria's economy. I am going to be focusing on when Syria's economy fell, with the start of the Syrian Civil War, and how liberalism has led to it. My project is focused on the Syrian civilians that have been affected by liberalism and the fall of their economy. I am going to be researching how the Syrians have been living under their current economy and the effects of liberalism that have caused it. I will be researching what caused Syria's economy to fall with liberalism and how it collapsed. Some contributors include liberalism, the Arab spring, and the civil war which I will be focusing on in my research and project. Why I am researching this project stems from my interest in learning and understanding the hardships Syrians have gone through. The "why" also refers to why has liberalism affected Syria's economy so much, which I will answer by researching how different people reacted to liberalism in Syria and actions that persisted because of it. Additionally, my project will refer to when and why liberalism was first introduced, and then move in a timeline of its effects into the current day. Lastly, the research in my project will refer mostly to Syria, but also other Middle Eastern countries if necessary, as my research will include the Arab Spring which factors countries like Tunisia and Egypt as well.

HUMANITARIAN CRISIS IN SYRIA AFFECTS WOMEN'S HEALTH

Presenter(s): Isabela Martins
Global & Area Studies

Mentor(s): Camelia Suleiman (College of Arts & Letters), Russell Lucas (James Madison College)

Among the many issues caused by the Syrian Civil War, poor financing inhibits many people, particularly women, from accessing proper gender-specific health care. Therefore, this research focuses on the impact of the Syrian Civil War on the reproductive health of females. Through the most current data found on this topic, I will analyze the current situation, the underlying causes, and the effects of the conflict on women's accessibility to healthcare in the country. The study was conducted by an extensive literature review of credible research and articles which used primary sources, such as personal reports from Syrian women and healthcare professionals, to create a comprehensive understanding of the issue. From looking at the data and the reports given by multiple unbiased sources, we can conclude that these issues result from a distorted gender environment where the conflict highlights the vulnerabilities primarily in the healthcare system and security of Syria affecting the female population of the country. The entire humanitarian community needs to address the issue together and view them as intersectionality issues - an understanding of how gender power dynamics interact with other power hierarchies of privilege or disadvantage. The research aims to provide a comprehensive understanding of the impact of the Syrian Civil War on women's sexual and reproductive health, as well as to understand the intersectionality of gender-based violence within the crisis, by raising awareness and suggesting supplemental policy decisions and interventions to improve Syrian women's sexual and reproductive health.

"THE MEDIUM IS THE MESSAGE": DECENTRALIZATION ON THE DIGITAL FRONTIERS OF THE SYRIAN CIVIL WAR

Presenter(s): Anna Le Page
Global & Area Studies
Mentor(s): Camelia Suleiman (College of Arts & Letters), Russell Lucas (James Madison College)

My research focuses on the usage of social media throughout the Syrian Civil War, particularly as a vehicle for dissent and liberalizing discourse about Bashar Al-Assad's regime. Many scholars and theorists have lauded the democratizing potential of social media sites. The case of Syria both affirms and challenges aspects of this hypothesis, in that social media applications - particularly Facebook, Twitter, and Instagram - have experienced a relative boom in the decade since the war broke out (as in the rest of the world), but the user experience is fraught with difficulties. Bashar al-Assad has pursued an ambivalent stance on social media, deciding to counterintuitively lift the ban on all platforms during the early uprising in 2011, but has since crafted increasingly draconian laws penalizing "cybercriminals" and "enemies of the State." In addition to stifling dissent, Bashar al-Assad has leveraged social media and endorsed vigilante groups like the Syrian Electronic Army to spread pro-regime messaging and disinformation. Genuinely subversive content, and even milder criticisms of the regime, have become costly and rare. Therefore, it presents a useful case study on the shortcomings of social media in a baseline undemocratic, wartime context. Rather than fostering a culture of democracy or facilitating coalition-building, social media has splintered the opposition and heightened the perils of speaking out. I will draw on Marshall McCluhan's theory that "the Medium is the Message," investigating where social media fits into this paradigm, and to what extent such a decentralized medium engenders a decentralized front.

COCA-COLA, CORPORATE VIOLENCE, AND COMMUNITY WELLNESS: ANTHROPOLOGICAL THEORY AND THE YUCATÁN PENINSULA

Presenter(s): Casey Orr
Global & Area Studies
Mentor(s): Eric Montgomery (College of Social Science)

Second only to "Okay," "Coca-Cola" is the most understood phrase across the planet, and the iconic drink can now be purchased and consumed virtually anywhere due to globalization. Anthropological theories, such as Coca-Globalization, have created general pathways to analyze the consequences of globalization on local communities and cultures. This project aims to connect this method to a specific case study of corporate violence in the Yucatán Peninsula region, namely Mexico and Belize. To this end, several theories of globalization and justice were applied to the Yucatán case study to illuminate the causes of community base-violence, including systemic poverty, illness, malnutrition, and even death. Ultimately, it becomes clear that there is an unavoidable connection between globalization and the eventual facilitation of corporate violence, illness, and other detrimental impacts on community well-being in the Yucatán Peninsula region.

HEALTH SCIENCES

FUSOBACTERIUM NUCLEATUM BIOFILIMS IN THE HUMAN ORAL MICROBIOME

Presenter(s): Cassidy Grosjean, Mason Miller
Health Sciences
Mentor(s): Jonathan Hardy (College of Human Medicine)

Fusobacterium nucleatum is a pathogen that grows along the gumline in humans. Fusobacterium nucleatum contributes to periodontal disease, which may lead to inflamation of the gums and eventually tooth loss if not treated properly. If the pathogen were to enter the bloodstream, it may also have implications on other aspects of human health. Fusobacterium nucleatum is attributed to causing colorectal cancer as well as premature births, highlighting the importance of maintaining good oral health is necessary for maintaining good overall health. The main focus of this research is to analyze the biofilm produced by Fusobcaterium nucleatum. It is proposed that a thick biofilm is formed to help the bacteria adhere to the gumline. As a result, the biofilm interacts with other bacteria along the gumline and surface of teeth such as Streptococcus mutans and Streptococcus gordonii. Microbiology imaging techniques were used to analyze biofilm growth of Fusobcaterium nucleatum in several combinations of Streptococcus mutans and Streptococcus gordonii as well as to observe the morphology of each bacterium.

PARENTING STYLE AND CHILD BMI IN LOW INCOME FAMILIES

Presenter(s): Allison Doneth
Health Sciences
Mentor(s): Jiying Ling (College of Nursing)

This study examined the relationship between parenting style and body mass index (BMI) in low-income families with young children. Parenting style included authoritarian (parents emphasize obedience over a nurturing relationship), authoritative (parents set boundaries but are nurturing), and permissive (parents do not set any limits to hold children responsible). Previous literature has found some relationships between authoritative and permissive parenting with obesity. However, few results analyze the association between parenting style and both child and parent BMI. Fifty-seven parent-child dyads were recruited from Michigan Head Start programs. The Parenting Style and Dimensions Questionnaire evaluated the parenting style. Measurements from a Shorr board and Seca 874 weight scale were used to calculate BMI. The University Institutional Review Board approved this study. Among children, 43.9% were Black and 15.8% were Hispanic. About 66.7% of families had an annual income <$20,000, and 49.1% of parents were unemployed. The overweight and obesity rate among parents was 27.3% and 48.5%, respectively. Childhood overweight and obesity rate was 23.2% and 10.7%. Permissive parenting showed a positive correlation with child BMI (r= .14), while both authoritative (r=-.16) and authoritarian (r=-.13) parenting styles had a negative correlation with child BMI. However, parents' BMI was negatively related to their permissive parenting style (r=-.34), but positively correlated with their authoritative (r=.27) and authoritarian (r=.21) parenting styles. The unexpected opposite relationships of parenting style with child BMI and parent BMI may indicate the different active and passive effects of parenting on parents' and children's health outcomes.

EXAMINING THE UTILITY AND EVIDENCE FOR WEARABLE TECHNOLOGY TO SUPPORT NURSING HEALTH: A NARRATIVE REVIEW

Presenter(s): Gabbi Allman
Health Sciences
Mentor(s): Fabrice Mowbray (College of Nursing), Leigh Small (College of Nursing), Susan Buchholz (College of Nursing)

Wearable technologies are commonly used across many sectors of health care to support the evaluation and care of patients. However, there is a limited understanding of how wearable technology is used to monitor and promote the health of nurses, the largest body of regulated healthcare professionals. The purpose of this review is to evaluate and synthesize the current published literature concerning wearable technologies and their value for monitoring the physical and mental health of nurses. We searched six databases for literature specific to wearable technologies used with nurses where data were available on the physical or mental health outcomes of this population. The search resulted in >8000 titles after duplicate removal and are being screened using Covidence ©. We are currently reviewing titles/abstracts, and full texts will be reviewed independently and in duplicate. We excluded grey literature, review articles, study protocols, conference abstracts, patient-focused articles, and those not printed in English. We will conduct citation tracking. Data will be reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). We will synthesize and narratively report based on four key factors: the type of wearable technology, the objective measure reported, the outcome reported, and the methodology used. Findings from this review will provide clinicians, healthcare administrators, researchers, and policymakers with an organized overview of the current literature on wearable technologies and their impact on the health of nurses.

EVALUATION OF ADOLESCENT PHYSICAL ACTIVITY AND ASSOCIATED PSYCHOSOCIAL FACTORS ACCORDING TO LEVEL OF INCOME

Presenter(s): Aastha Walia, Elizabeth Klein, Lydia Mathews, Mackenzie Cronk
Health Sciences
Mentor(s): Hesam Varpaei (College of Nursing), Lorraine Robbins (College of Nursing)

Little is known about whether family income affects adolescents' PA perceptions. This study's purpose is to determine if adolescents in families having low and high family incomes (≥$20,000/year and >$20,000/year) differ in their PA and psychosocial factors related to PA (social support, self-efficacy, types of motivation). The University Institutional Review Board approved the study, which involved a secondary analysis of baseline data from a pilot intervention study. Adolescents (10-13 years) completed surveys and wore accelerometers. SPSS statistics software 26 was used. Chi-square and independent t-tests were applied. The sample included 79 adolescents (n=39 male; n=41 female). Most were black (56.3%). Over half (53.2%) were in families with incomes <$20,000/year. Twelve (15.2%) were overweight; 26 (32.9%) were obese. On a typical day, less than 10% in each income group attained ≥60 minutes/day of PA. No group differences in demographics were noted. Compared to higher-income adolescents, lower-income adolescents reported higher autonomous motivation for PA (p=.025), identified motivation (p=.033), and integrated regulation (p=.033). Approaching statistical significance, intrinsic motivation was higher in the lower- than higher-income group; and lower-income adolescents had higher minutes/hour of light PA (p=.099) and lower minutes of sedentary behavior (p=.099) than higher-income adolescents. No group differences occurred in screen time. Higher-income adolescents may have less motivation for PA, lower PA levels, and more sedentary time than lower-income adolescents. Although this information may be important when developing PA interventions, more studies are needed to confirm the findings.

TESTING FOR VIRULENCE GENES IN E. COLI O157:H7 USING DNA BIOSENSOR

Presenter(s): Jocelyn Cayen, Kaily Kao
Health Sciences
Mentor(s): Evangelyn Alocilja (College of Agriculture & Natural Resources)

Virulence is an ability of an organism to infect a host and cause disease. The genes that facilitate this ability are known as virulence genes [2]. One strain of E. coli, E. coli O157:H7, contains virulence genes, that are more deadly than those that do not

contain the gene. E. coli O157:H7 alone causes 40% of deaths from E. coli infections, in the United States [1]. Detecting these genes is essential in determining whether there is an immediate threat of the infection and can increase success in limiting E. coli-related deaths by preventing infections. 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 plasmonic 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. 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 shows successful differentiation between target E. coli O157:H7 DNA from several non-target bacteria species, using a general E. coli biosensor. This method also is effective in detecting bacteria containing the Stx1 virulence gene. With a 30-minute assay time, this biosensor has the potential to be more rapid, accessible, and affordable than current testing methods.

PARENT-ADOLESCENT DYAD INTERVENTIONS TO INCREASE PHYSICAL ACTIVITY AND HEALTHY EATING: A SYSTEMATIC REVIEW

Presenter(s): Nina Dorigo, Sam Vanderiet
Health Sciences
Mentor(s): Lorraine Robbins (College of Nursing)

In the US, adolescent obesity is a severe public health problem, as indicated by at least 1 in 5 adolescents being obese. Obesity predisposes adolescents to health conditions that once occurred mainly in adults (diabetes, high blood pressure, high cholesterol). Although implementing interventions that actively involve parents may help in promoting their adolescent's physical activity and healthy eating, no literature review was found that comprehensively examined the effectiveness of these interventions or the strategies used to achieve positive outcomes. Guided by the PRISMA statement, key databases (CINAHL, PubMed, Web of Science, SportDiscus, ERIC and Sociological Abstracts) were searched for randomized controlled trials and quasi-experimental studies. The systematic review was comprised of 59 papers that centered around racially and ethnically diverse adolescents who had a parent or primary caregiver actively involved in the intervention to offer support (parent-adolescent dyads). The RoB 2 and ROBINS-I tools were used to appraise the quality of each study. Findings from the content analysis showed healthy lifestyle interventions that actively involved parents to support their adolescents resulted in significant post-intervention improvements in adolescents' weight status, body composition (e.g., body fat), physical activity, and healthy eating. In this presentation, we will identify the intervention strategies that may have been most effective for promoting physical activity and healthy eating among adolescents. The review offers evidence that using certain strategies to actively involve parents together with their adolescents in healthy lifestyle interventions may be a fruitful approach for assisting adolescents to maintain or attain a healthy weight.

EVALUATING SPATIAL INTERPOLATION RELIABILITY FOR THE LOT-LEVEL ASSESSMENT OF NEIGHBORHOOD DISORDER (LAND) VIRTUAL AUDIT TOOL

Presenter(s): Josh Pepper
Health Sciences
Mentor(s): Amber Pearson (College of Human Medicine)

Neighborhood disorder (e.g., broken windows, graffiti) has been shown to be related to deleterious resident physical and mental health outcomes. Consequently, quantification of disorder may be useful for targeting resources or measuring harmful exposures. However, a major challenge with its quantification is the intensive labor involved in either field observation or virtual auditing of each parcel or street segment. One solution is the interpolation of disorder across space, given a measured sample of spatially distributed known values. Interpolation methods can provide insightful predictions of values within recorded data points, but they may be less reliable in places with high levels of heterogeneity in disorder. In this study, we utilized a virtual audit tool (Lot Assessment of Neighborhood Disorder; LAND), where scores were determined on a lot level and aggregated to street segments. This process was completed for 710 block faces and 355 street segments across 11 neighborhoods in Detroit, MI. We then implemented Inverse Distance Weighting (IDW) and Kriging (ordinary, simple, and universal) spatial interpolation methods to measure which method was the most reliable for predicting LAND scores at unknown locations, reserving 80% of the coded lots for the interpolation and 20% for reliability testing. The results included comparative validation statistics for four interpolation methods to determine the reliability of LAND score predictions at unknown locations. All interpolation methods displayed adequate reliability, but Ordinary Kriging was shown to be the most reliable. The discussion focused on future LAND score implementations and limitations of spatial analysis in moderately heterogeneous city environments.

EVALUATION OF PHYSICAL ACTIVITY AND ASSOCIATED PSYCHOSOCIAL FACTORS ACCORDING TO ADOLESCENT WEIGHT STATUS

Presenter(s): Audrey White, Ayush Ippalapelli, Bianca Loos, Chelsea Abulu
Health Sciences
Mentor(s): Hesam Varpaei (College of Nursing)

Significance and Purpose/Introduction: The purpose was to compare physical activity (PA) and psychosocial factors (PA self-efficacy, social support, motivation) between healthy weight (HW) and overweight/obese (OW/OB) adolescents. Methods: This secondary data analysis used baseline data from a pilot intervention study. Ten- to 13-year-old adolescents from two urban kindergarten-8th grade public schools in one school district participated. The University Institutional Review Board provided approval. T-test and Chi-square test were used. Results: Seventy-nine adolescents (49.4% male; 50.6% female) participated. Mean age was 11.61 (SD±.86). Most were black (55.7%), 22.8% were white, and 21.5% were multiracial. Over half (51.9%) were in families earning <$20,000/year. Almost half (48.1%) were OW/OB. No between-group differences in demographic factors occurred. Compared to adolescents with a HW, those who were OW/OB had fewer minutes/hour of sedentary behavior (M =40.82 vs. 38.13, p=.030) and higher minutes/hour of light PA (M =16.18 vs. 19.00, p=.004). No between-group differences occurred for moderate or moderate-to-vigorous PA. Approaching significance, minutes/hour of vigorous PA was higher for HW than OW/OB adolescents (M =0.94 vs. 0.63, p=.057). No between-group differences in psychosocial factors were noted. A higher percentage of HW than OB/OW adolescents spent >2 hours gaming, watching videos, and using the phone on a usual school day (71.4% vs. 28.6%; p=.001) and weekend day (65.0% vs. 35.0%; p =.018). Discussion and Conclusion: Efforts may be needed to assist OW/OB adolescents in increasing their vigorous PA and to help HW adolescents reduce sedentary behavior and screen time. More studies may be needed to confirm these findings.

MEDICAL TRANSPORTATION ON CAMPUS

Presenter(s): Gabrielle Partlo, Hannah Meltser, Miranda Ostrowski
Health Sciences
Mentor(s): Steven Safferman (College of Agriculture & Natural Resources)

Our goal is to research methods of transportation Michigan State University provides to Olin medical center. We want to know how many students are aware of Olin, their opinions of it, as well as researching travel times for ambulances into and out of Michigan State University. After collecting data, talking to professionals, and researching statistics, we plan to offer more/better transportation options for university students to receive healthcare treatment. This may include more methods of transportation to Olin or urgent care close to campus, or a change in road structure to decrease ambulance run times. We want to help students gain better access to healthcare treatment and know their options. Our plan is to find more ways to get students to Olin safely and timely, improve current transportation methods if necessary, provide insight on student knowledge of campus healthcare options, and add possible transportation options to urgent care close to campus. Already we have gathered research on current CATA routes to Olin and services provided. We contacted Olin directly to find more information, and we called the East Lansing Fire Department to receive records on ambulance run times to areas on campus, and how quickly they made it to the hospital. We also have student input in order to learn what students know about Olin and healthcare options at Michigan State University. With this information, we hope to make an education plan to help more students learn about Olin so they stay safe.

SOCIAL SUPPORT AND PHYSICAL ACTIVITY AMONG YOUNG URBAN ADOLESCENTS

Presenter(s): Veronica Walters
Health Sciences
Mentor(s): Lorraine Robbins (College of Nursing)

Social support impacts the levels of physical activity (PA) among adolescents. Little is known about the most influential source of social support, as well as the frequency adolescents receive certain types of support. A secondary analysis of baseline data was based on a pilot study to evaluate the efficacy of an intervention in increasing moderate to vigorous PA (MVPA). The study purpose was: 1) Determine sources of social support for PA; 2) Test the relationship between various types of social support and MVPA; 3) Examine the frequency adolescents receive certain types of social support for PA. MSU IRB and school administrators provided approval for the study. 80 10- to 13-year-old 5th-7th graders were recruited from two public schools in diverse, low-income areas. Adolescents completed an 8-item Social Support Scale. Most identified as females (51.2%). The majority were Black with the remainder (22.5%) being White, or multiracial (21.3%). Most families (52.5%) had incomes < $20,000 annually. Mothers were identified by the majority (n=52, 65.0%) followed by fathers as another major source. Survey items "someone takes me to play sports/exercise" and "someone plans things to help me be physically active" had the strongest correlations with MVPA (r = .364, p= .003, r= .438, p= .005, respectively), but less than 1/3 reported they "often" received this support (n=23, 28.7%, n =18, 22.5%, respectively). Findings suggest that instrumental support may be more important than emotional for increasing MVPA. Parents are key sources of this and may need to be encouraged to help their adolescents.

EEGS AS A TOOL TO INDICATE DRIVING FATIGUE

Presenter(s): Linda Komis, Madison Myers, Mya Sebek, Rhea Raut
Health Sciences
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

In this analysis, there was an examination of electroencephalography (EEG) channels to identify signs of driver fatigue. The data was conducted on graphs and the peaks and troughs of the waves were analyzed to create enough evidence to provide the basis of this study. There is an account and analysis of statistics of driving fatigue and its consequences to provide insight on the problems of driving fatigue. By using different channels of EEGs to examine the signs between an alert driver and a drowsy driver, there is evidence of brain activity that allows one to determine who is the drowsy driver and who is the alert driver. The importance of this study is shown as drowsy drivers may not show symptoms of being drowsy, but their EEGs show brain activity that proved otherwise.

FIRSTSTEP2HEALTH: EFFECTS ON REDUCING PARENTS' PERCEIVED STRESS AND IMPROVING COPING

Presenter(s): Sejla Sinanovic, Sunyoung You
Health Sciences
Mentor(s): Jiying Ling (College of Nursing)

There is limited evidence on the effects of healthy lifestyle interventions on improving participants' mental health. FirstStep2Health is a healthy eating and physical activity intervention aimed to prevent childhood obesity in low-income preschoolers and parents. The purpose of this study was to evaluate the effects of FirstStep2Health intervention on reducing parents' perceived stress and improving coping strategies. A total of 57 parents (mean age=30.51, 29 intervention and 28 control) completed the study. Participating mothers completed a demographic survey, the 10-item Perceived Stress Scale, and the Brief-COPE to measure their demographics, perceived stress, and coping strategies via Qualtrics at baseline and post-intervention. Pearson correlation and repeated ANOVA analyses were performed using SPSS Statistics 26. The participating mothers were 12.3% Hispanic, 38.6% Black, 54.4% single, 49.1% unemployed, and 66.7% with a yearly income less than $20,000. Compared to the control group, the intervention mothers had a significant increase in their problem-focused coping strategies (active efforts to manage stressful situations). Both groups' mothers' perceived stress level decreased after the intervention, which could be due to seasonal stressors such as holidays, harsh winter colds, and the flu/COVID-19 pandemic. Although not significant, intervention mothers' avoidant (efforts oriented toward avoiding the situation) and emotion-focused (regulating negative emotional reactions to stress) coping strategies showed an increasing trend while both coping strategies decreased in the control group. The results support FirstStep2Health intervention's promise on improving problem-focused coping strategies, highlighting the importance of promoting healthy lifestyle to achieve overall well-being.

INTERVENTION EFFECTS ON REDUCING ANTHROPOMETRIC FACTORS AND IMPROVING DIETARY INTAKE

Presenter(s): Breana Ramos, Lauryn Hudson
Health Sciences
Mentor(s): Jiying Ling (College of Nursing)

Interventions in preschoolers, especially those from low-income families, have achieved only minimum positive effects on the battle of childhood obesity. FirstStep2Health is a healthy eating and physical activity intervention to prevent obesity among low-income preschoolers. This study aimed to evaluate the intervention effects on reducing preschoolers' anthropometric factors and improving their dietary intake. Height, weight, and percent body fat were measured objectively, dietary intake was assessed by 24-hour recall. Fifty-seven preschoolers (29 intervention and 28 control) participated, with a mean age of 49.87 months. Among these preschoolers, 44% were Black and 16% were Hispanic. Nearly half of their respective parents were unemployed, and greater than half made less than $20,000 annually. About half (54%) of parents were single and over half had three or greater children in their household. Of the preschoolers, 23.2% were overweight, and 10.7% were classified as obese. The intervention decreased preschoolers' BMI ($d=-0.20$, $p=.487$), BMI-P ($d=-0.62$, $p=.040$), BMI z-scores ($d=-0.35$, $p=.245$), and percent body fat ($d=-0.54$, $p=.077$) compared to the control group. However, the intervention did not increase preschooler's fruit/vegetable intake ($d=-0.35$, $p=.685$). One possible explanation for the lack of intervention effects on improving preschoolers' fruit/vegetable intake is that parents had challenges attempting to remember and report what their child consumed throughout the day. Overall, the study's results support the effects of the FirstStep2Health intervention in preventing obesity among low-income racially diverse preschoolers. Due to the small sample size, further efforts with a larger sample size is necessary to confirm the results.

THE USE OF CHATBOTS TO DETECT AND REDUCE DEPRESSION AND OTHER PSYCHOLOGICAL SYMPTOMS IN CANCER PATIENTS

Presenter(s): Bryn Mermelstein
Health Sciences
Mentor(s): Dawn Goldstein (College of Nursing)

Cancer is a chronic health problem that results in many negative physical symptoms. However, many psychological problems, such as depression and anxiety, can also ensue that often go undiagnosed and untreated. With cancer care moving towards self-management, patients need resources to help support them during cancer treatment and recovery. The purpose of this paper was to evaluate the state of the science regarding the use of artificial intelligence (AI) technology as a means of depression screening and interventions to support cancer patients. This scoping literature review, using the Arksey and O'Malley (2005) framework assessed AI, specifically chatbots, depression detection, and intervention among cancer patients. Findings recovered five studies over a 10-year period that met criteria demonstrating a lack of empirical evidence addressing this potential resource to support cancer patients. Most of the sources found protocols rather than actual studies. Different age populations, including adolescents and types of cancer demonstrated differences. All focused on the various technologies such as mobile applications and different kinds of chatbots that deliver voice-detection measurements surveys to develop biomarkers of depression from the individual's speech or deliver psychotherapeutic interventions. More research on this topic, specifically randomized controlled trials (RCTs), is necessary as we need to know more about the efficacy, feasibility, and accessibility of chatbots in this population. Even though there are only preliminary studies thus far, it is known that cancer patients need support for their psychological symptoms. Chatbots could ensure these patients manage their symptoms and have the highest quality of life possible.

LONG-TERM COVID-19 IMPACT AMONG AGE GROUPS

Presenter(s): Hannah Huber
Health Sciences
Mentor(s): Horng-Shiuann Wu (College of Nursing)

In early 2020, Coronavirus (COVID-19) was not believed to create long-lasting effects. However, after 664 million individuals infected, studies show COVID-19's long-term effects. Knowing how long-term COVID-19 symptoms impact abilities to complete daily activities will inform future patient care. The aim of this study was to examine if prevalence, severity, and interference of long-term COVID symptoms vary by age among survivors. Descriptive analysis included 150 adults (mean = 53 years) who were contacted approximately 11 months since testing positive for COVID-19. 108 participants were < 65 years (younger) and 41 were ≥ 65 years (older). 22 COVID-related symptoms was assessed using 0-9 scales (9 = worst severity or interference). Among symptomatic (n=100), higher proportion of older than younger adults (70% vs. 64% respectively) experienced ≥ 1 long-term COVID symptom. Fatigue was most prevalent (n= 52) followed by trouble remembering things (n= 43). Compared to older group, younger reported more severe fatigue (mean = 6.2 vs. 5.2) and joint/muscle pain (mean = 6.2 vs. 5.1), and interference with life due to difficulty remembering things (mean = 4.8 vs. 3.8). The younger group reported significantly greater fatigue interference (p= .023), more severe cough (p = .034), and severe shortness of breath (p = .052). 67% of COVID-19 survivors reported long-term symptoms with younger reporting greater severity and interference. Younger survivors need effective symptom management and holistic patient care through physical and emotional interventions. Future research should investigate the chronic impact of COVID-19 and interventions to improve quality of life.

USING SOCIAL MEDIA AS A RESEARCH TOOL: RESEARCHMATCH VERSUS SOCIAL MEDIA RECRUITMENT PROCESSES

Presenter(s): Alli Walsh
Health Sciences
Mentor(s): Emma Schlegel (College of Nursing)

Background: In research, social media has become a key tool to expanding the reach of recruitment methods across distance and diverse populations, particularly among young adults. ResearchMatch is a web-based recruitment registry facilitating connections between volunteers and researchers. The registry includes over 154,000 self-registered members and 10,000 researchers from 186 U.S institutions. It is unknown how the use of social media compares to ResearchMatch in study recruitment of young adults. Purpose: Determine if recruitment method (social media advertisements compared to ResearchMatch) influences participant characteristics among emerging adults who menstruate. Methods: We recruited emerging adults (18-25 years) who menstruate from October 2022 to November 2022 via ResearchMatch and social media (Instagram and Snapchat) advertisements. Analysis involves a subset of recruitment data from a larger study. Chi-square and independent t-test analyses were used to compare demographic data. Results: Enrollment rates for ResearchMatch and social media differed (58% and 39%, respectively). Completion rates for both methods were the same (~93%). 245 emerging adults completed the survey. Social media resulted in recruitment of younger participants (18-21; 37.9% compared to 24%) and ResearchMatch garnered participants with a higher level of education (74.9% compared to 60.6%). Differences in race approached significance, with social media recruiting higher rates of White participants. Conclusions: Social media and ResearchMatch are both successful tools for research recruitment, providing distinct benefits for recruiting specific populations. Understanding their differences is imperative for researchers deciding which recruitment method best fits their needs. Future research should further explore differences in race by recruitment method.

HUMAN MILK OLIGOSACCHARIDE METABOLIZING GENES AND ATOPIC DERMATITIS/ECZEMA

Presenter(s): Neha Gopalakrishnan
Health Sciences
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

The infant gut contains bacteria that play an influential role in modulating health and development. Human milk influences the infant gut bacteria by containing oligosaccharides (Human Milk Oligosaccharides or HMOs), carbohydrates indigestible by infants. However, the gut supports bacteria that uniquely work to metabolize these sugars. Genes that code for HMO metabolizing enzymes have been linked to improved immunity in infants, but there is limited research studying the impact of these genes on specific conditions. This study aims to assess relationships between the abundance and diversity of HMO metabolizing genes in infant gut microbiomes and eczema, a condition that affects nearly 20% of infants in the United States with no effective treatment. The presence of eczema in infants is often an indicator for later life development of food allergies, asthma, and immune disorders. To assess the

impact of HMO metabolizing genes on this skin condition, this study analyzes 3-month-old infant fecal samples collected from infants in the Midwest United States. We aim to assess metagenomic diversity of HMO metabolizing genes in the infant gut microbiome, and to associate these gene patterns with the prevalence of eczema in infants. In this presentation, I will report on the prevalence of eczema and other characteristics of the study population. Future steps include utilizing quantitative PCR to measure the abundance of specific HMO metabolizing genes in infants. Determining these relationships will uncover whether certain gene patterns offer protection against eczema, helping to formulate treatments that optimize child health.

NEGOTIATING ETHICAL DILEMMAS WITHIN THE FIELD OF MEDICINE: A MEDICAL PROFESSIONALS VIEW

Presenter(s): Mia Jones
Health Sciences
Mentor(s): Steven Fraiberg (College of Arts & Letters)

Medicine is a place where difficult decisions often have to be made. These decisions not only affect the individual making them, but also the people under their care. This is also a field where ethical difficulties are frequently encountered. For this reason, in the following ethnographic study I intend to investigate the ethical dilemmas encountered within the medical field, and how medical professionals negotiate or resolve these issues. To collect data, I have relied on interviews with 5-8 medical professionals from many career domains in order to understand the different factors that shape the way medical dilemmas are negotiated from a professional point of view. I also created surveys that were filled out before the interview by each interviewee for more statistical data to support my findings. Lastly, I used other resources such as medical websites, medical podcasts, and medical books that are related to ethical decisions within medicine. To analyze this information, I have triangulated the data to detect significant patterns or themes. The purpose of this project will be to present these findings with the hope of contributing to research and practice in this field.

BLOOD PRESSURE ASSESSMENT IN POSTMENOPAUSAL HYPERTENSIVE FEMALES: ARE THERE BENEFITS TO MEASURE SEATED BLOOD PRESSURE MORE THAN ONCE?

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

Background: It is a common misunderstanding that females rarely experience high blood pressure, however females account for nearly half of adults with hypertension. As a result, they have been understudied compared to males. There are still unanswered questions about best practices in measuring blood pressure (BP). Methods: Blood pressure measures were compared between arms, between visit days, and within a study visit using recommended guidelines for measuring BP. Post-menopausal females (ages 55-80, n=7) with hypertension had morning seated BPs taken bilaterally with an automated machine (GE ProCare) yielding systolic (SBP), diastolic (DBP) and mean arterial pressure (MAP). At each visit, BP was measured up to 6 times in each arm. Data were compared with paired tests with significance at $p<0.05$. Results: SBP was 152±23(R) and 150±18 mmHg(L) ($p=0.715$), DBP was 90±15(R) and 84±14(L) mmHg ($P=0.016$) and MAP was 108±15(R) and 111±15(L) mmHg ($P=0.068$). Average BP (R+L arm) on two different visit days (n=5) was 147±22 and 133±6 mmHg (SBP), 82±13 and 77±10 mmHg (DBP) and 105±15 and 98±9 (MAP) for visit 1 and 2, respectively ($P>0.05$). When comparing the 1st BP measure to the 2nd BP measure on visit 1 (n=7), the BPs were 148±17 and 151±16 (SBP), 85±13 and 85±14 mmHg (DBP), and 112±18 and 115±18 mmHg (MAP), Left arm, $P>0.05$. Conclusions: The preliminary findings show differences in right vs left arm DBP suggesting BP may have interarm differences in this population and may indicate measuring BP in each arm when determining resting blood pressure.

THE PELTIER EFFECT AND MEDICAL APPLICATIONS

Presenter(s): Daisy Jakkula, Dingyun Long, Erica Mitchell
Health Sciences
Mentor(s): Chunqi Qian (College of Osteopathic Medicine)

As we are carrying out a poster presentation in-person, we will present a circuit with 2 copper wires, connected to a module. When connected to a power supply, this module produces a heating effect on one side of it and a cooling effect on the opposite side. This represents the Peltier effect that we seek to apply to other fields of study. We first tested the Peltier module by connecting the two copper wires with various batteries to test and measure its effectiveness at heating and cooling. Then we thought of ways to apply this concept to both the engineering and medical field by potentially incorporating this device as a medical heating/cooling pad and a thermodynamic jacket. The research we are carrying out is significant to the greater world as it allows us to discover a way to fuse the engineering model with greater implications in the social world. This includes applying the Peltier effect noticed in our circuit to medical and social aspects. This could potentially be creating a heating pack for pain management in the healthcare field, or a "solar jacket" for climate adjustment purposes for individuals who may require it.

MOUSE ESTROUS ACYCLICITY IN RESPONSE TO SHIFT WORK-LIKE 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)

Shifts in light associated with shift work can alter menstrual cycles in women, resulting in emotional issues, menstrual disorders, and pregnancy complications. As with humans, changing light patterns with mice can deregulate estrous cycles (the mouse equivalent of human menstrual cycles) and result in reproductive problems. A previous study by our lab found that when female mice were exposed to periods of light and dark simulating shift work, 50% had acyclic estrous cycles. Vaginal lavage was performed only at the end of the observational period for this experiment, so the exact point at which the mice became acyclic is unknown. This information could provide insights regarding tolerance levels for shift-work-like lighting. To further investigate, a new group of female mice was exposed to rotating lights for four months and vaginal lavage was performed daily. Samples were then observed under a microscope and the daily estrous cycle stage of each mouse was recorded. This data is currently under analysis. I hypothesize that exposure to rotating lights will result in a collective breaking point when the affected mice begin to have acyclic estrous cycles. If a breaking point is observed, it may indicate a specific limit on the duration that mice can handle exposure to light cycles mimicking shift work before estrous cycles are impacted. The lack of a consistent breaking point would be equally important as it would indicate that tolerance levels for these light cycles vary among individuals. Insights provided by this study could inform health regulations for shift workers.

HOW HAIR CORTISOL IS RELATED TO PHYSICAL ACTIVITY AND EATING BEHAVIOR AMONG PARENT-PRESCHOOLER DYADS

Presenter(s): Shrihan Nalamati
Health Sciences
Mentor(s): Jiying Ling (College of Nursing)

The purpose of this study was to investigate the relationship of hair cortisol with physical activity and dietary intake among low-income parent-preschooler dyads. Cortisol is the body's primary stress hormone of responding to stress, controlling blood pressure, and increasing metabolism of glucose. It is known that an increase in cortisol levels can lead to larger appetites but a decrease in metabolism. This study was conducted in 57 parent-preschooler dyads (parents: 21-48 years, preschoolers: 37-61 months) recruited from Head Start daycare centers. Hair samples were collected for extracting cortisol level, dietary intake was assessed by 24-hour dietary recalls for preschoolers and Block screener for parents, and physical activity was assessed by ActiGraph accelerometers. All participating parents were female, with 12.3% being Hispanic and38.6% being Black. About 66.7% had a household income <$20,000 and 49.1% were unemployed. Among preschoolers, their own hair cortisol had a small positive relationship with total daily carbohydrate intake (r=0.13), light physical activity (r=0.15), and moderate physical activity (r=0.14); while a small negative correlation with vigorous physical activity (r=-0.13). Among parents, hair cortisol was negatively related to their light physical activity (r=-0.12), moderate-to-vigorous physical activity (r=-0.53, p=.025), and fruit/vegetable intake (r=-0.12). The above interesting results between parents and preschoolers may suggest the age differences in the biological mechanisms of hypothalamic-pituitary-adrenal axis on influencing lifestyle behaviors. The release of cortisol in response to stress may be a facilitator for preschoolers to engage in healthy behaviors, but a barrier preventing parents from participating in healthy behaviors.

ASSESSMENT OF MOTOR CONTROL AND LEARNING IN INDIVIDUALS WITH AND WITHOUT CHRONIC LOWER BACK PAIN

Presenter(s): Nicholas Bray
Health Sciences
Mentor(s): John Popovich (College of Osteopathic Medicine)

Individuals with low back pain (LBP) experience deficits in motor control, but LBP's influence on motor learning is not understood. Therefore, the primary aim of this study was to investigate the effects of LBP on motor learning. A secondary aim was to determine if there are differences in motor control in individuals with LBP compared to asymptomatic individuals. Thirty-one participants (n=16 with LBP; n=15 Asymptomatic) participated in this study. LBP participants experienced symptoms for >3 months, while asymptomatic participants had no LBP lasting >3 days over the last year. Participants performed trials of two trunk position tracking tasks on two different days. These tasks required participants to track 2 time-varying input signals displayed on a screen by moving their trunk in the sagittal plane (i.e., flexion/extension). Position was recorded using string potentiometers. Root mean square error (RMSE) between the input signal and recorded trunk position quantified performance. Learning was assessed over 20 trials, while average RMSE of the first 5 trials of the second visit measured retention. Statistical comparisons were made within and between groups, with significance set at $p<0.05$. Participants demonstrated significant performance improvements (reduced RMSE) with successive trials ($p<0.05$). There was no significant difference in learning or retention between groups. There were also no significant between-group differences in performance when comparing the different tasks. LBP had no significant effect on motor learning as assessed via trunk-specific motor tasks, which may be attributable to individuals accurately performing tasks with different movement strategies; however, this theory would require further investigation.

PARENT-CHILD DYADS? BMI AND ASSOCIATIONS WITH COLLECTIVE FAMILY EFFICACY, HEALTHY EATING, STRESS PBF, AND WAIST CIRCUMFERENCE

Presenter(s): Sunday Quillen
Health Sciences
Mentor(s): Tsui-Sui Kao (College of Nursing)

The Mindful Healthy Family Program seeks to evaluate acceptability, feasibility, and preliminary efficacy of Mindfulness-based Motivational Interviewing program on American Indian and rural families. While the program is still ongoing, the purpose of this preliminary analysis was to use collected baseline data and evaluate the associations between parent-child dyads including dyad's BMI and parents' percent body fat, waist circumference, and collective family efficacy scores. Baseline data were collected via Qualtrics survey, and a physical assessment guided by a research assistant via phone calls. Analysis (SPSS 26) was used to analyze the correlations between variables pertaining to the dyads and effect intervention on participants. Among 34 families (15.6% American Indian families), the mean age was 38.50 (SD=4.62) for parents (81.3% female) and 6.41 (SD=2.78) for children (50% female). The mean BMI was 34.77 (SD=6.57) for parents and 18.02 (SD=6.33) for children. In addition to baseline data, post program data were collected from 11 participants who completed the program, 6 intervention and 5 control. This allowed for effect size to be determined for BMI (-0.113), PBF (-0.027) and Waist Circumference (0.243) to evaluate the changes made during study participation and how the intervention group compared to the control. In terms of behavior changes effect size was calculated for the Healthy Eating Index (0.630), Collective Family Efficacy (-0.306) and Perceived Stress Scale (0.761). In conclusion, significant effect sizes were identified meaning the program has had success is its goal of improving both physical health and lifestyle through mindful-based intervention.

PHOSPHATIDYLSERINE-EXPOSING ANNEXIN A1-POSITIVE EXTRACELLULAR VESICLES: POTENTIAL CANCER BIOMARKERS

Presenter(s): Matthew Gagea
Health Sciences
Mentor(s): Masamitsu Kanada (College of Human Medicine)

Under physiological conditions, phosphatidylserine predominantly localizes to the cytosolic leaflet of the plasma membrane of cells. During apoptosis, PS is exposed on the cell surface and serves as an "eat-me" signal for macrophages to prevent releasing self-immunogenic cellular components from dying cells which could lead to autoimmunity. However, increasing evidence indicates that viable cells can expose PS on their surface; moreover, tumor cell-derived extracellular vesicles also externalize PS. Recent studies have proposed PS-exposing EVs as a potential biomarker for early cancer detection and other diseases. In this study, we enriched small EVs and medium/large EVs from conditioned media of breast cancer cells and non-cancerous cells. Since several PS-binding molecules are available, we compared recombinant proteins of annexin A5 and the carboxylated glutamic acid domain of Protein S, also specific for PS, to detect PS-exposing EVs. Firstly, PS externalization in each EV fraction was analyzed using a bead-based EV assay. The bulk EV assay showed higher PS externalization in m/lEVs derived from MDA-MB-468 cells but not from MDA-MB-231 cells, while higher binding of GlaS was also observed in m/lEVs from fibroblasts. Second, using single EV flow cytometry, PS externalization was also analyzed on individual sEVs and m/lEVs. Significantly higher PS externalization was detected in m/lEVs derived from cancer cells compared to m/lEVs from non-cancerous cells. These results emphasize the significance of PS-exposing m/lEVs as an undervalued EV subtype for early cancer detection and provide a better understanding of PS externalization in disease-associated EV subtypes.

EVALUATING THE ACCEPTANCE OF PORTABLE EXERCISE BIKE IN OLDER ADULTS WITH CARDIOVASCULAR DISEASES

Presenter(s): Allison DeLuna, Darby Pickford
Health Sciences
Mentor(s): Pallav Deka (College of Nursing)

For most older adults, including those with cardiovascular diseases, adherence to recommended exercise guidelines is difficult. Some barriers include inclement weather, unsafe neighborhoods, lack of transportation, gym affordability, difficulty incorporating physical activity into daily life, and boredom from doing the same exercises. We investigated the use of a portable exercise bike (Sunny Health and Fitness Magnetic Mini Exercise Bike) that allows for pedaling and hand biking in the home setting. Twenty-one participants (43% male and 57% female) with history of cardiovascular diseases self-reported their physical activity using the International Physical Activity questionnaire. Thereafter, they performed two 6-minute-long sessions of moderate intensity bouts of pedal and hand biking and completed the acceptability survey. The average age and BMI of the participants was 71 ± 6.51 years and 28 ± 6.42 respectively. Participants had an average of 3.14 ± 1.46 comorbidities with some participants reporting chronic musculoskeletal problems. Based on the IPAQ scores, in the past 7 days, 2 participants performed vigorous physical activity (> 3000 MET-minutes), 8 moderate (600-3000 MET-minutes), and 10 low physical activity (< 600 MET-minutes). Average daily sedentary time was 8 hours. The acceptability survey showed that 97% of participants indicated the portable exercise bike was easy to set-up, use and store in the typical home environment. 84.25% felt as if they could multitask while pedaling or hand biking. Five participants inquired about purchasing the portable exercise bike at the end of the study. Overall, the portable exercise bike was well accepted in this population.

MISLEADING STATISTICS: DARRELL HUFF'S LESSONS IN HEALTHCARE

Presenter(s): Kriti Shirodkar
Health Sciences
Mentor(s): Aklilu Zeleke (Lyman Briggs College)

Poor statistics presented as evidence can influence politics, public opinion, and the health of the American people. Despite their widespread influence, government organizations related to healthcare, such as the CDC, often fail to report data without bias. Such bias can occur in the data collection method and/or the process of distributing results to the public. I studied American journalist Darrell Huff's "How to Lie with Statistics" and then investigated the effect of misinformative statistics in current, divisive healthcare issues-the coronavirus pandemic and women's reproductive rights. Through the analysis of data from COVID-19 and abortion public records between 2015-2021, courtesy of the CDC, UCLA, Pew Research Center, and more, results illustrated a correlation between poorly conducted statistics and the perpetuation of injustice in systematically disadvantaged populations. In the coronavirus pandemic, more people of color suffered illnesses and mortality due to government negligence and misinformation. Similarly, pro-abortion organizations and related legislature suffered negative social sanctions. My findings underline the importance of engaging with media critically, as a consumer, and considering data's decision-making implications for people all over the country as a mathematician and scientist. Only by viewing STEM "in [its] diverse human, social, and global context" (Lyman Briggs College) can one truly grasp the weight of research and pursue future findings with appropriate ethical responsibility.

ELECTRODES, PUPILS, B-WAVES OH MEYE! PRELIMINARY ANALYSIS OF THE PORTABLE RETEVAL ELECTRORETINOGRAPHY DEVICE FOR USE IN DOGS

Presenter(s): Lydia Kapeller
Health Sciences
Mentor(s): Andras Komaromy (College of Veterinary Medicine)

Purpose: To evaluate the portable RETeval electroretinography (ERG) device as a potential pupil dilation-free method of retinal function testing in dogs. Methods: The study was conducted in three phases to evaluate different ERG recording setups in

purpose-bred beagle dogs: (1) Comparison of B-wave amplitudes with vs. without pupil dilation (five eyes in three dogs); (2) establishment of the lower lid for positive electrode placement as an alternative to the cornea so that pupil diameters can be measured during ERG recordings (six eyes in four dogs); and (3) assessment of the ability to obtain ERG responses without pupil dilation using the RETeval pupil tracking feature (six eyes in three dogs). All recordings were done under (midazolam, dexmedetomidine, and butorphanol) and pupils were dilated where necessary with tropicamide 1% ophthalmic solution. Data analysis was performed by descriptive statistics and Student t-test with significance set as P<0.05. Results. Mean B-wave amplitude was significantly decreased when comparing dilated (53.1 +/- 15.5 microvolts) vs. undilated pupils (13.7 +/- 5.4 microvolts; p<0.002)[KA1] . ERGs could be recorded with the lower lid electrode placement, but the B-waves were significantly lower (19 +/- 4.7 microvolts) compared to standard corneal contact lens electrode placement (49.9 +/- 11.2 microvolts; p<0.0001). ERG responses were obtainable using the RETeval pupil tracking feature on undilated eyes. Conclusions: The RETeval portable ERG device offers potential for canine ERG testing without the use of dilation. A positive needle electrode in the lower lid is a potential alternative to using a corneal contact lens electrode.

PEDIATRIC DIABETIC KETOACIDOSIS PRESENTATIONS TO AN EMERGENCY DEPARTMENT BEFORE AND DURING THE PANDEMIC

Presenter(s): Joshua Prabhu
Health Sciences
Mentor(s): Usha Sethuraman (Children's Hospital of Michigan)

Studies reveal that SARS-CoV-2 infection is associated with an increased rate of new onset diabetes (NODM) in adults. However the incidence and severity of NODM and diabetic ketoacidosis (DKA) in children during the pandemic is unknown. Our objectives were to compare the occurrence, severity, and outcomes of pediatric NODM between the pre-pandemic and pandemic periods and determine the risk factors for severe outcomes during the pandemic. We conducted a retrospective study of children <18 years evaluated at a pediatric emergency department for NODM or DKA during the pre and pandemic periods. We defined severe outcomes as death, or requiring mechanical ventilation, non-invasive oxygen, or hyperosmolar therapy. We abstracted demographics, clinical and laboratory features, disposition and outcomes. Amongst 673 eligible children, there were no differences in demographics and types of diabetes between the two study periods. During the pandemic, there was an increase in the proportion of children with DKA, severe DKA, and severe outcomes. The average number of DKA visits per patient also increased and lower median levels of serum bicarbonate, blood pH, and higher beta hydroxybutyrate were noted. Logistic regression revealed that while severe outcomes during the pandemic were associated with elevated blood urea nitrogen (BUN) and lowered oxygen saturation, SARS-CoV-2 status was not a risk factor. In conclusion the proportion of children with severe DKA and severe outcomes increased during the pandemic. Elevated BUN and lowered oxygen saturation were risk factors for severe outcomes. Further studies are required to confirm and explore the reasons for these findings.

THE ATTITUDE AND INTENTIONS OF GETTING THE INFLUENZA VACCINE BETWEEN INTERNATIONAL VERSUS DOMESTIC COLLEGE STUDENTS IN THE U.S.

Presenter(s): Loveleen Kaur
Health Sciences
Mentor(s): ChengChing Liu (College of Nursing)

Getting vaccinated helps build herd immunity, which in return, helps provide to the general population another level of protection from illness. There are more than one million international college students in the U.S. However, international students are still under researched in the healthcare field. It's vital to understand the attitude and intention of getting influenza vaccine among international students as much as domestic students. The purpose of this study is to understand the attitude toward and intention of getting influenza vaccine using the theory of planned behavior (TPB). The theory of planned behaviors demonstrates various factors that may influence our behavior including personal attitudes, perceived behavioral control (PBC), and subjective norms. A cross-sectional survey was conducted. Guided by the TPB, a questionnaire was developed to assess students' personal attitudes, intentions, perceived behavioral control, and subjective norm related to obtaining the influenza vaccine. Students were recruited through Amazon mTurk and a Registrar office at a midwestern university in the U.S. A descriptive analysis including means and t-tests, and multiple linear regression analysis were employed using SPSS software.The average of attitude and PBC were higher and were statistically significant. More so, students' attitude, PBC, and subjective norms were statistically significant in both student groups which can be used to predict the intention of receiving influenza vaccine among international students. As nurses, we can deliver understandable information to domestic college students to reinforce the attitude and PBC to increase the influenza vaccination rate.

DIFFERENCES IN SPORT-RELATED RISK APPRAISAL BETWEEN INDIVIDUALS WITH AND WITHOUT ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Presenter(s): Charlotte Pohl, Emiko Oku
Health Sciences
Mentor(s): Francesca Genoese (College of Law), Matthew Harkey (College of Education)

Background: Anterior cruciate ligament (ACL) tears are a sport-related injury that frequently require surgical intervention. The Anterior Cruciate Ligament Return to Sport After Injury (ACL-RSI) Scale measures psychological readiness to return to sport and includes three subscales: Emotions, Confidence, and Risk Appraisal. Individuals with and without ACL reconstruction (ACLR) have reported poor total ACL-RSI scores; however, no literature has explored differences in ACL-RSI Risk Appraisal subscale scores. Greater perceived sport-related risk may increase risk of injury among healthy individuals, as well as secondary ACL injury among individuals post-ACLR. The objective of this study was to explore differences in ACL-RSI Risk Appraisal scores between females with history of ACLR and uninjured controls. Methods: 10 females with ACLR (months since ACLR = 21.65 ± 15.03; age =

20.1± 5.55 yr) and 10 age matched controls without ACLR (age = 20.0 ± 4.5 yr) participated. Risk appraisal was assessed with the ACL-RSI Risk Appraisal subscale. Subscale scores range from 0 - 100, where lower scores indicate greater perceived risk regarding sport participation. Descriptive statistics (median[IQR]) were calculated for Risk Appraisal scores and Mann-Whitney U Tests were used to compare Risk Appraisal scores between groups. A-priori α was set at $p<0.05$. Results: Individuals with ACLR had lower ACL-RSI Risk Appraisal scores (72.5[31.25] compared to uninjured controls (100[3.75]; $p < 0.001$). Conclusion: Individuals with ACLR exhibited lower ACL-RSI Risk Appraisal scores compared to uninjured individuals. These results provide normative ACL-RSI Risk Appraisal scores for rehabilitation specialists to use as a baseline when working with individuals post-ACLR.

THE ASSOCIATION BETWEEN COPING SKILLS, INDIVIDUAL VS. TEAM SPORT, AND CONCUSSION RECOVERY IN COLLEGIATE ATHLETES

Presenter(s): Lili Klein
Health Sciences
Mentor(s): Aaron Zynda (College of Education)

Personal (e.g., coping skills) and situational factors (e.g., individual vs. team sport) influence an athlete's cognitive appraisal of injury, which may alter recovery outcomes. The purpose of this study was to assess the relationship between coping skills and individual vs. team sport and their association with recovery time following sport-related concussion (SRC). A prospective study of collegiate athletes diagnosed with SRC within 5 days of enrollment was conducted. Demographics, injury/recovery information, and the Athletic Coping Skills Inventory (ACSI) were completed at the initial visit and medical clearance. The ACSI includes 28 items rated from almost never (0) to almost always (3) divided into 7 subscales (each scored out of 12) and one total score (scored out of 84), with higher scores signifying better coping skills. Athletes were categorized into team (e.g., football, soccer) and individual (e.g., wrestling, gymnastics) sport types. Multiple regression was used to determine if coping skills and sport type significantly predicted athletes' recovery time (e.g., days to symptom resolution). Eighty-three athletes (42 female; age=20.4 years, SD±2.3) were included; 69 from team and 14 from individual sports. Multiple regression revealed that sport type (p=14.1, p=0.018) and the Peaking Under Pressure subscale scores (p=-1.79, p=0.048) significantly predicted days to symptom resolution following SRC. Results show that, holding coping skill subscales constant, team sport athletes were associated with longer concussion recovery times compared to individual sport athletes. Additionally, individual sport athletes with higher scores on the "Peaking Under Pressure" subscale were associated with shorter recovery times.

EFFECTS OF HAPTIC FEEDBACK ON BALANCE ACQUISITION

Presenter(s): Ethan Newman
Health Sciences
Mentor(s): Joey Wijffels (College of Education), Rajiv Ranganathan (College of Education), Simon Cone (College of Education)

Motor learning is essential for a wide range of activities, ranging from learning how to play a sport to rehabilitation after neurological injury. During this process, an individual acquires the ability to complete a new motor task. Practice is necessary for effective learning, but in real-world applications, the amount of time allotted to learning is limited. As a result, there is a need to find new ways of accelerating motor learning to maximize benefit within a given time. Various methods of achieving this have been explored, such as providing audiovisual feedback during learning. In this study, we focus on haptic feedback because it can provide relevant information without distracting from the primary task. Previous studies demonstrated that haptic feedback can improve performance on complex tasks, but these have been typically conducted only over short durations. We aim to evaluate if haptic feedback can be used to accelerate learning in a complex whole-body balancing task that requires practice over a several week period. The participant will attempt to keep a stability platform centered while wearing a haptic vest and receiving position and velocity-based feedback. The haptic vest in question is a bHaptics X40 to provide necessary feedback. This vest is equipped with forty motors that activate according to the platform's movements. Results are currently unknown as the experiment is still ongoing. This experiment is anticipated to show the effectiveness of haptics in movement acquisition. These results may have implications for the design of rehabilitation procedures for individuals with movement impairments.

THE RELATIONSHIP OF PRENATAL AND POSTPARTUM DEPRESSION WITH GASTROINTESTINAL MICROBIAL DIVERSITY AND COMPOSITION

Presenter(s): Nikita Nel
Health Sciences
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

As prenatal and postpartum depression continue to affect a growing number of families in the United States, it is imperative that new avenues of treatment are identified, such as microbial therapeutic intervention. By analyzing the human gut microbiome, distinct differences in maternal gut microbial diversity can be identified as a potential target for such interventions. The objective of this study is to characterize the relationship between the gut microbiome and prenatal and postpartum depression as measured by the Edinburgh Postnatal Depression Scale (EPDS). Study participants (n=73) completed the EPDS questionnaire at a prenatal and postpartum visit. Stool biospecimens were obtained during their third trimester of pregnancy. Participants were characterized as having elevated symptoms of depression with an EPDS score ≥10. Prenatal EPDS scores were positively correlated with postpartum EPDS scores. Microbial analysis was performed in R studio software. Results revealed that prenatal and postpartum EPDS scores were significantly associated with microbial diversity and composition. Participants with higher prenatal EPDS scores had significantly different alpha diversity levels, with less diverse, more even gut microbiomes and unique beta diversity community structures. Participants with more severe postpartum depression also had lower diversity, richness, and greater evenness of their gut microbiome as indicated by alpha diversity metrics. Phascolarctobacterium was significantly more abundant in stool samples from participants with higher postpartum EPDS scores. The results herein grant insight to important potential therapeutics that can be used to improve maternal mental health by targeting the gastrointestinal microbiome.

HISTORY, POLITICAL SCIENCE & ECONOMICS

A HISTORICAL ANALYSIS OF THANKSGIVING TURKEY PRICES: INSIGHTS FROM NEWSPAPER GROCERY ADS

Presenter(s): Alayna Tisch
History, Political Science & Economics
Mentor(s): David Ortega (College of Agriculture & Natural Resources)

Was this past Thanksgiving the most expensive one ever? Newspaper headlines seem to claim year after year that the cost of a Thanksgiving meal is dramatically increasing. But is this really the case? To try and answer this question, we turned to grocery advertisements published the Sunday before Thanksgiving in the New York Times and Detroit Free Press from 1918 to 2021. While it is true that the nominal per pound price of turkey, arguably one of the most iconic Thanksgiving foods there is, has significantly increased, there are other factors that need to be taken into consideration such as rising wages and increasing bird size. We used historical wage data from the U.S. Department of Labor to determine the amount of time it takes to earn enough money to purchase a Thanksgiving turkey. We also take into consideration the fact that the average size of a farm raised turkey more than doubled during the past century. Our findings reveal that the average turkey today requires significantly less labor hours to afford, with a turkey in 1918 requiring 8.4 hours of work now requiring only about 1.1 hours in 2021.

HITLER'S MUSIC BOX: THE POLITICS OF MUSIC IN NAZI GERMANY

Presenter(s): Sydney Kleiner
History, Political Science & Economics
Mentor(s): Marisa Brandt (Lyman Briggs College)

Music has proven to be effective as propaganda, influencing audiences into supporting their country (Cull 51). During WWII, Hitler realized the power of musical propaganda, and its ability to influence either pride or prejudice against one's country. Therefore, Hitler knew the importance of having music on his side, and wanted to gain control of the industry. Hitler employed several methods to gain control of the industry. The purpose of this analysis is to rank these methods in order of effectiveness, which can be done by evaluating which methods helped Hitler gain the most influence through popular support. This paper explores the following question: What were the most effective methods that the Nazis used to gain control of and use music for their own political interests? Hitler gained control of the music industry by integrating music into Nazi youth organizations and youth education, eliminating Jewish influence in music, creating a coalition between propaganda and music administrations, and promoting Aryan or antiSemitic composers.

SENATOR VOTING ON LOWER COURT NOMINEES

Presenter(s): Jack Carlson
History, Political Science & Economics
Mentor(s): Jonathan King (College of Social Science)

While the rise of partisanship in Supreme Court nominations and confirmations has been evident for decades, less is known of how partisanship impacts largely bipartisan lower court confirmations. Has partisanship seeped into the lower court confirmation process and now the primary driver of how senators vote on circuit and district nominations? Using a novel dataset of senator voting for all circuit and district nominations from 1981-2022, we find the answer is yes. What was once an overwhelming bipartisan process now reflects the partisan rancor previously only seen at the Supreme Court with partisanship the key driver of senator voting behavior for lower court confirmations.

ASSORTATIVE MATCHING IN AFRICA

Presenter(s): Jay Stansberry
History, Political Science & Economics
Mentor(s): Hanzhe Zhang (College of Social Science)

Study the change in assortative matching patterns between men and women in African countries over time. Using country by country census and survey data, we studied how men and women marry based on educational attainment, and how this has changed in the last century. Assortative mating patterns can have a number effects on the economy and could explain wealth gaps in many parts of the world.

ASSORTATIVE MATCHING IN SOUTH AMERICA

Presenter(s): Matt Dirisio
History, Political Science & Economics
Mentor(s): Hanzhe Zhang (College of Social Science)

Conceptually, assortative matching occurs when individuals of the same or similar characteristics marry (or cohabit) with each other, but its prevalence varies across time periods and societies. Theoretically, the faculty PI has developed new axiomatic measures of assortative matching for heterosexual couples (in two-sided marriage markets) and homosexual couples (in one-sided marriage markets), respectively. Empirically, I will examine the degree of assortative matching on college education (and other socioeconomic characteristics) across countries and periods in South America utilizing the statistical package Stata and compare the degree of assortative matching between heterosexual and homosexual couples for the countries that have legalized same-sex marriage.

ASSORTATIVE MATCHING IN EDUCATION IN ASIA

Presenter(s): Meital Lurie
History, Political Science & Economics
Mentor(s): Hanzhe Zhang (College of Social Science)

Conceptually, assortative matching occurs when individuals of the same or similar characteristics marry (or cohabit) with each other, but how prevalent assortative matching is differs by society and time. Theoretically, the faculty PI, Hanzhe Zhang, has developed new axiomatic measures of assortative matching for heterosexual couples (in two-sided marriage markets) and homosexual couples (in one-sided marriage markets), respectively. Empirically, the undergraduate team examined the degree of assortative matching on college education (and other socioeconomic characteristics) across countries and periods. The data for the US are available on IPUMS USA (Integrated Public Use Microdata Series), and the data for other countries are available on IPUMS International. The PI and I browsed the literature and document the pattern of assortative mating on college education in the US. IPUMS International contains over 1 billion personal records from 547 censuses and surveys in 103 countries. We focused on Asian Countries.

FROM PATRIOTISM TO POLITICAL INCIVILITY

Presenter(s): Therese Reinhold
History, Political Science & Economics
Mentor(s): Jennifer Wolak (College of Social Science)

In recent years, political incivility has reached new heights, in matters of frequency and aggression. This incivility has appeared in an array of mediums - from political talk shows to the House Floor. It is important to note that this unorthodox behavior stems from the United States' two major parties, making political incivility a prominent bipartisan issue. A 2022 Gallup Poll asserted that only 38% of Americans are proud of their country, a record-breaking low. The consensus is that pride is low but incivility is high. I hereby offer the term "patriotism" to explain increased tolerance of incivility on both sides of the aisle. In addition to country pride, patriotism follows the affection and respect for the core values that the country has been founded on. I hypothesize that those who score higher in patriotism will be more tolerant of political incivility in public figures. Additionally, high - scoring subjects are more likely to see political acts of incivility as patriotic. To measure this relationship, I designed an experiment composed of three sections. The first section introduces the manipulation of patriotism. The second, calls for the subject's assessment of the various candidates' varying behaviors. The last section calls for a self-reflection of patriotism. Through the preceding experiment, I aim to answer whether increased tolerance to political incivility is the result of nearly three hundred years of American patriotism.

CONGRESSDATA

Presenter(s): Alyssa Konesky
History, Political Science & Economics
Mentor(s): Nick Pigeon (College of Social Science)

The CongressData project and app aim to compile data relevant to all congressional districts throughout American history into a comprehensive application to closer liaison and expose the public to political data. The goal of the CongressData project is to make finding and compiling relevant data easier for researchers and the public as they continue their own research or study. By importing public federal data and reaching out to independent researchers, the information is compiled into Excel and then imported to GitHub. Datasets such as Congressional committee assignments and independent research like how long it takes for people to travel to work are included in the CongressData app. The data is then uploaded to the app and can be filtered and viewed. The application allows you to filter the years, congressional districts, and even keywords to display all relevant data. As the application finalizes, it will streamline the accessed datasets on a range of congressional topics.

REMOTE ELECTRONIC VOTING IN ECUADOR'S ELECTION ON FEBRUARY 5TH, 2023

Presenter(s): Carly Sandstrom
History, Political Science & Economics
Mentor(s): Robert Brathwaite (James Madison College)

Many countries have been struggling with low voter turnout rates, but few have figured out how to combat this issue. Encouraging high voter turnout rates can help strengthen democracies and solidify trust in a nation's government. To look at one possible solution to low voter turnout rates, I turn to Ecuador's implementation of remote electronic voting for citizens living abroad. I begin this research by situating Ecuador's current voter turnout rates in relation to the country's history, beginning in 1978. To analyze remote internet voting, I look at previous literature on this mode of voting and then look at how the Consejo Nacional Electoral (CNE) has worked to mobilize voters living abroad. To do so, I rely on interviews with a delegate to the CNE and comparisons of Ecuadorian consulates throughout Europe. I also attempted to collect survey data regarding voter opinions but was unsuccessful. The CNE's voter mobilization campaign is attempting to combat many of the potential issues with remote electronic voting. As results from the election are released, I will update this research to analyze whether the CNE's efforts to mobilize voters living abroad were successful. I also address the potential political implications of allowing citizens who are residing outside of the country to vote.

ADVANCING RACIAL EQUITY WITHIN U.S. POLITICS

Presenter(s): Jairahel Price
History, Political Science & Economics
Mentor(s): Matthew Grossmann (College of Social Science)

Although a significant number of businesses across the country have tailored their human resources departments to prioritize Diversity, Equity, and Inclusion(DEI) in some capacity, few guides exist that promote racial equity in U.S. politics. Both political representation and policies passed from the local to federal level lack a formalized set of guidelines for implementing DEI values, resulting in the continued polarization of topics encompassing race and equity. From an economic standpoint, a 2018 report, The Business Case for Racial Equity, outlined the economic benefits to creating an equitable workforce and economy for a growing ethnic minority population, to contextualize the racial justice narrative in today's economy. Similarly, our research will introduce a Political Case for Racial Equity to outline the racial disparities in elections, party leadership, and policymaking. We also rely on quantitative evidence of structural inequities for ethnic minority groups in criminal justice, education, healthcare, and economic opportunity. This study further highlights current 'profiles' of successful advocacy or policy creation by politicians on both ends of the partisan spectrum that may improve these aspects of society for minority individuals. A variety of age groups, demographics, etc, are used to emphasize a bipartisan approach to the ongoing issue of racial equity, specifically establishing the issue as an existing problem for the entire country, not a polarized opinion. As such, the collection of structural improvements to legislative training, our criminal legal system, healthcare, economic and educational opportunities are important steps to advance racial equity in politics nationwide.

HEALTH AND HUMAN RIGHTS: IRELAND'S POLICIES OF ABUSE IN MOTHER AND BABY HOMES

Presenter(s): Ian Donahue
History, Political Science & Economics
Mentor(s): Linda Sayed (James Madison College)

Throughout the 20th century, Ireland operated a series of institutions known as mother and baby homes, which were a combination of welfare and penal institutions for unwed mothers and their infants. These homes were morally coded institutions, serving to penalize and hide the "shame" of unmarried motherhood from the public eye and were distinctly discriminatory and gendered institutions. These homes, while typically privately run by Catholic religious orders, were funded, and supported by state policy. The homes are associated with a long list of human rights abuses: illegal adoption, torture, slavery, arbitrary detention, discrimination based on gender, race, and socio-economic grounds and more. This research focuses on the practice of illegal intercountry adoption and is guided by the following questions: What was the nature of intercountry adoption in 20thcentury Ireland and how might a human rights framework be applied to understanding the issue today. This work argues that Ireland's system of mother and baby homes violated human rights as defined by international human rights legislation. Furthermore, understanding these issues as systemic violations of human rights resulting from state policy is crucial for appropriate redress today. The scope of this paper is confined to the period following the conception of the Irish free state in 1922, up until the end of the century. While this research is historical and archival in nature, its implications are pressing for today as they pertain to ongoing discussions of victim redress, prosecution of the culpable, and current intercountry adoption in other contexts.

FROM FERAOUN TO THE FLN: GENDER AND NATIONALISM IN THE ALGERIAN WAR

Presenter(s): Max Martus
History, Political Science & Economics
Mentor(s): Emine Evered (College of Social Science)

With over 60 years passed since the end of the Algerian War for Independence and a plethora of scholarly work dedicated to its events, we should not forget the more focused stories of everyday people who suffered, survived, and died during eight years of complicated war. When we focus on individualized narratives, what we find is that the FLN (Front de libération nationale) carried out a universal revolution which cut across ethno-linguistic, political, and gender divisions using a combination of Algerian nationalism and revolutionary violence. To support this research, we draw from a variety of primary and secondary sources in both French and English, such as the wartime journal of Mouloud Feraoun, an Algerian Kabyle writer whose complicated identity helps provide a unique perspective on this conflict. For the sake of this presentation, we will focus on the relationship between gender and nationalism within the FLN's universal revolution. The FLN leadership clearly used nationalistic rhetoric and promises of greater equality to gain women's support. Still, the FLN was not a monolith, and it is important that we distinguish their utopian ideals from the daily actions of their foot-soldiers. Firsthand accounts like those of Feraoun show us that women were subjected to widespread abuse from FLN rebels who did not share such idealistic notions of gender equality. But these accounts also illustrate the reality that although they suffered from widespread abuse, Algerian women had gained new rights and responsibilities that could not be entirely reversed after independence.

LITTLE LABORATORIES OF REPRESENTATION: WHERE DO WOMEN CANDIDATES RUN IN MICHIGAN'S LOCAL ELECTIONS AND WHAT HAPPENS WHEN THEY ARE ON THE BALLOT?

Presenter(s): Mikayla Stokes
History, Political Science & Economics
Mentor(s): Eric Juenke (College of Social Science)

What does the pipeline of women candidates in Michigan look like in 2022? State and federal candidates typically have previous officeholding experience in local office. Whether it is in city councils, school boards, or county boards, candidates gain experience by running locally. It is important to understand these local trends to see if obstacles to women's ambition is driven by candidate supply problems at the local level or if they arise later when thinking about running for statewide or federal office (Crowder-Meyer 2019; Crowder-Meyer and Benjamin 2014). We describe the process of collecting and coding data for women candidates for local office in Michigan in 2022. Next, we describe the difficulties involved with collecting this information from the eighty-three country clerks and the process we use to code gender and race/ethnicity. Further, we provide some preliminary descriptive results for 2022, demonstrating that the pipeline for women candidates at the local level looks very similar to those at higher levels of office, particularly when we look at differences by party. The data will contribute to a better understanding of Michigan's candidate pipeline and will allow us to link research between the local and state levels in the future.

BEYOND THE PALE: UNDERSTANDING INTERGROUP CONTACT IN 21ST CENTURY NORTHERN IRELAND

Presenter(s): Macken Keefe
History, Political Science & Economics
Mentor(s): Brendan Mullan (College of Social Science), John Waller (College of Social Science)

Northern Irish history is a story of two distinct, yet intertwined, people groups: Catholics, who have historically supported a united, free Irish Republic, and Protestants, who traditionally support membership in the United Kingdom. These groups have competed for socio-economic resources and political power for hundreds of years. As a result, the capacity for these two groups to cooperate here has been limited by a combination of de facto and systematic mechanisms. The periodic state-sponsored and paramilitary conflict that marred Ireland throughout the 20th century did little to prompt cooperation between these groups, but instead inspired and deepened mutual feelings of fear and distrust. Although the 1998 Good Friday Agreement has produced a relatively peaceful environment in Northern Ireland, Catholics and Protestants continue to live and learn in segregated "parallel societies," particularly within its capital city, Belfast. "Intergroup contact," or interactions between members of two or more different people groups, has become an increasing point of focus in peace and justice studies literature. In other post-conflict societies, evidence suggests that intergroup contact is positively associated with reconciliation and forgiveness between embattled people groups. This project probes the general validity of contact theory, highlights the barriers to intergroup contact in Northern Ireland, and evaluates the potential for contact-based initiatives to break the Catholic-Protestant stalemate. Understanding the state and future of intergroup contact in this region is shown to be particularly relevant because its future has been made uncertain by unprecedented demographic changes and ongoing Brexit negotiations.

WHAT MATTERED AND WHY IN MAJORITY-MINORITY DISTRICTS IN THE 2022 MICHIGAN DEMOCRATIC PRIMARIES

Presenter(s): Lexie Milukhin
History, Political Science & Economics
Mentor(s): Nick Pigeon (College of Social Science)

The Michigan Redistricting Commission had a variety of goals meant to be achieved by their redraw, including creating competitive districts. In this they were successful. These highly competitive districts were made up of newly created districts, districts where an incumbent was edged out by the redraw, and others. The outcome has been several surprise victories in highly competitive majority-minority districts, demonstrated by the 2022 Michigan Democratic Primary. Our research sought to understand why each candidate in these instances ultimately garnered the nomination, by identifying and measuring contributing factors. For our analysis of the primary elections, we looked at districts with Black candidates running, as well as districts with a plurality of Black voters. For these candidates, we looked at their incumbency status, governmental tenure, social capital within their communities, campaign fundraising, local news coverage, and the endorsements they received from local and state organizations, including unions, community leaders, and other elected officials. We measured these metrics against competitors. Based on our analysis, when it comes to surprise victories in highly competitive districts that are majority-minority, we concluded that which of our aforementioned factors matter and why differs contingent on context. This context includes the number of candidates, if there is an individual running with existing social capital, and whether or not the majority-minority vote has been split.

RULE BY CONSEILLERS AND THE RÉSEAU FOCCART: FRANÇAFRIQUE'S EARLY YEARS

Presenter(s): Max Martus
History, Political Science & Economics
Mentor(s): John Doyle-Raso (College of Social Science)

Over 60 years since granting independence to its Sub-Saharan African colonies, France still struggles with a legacy stained by neocolonialism. To determine how France was able to maintain significant economic, political, cultural, and military privileges in many of its former Sub-Saharan colonies, we must look to the decade immediately following independence. In effect, personal relationships, pro-French advisors, and French-supported suppression of political opponents provided the backbone of this neocolonial system. Historians have established many of the instruments of French neocolonialism but have not given proper attention to the vital collaboration between African leaders and French intelligence networks within this system. Unpopular regimes often survived the first decade of independence with the explicit backing of French intelligence networks, specifically in Cameroon, Gabon, and Cote d'Ivoire. To contextualize the role of these leaders, this research uses several speeches from post-independence heads of state in former French West and Equatorial Africa, as well as secondary source analysis of their regimes in both English and French. Guinea is used as a foil because, although a former colony, it's premature independence meant it largely escaped French neocolonial control. What we find is that early French neocolonialism was established with the domination of pro-French advisors in the inner circles of African leaders and loyalty was ensured through suppression of anti-government movements by French intelligence networks. We can see a pattern of culpability for African leaders in hindering the sovereignty of their newly independent peoples, which in turn helped ensure continuing French privileges.

CLIMATE MIGRATION AND COMMUNITY DEVELOPMENT IN MICHIGAN: CAN TWO NEGATIVES EQUAL A POSITIVE?

Presenter(s): Raquel Acosta
History, Political Science & Economics
Mentor(s): Daniel Ahlquist (James Madison College)

With the threat of climate change reshaping our world's physical landscape at an exponential rate, our social landscape will endure substantial changes as well. Climate migration is a growing concern for many as excess resources and adequate planning are far and few in between. Michigan is now being sought after by many as a possible 'climate haven' during tumultuous times. While some fear the negative consequences an influx of migrants may have in our Michigan communities, we must not overlook the many new possibilities that come with this new population growth.

HUMANITIES

LITERARY DEPICTIONS OF EGYPTIAN REGIMES, REVOLUTIONS, AND RESISTANCE

Presenter(s): Gabriel Sandoval

Humanities
Mentor(s): Martha Olcott (James Madison College)

Naguib Mahfouz (1911-2006) and Alaa Al-Aswany (1957-Present) are two renowned Egyptian authors whose works blend critiques of Egyptian society and well-polished literary storylines. They use characterization and style to portray their thoughts on the Egyptian nation throughout the twentieth and twenty-first centuries. Supervised by Professor Martha Olcott, my James Madison College Senior Honors Thesis explores Mahfouz and Al-Aswany's views on various aspects of Egyptian society including resisting against oppressive regimes, Egyptian nationalism, advocating for gender equality, and failed revolutions. I worked to compare their views by looking at the similarities and differences between their literary depictions. My high intermediate knowledge of Arabic allowed me to view sections of their work in Arabic and compare the original voice of the authors to the translated copies of their work. My goal in looking at the original Arabic was to analyze their usage of dialect and vocabulary to see if the Arabic versions contain sentiments that the English copies do not. The overall goal of my thesis was to gain a greater insight into these prominent authors' opinions about living in Egyptian society and see how they conveyed these opinions through literary tools. I wanted to see where they aligned and differed, and what their unique experiences as citizens contributed to their works.

FEMALE ALCHEMISTS IN THE SPANISH GOLDEN AGE

Presenter(s): Shae Thompson
Humanities
Mentor(s): Mark Davis (College of Arts & Letters)

Female alchemists in Early Modern Spain during the Spanish Golden Age are often depicted as makers of perfumes, cosmetics, remedies, and medicines and are associated closely with the spaces they create in. The latter part of this time period was defined by an enhanced merging of medicinal and cooking properties, which can be closely observed by examining literary and historical evidence that conveys a progression from medicinal practices to cooking. Furthermore, stereotypical gender-specific associations can be examined by observing the parallel relationships between men with medicine and women with cooking. Fernando de Rojas' La Tragicomedia de Calisto y Melibea (La Celestina) and Lope de Vega's El leal criado demonstrate the role of female alchemists in the health sciences within a patriarchal society. Through the analysis of works of literature from the Spanish Golden Age along with documents pertaining to early medicinal practices and the advancement of these practices throughout time, one can begin to understand the common historical practices of female alchemists and the deterioration of their roles due to significant gender constructs placed upon them by a male-dominated patriarchal society.

MENTORSHIP WITH LATINX STUDENTS AND LOCAL LEADERS: TWO EXPERIENCES

Presenter(s): Esli Mendoza, Fatima Nunez-Sanchez
Humanities

Mentor(s): Estrella Torrez (Residential College in the Arts & Humanities)

This presentation highlights the experiences of two undergraduate students in a youth mentorship program, where they worked with high school students, undergraduate peers, and community members of the greater Lansing area. The undergraduate researcher assistants (URAs) prepared for the program by analyzing and adapting methods such as LatCrit and Critical Race Theory into their work, allowing students to better understand supporting first-gen students, Latinx individuals attending a predominantly white institution, and addressing mental health in the Latinx community. The URAs recruited Latinx students and local leaders to establish mentorship dynamics. As they organized the project, they encountered hidden struggles, including difficulties reconnecting post-COVID and mental health challenges. Adjusting to life post-Trump era and COVID-related challenges allowed the URAs to understand the exhaustion experienced by the Latinx community. At the end of the academic year, the URAs reflected on the impact of the program and those involved in their lives. Through their experiences, the URAs learned the process and effort required to coordinate these support groups, and the importance of understanding and addressing the unique challenges facing Latinx youth.

INTEGRATIVE & ORGANISMAL BIOLOGY

INDIVIDUAL ATTRIBUTES AND THEIR INFLUENCE ON THE HUNTING BEHAVIOR OF SPOTTED HYENAS

Presenter(s): Grace Werner
Integrative & Organismal Biology
Mentor(s): Julie Jarvey (College of Natural Science), Kay Holekamp (College of Natural Science), Sabrina Salome (College of Natural Science)

In social species, the evolution of cooperation provides multiple fitness benefits to group-living animals. Cooperative hunting allows animals to take down bigger prey with greater success, though this is balanced by the costs of sharing this resource. By hunting alone, individuals receive all of the reward from hunting, but may risk injury or expend more energy in the process. Individual attributes, such as the hunter's age and, in social species, its dominance rank, can influence these costs and benefits. We investigated the hunting behavior of a social carnivore, the spotted hyena (Crocuta crocuta), to investigate how age and rank influenced hunting behavior. Over a period of 20 years, the hunting behavior of a clan of hyenas in the Maasai Mara National Reserve in Kenya was recorded. The hyenas hunted a variety of prey with varying success, with the most commonly hunted species being Thomson's gazelles and wildebeest. The group sizes ranged from 1 to 16 hunters, though hyenas were most frequently observed hunting alone. However, group hunts were generally more successful than solo hunts, demonstrating the importance of cooperation in this species. Hunting behavior also varied by hyena age and rank, as juvenile and higher ranking hyenas were more likely to hunt in groups than adult and lower ranking hyenas. Hunting success was higher for adult hyenas than juveniles and for groups when hunting the most common prey types. These results demonstrate the tradeoffs between solo and group hunting for individuals with varying ages and social ranks.

EFFECTS OF LIVESTOCK GRAZING INTENSITY ON CARNIVORE TRENDS IN THE MAASAI MARA

Presenter(s): Rebecca Fisher
Integrative & Organismal Biology
Mentor(s): Olivia Spagnuolo (International Studies & Programs)

Apex carnivores and mesocarnivores are able co-exist in the same ecosystems without intense competition for resources through a phenomenon called niche partitioning. Although the effects of human disturbance on wildlife behavior, such as space use and activity pattern, have been documented extensively, relatively little work has been done to investigate how anthropogenic activity impacts interspecies interactions, such as niche partitioning. The goal of this study is to explore how lions (Panthera leo), cheetahs (Acinonyx jubatus), and black-backed jackals (Canis mesomelas) alter their space use and activity patterns in response to livestock grazing. We used observational ecological data collected in the Talek region of the Masai Mara Nation Reserve, Kenya during times of fluctuating livestock grazing intensity. We assessed how livestock grazing intensity affected the frequency, distance from the park boundary, or time of day at which each species was observed. This study is important for the conservation of large carnivores by contributing to the understanding of anthropogenic effects on behavior in two African carnivores. Increased anthropogenic activity may compromise the balance required for niche partitioning in an ecosystem, resulting in a higher risk of extinction. With every species playing a critical role in ecosystem balance, the loss of one species, especially a carnivore, can result in a top-down trophic cascade.

EVALUATING THE EFFECTS OF CLIMATE CHANGE-INSPIRED HEAT WAVES ON THE COEVOLUTIONARY RELATIONSHIP BETWEEN COMMON MILKWEED (ASCLEPIAS SYRIACA) AND MONARCH BUTTERFLIES (DANAUS PLEXIPPUS)

Presenter(s): Alyssa Mollema, Caz Schwennesen
Integrative & Organismal Biology
Mentor(s): Xose Lopez Goldar (College of Natural Science)

Climate change has been predicted to increase the frequency and intensity of extreme weather events, such as heat waves (sudden rises in temperatures that last a few days), and it is unknown how specialized coevolutionary plant-insect interactions will function under these conditions. We hypothesize that heat waves will disrupt coevolutionary interactions between the host plant and specialist herbivores through changes to the physiological and behavioral adaptations of both organisms. We simulated a heat wave (HW, +10 ºC above controls) on monarch caterpillars (Danaus plexippus) and common milkweed (Asclepias syriaca) plants in growth chambers for four days. After the initial four days, control and HW plants and insects were distributed into new plant-insect combinations of control-control, control-HW, HW-control, and HW-HW for another four days to compare the effect of HW on both organisms separately, and on the entire interaction. We measured plant height, exuded defensive latex, monarch damage and weight after each four-day period. HW plants increased growth and latex production but experienced more herbivory than

control plants. This suggests that despite the plant defense induction by HWs, the latex was more tolerable for the caterpillars. Plant responses to subsequent herbivory after a HW may be drastically hampered and therefore disrupt the interaction in favor of the herbivore. Nonetheless, this lower toxicity of plant defenses may derive into sequestration of less potent cardenolides, increasing the risk of predation for the monarch. The results of this study can be used to inform monarch conservation efforts.

THE EFFECTS OF CONCERT MUSIC ON POTTER PARK'S PRIMATES

Presenter(s): Abigail Snelling
Integrative & Organismal Biology
Mentor(s): David Biedenbender (College of Music), David McCarthy (Residential College in the Arts & Humanities)

Many zoos and aquariums host musical events to draw in more community members to visit their institution. However, there is a major ethical question in terms of how these events can impact the welfare of the animals at these institutions. To investigate the impacts that concert music can have on animals housed in zoos, the Potter Park Zoo's spider monkeys (Ateles geoffroyi) and ring-tailed lemurs (Lemur catta) were exposed to three different types of concert music (dissonant, lyrical, and jazz) and their behaviors were recorded both with and without music. It was found that there were no significant differences between the control behaviors and behaviors while music was playing. However, the spider monkeys did express more negative behaviors and fewer positive behaviors when jazz or lyrical music was playing. Using this information, Potter Park Zoo hosted a concert in collaboration with MSU's Grand River Brass in which the musicians played dissonant music since this style is what most closely aligned with the primates control behaviors.

EXAMINING GENETIC EFFECTS OF CONNECTIVITY AND CULVERT RESTORATION ON BROOK TROUT (SALVELINUS FONTINALIS) IN A MINNESOTA STREAM

Presenter(s): Emily Bardwell
Integrative & Organismal Biology
Mentor(s): Mariah Meek (College of Natural Science)
Human activities such as urbanization and infrastructure development have a significant impact on freshwater ecosystems, particularly in terms of fish dispersal. Culverts are often built to connect water sources when divided by roads and are common in freshwater streams. Some culverts may act as barriers to movement for stream-dwelling fishes such as brook trout (Salvelinus fontinalis). Populations with limited dispersal capability due to the inability to cross culverts may lack gene flow and could have reduced genetic diversity compared to populations that have the ability to disperse between tributaries. Here, I aim to gain insight into the genetic influence that culverts and other natural and anthropogenic barriers may have on brook trout populations. Using fin samples collected from isolated brook trout populations where a barrier was present, I will quantify the genetic diversity of each population and the divergence from other local brook trout populations. Using the data generated in this study, I will delineate unique brook trout populations and establish the genetic population structure of brook trout in this region. Furthermore, I

will use samples collected post-barrier removal to examine how these populations responded after connectivity to mainstem tributaries was re-established. Results from this study will provide key information on the effects of barriers on isolated brook trout populations, and the influence of isolation on population genetics and gene flow in this system. This knowledge can be used in conservation and management planning to maximize the population persistence of brook trout under changing environments.

POTENTIAL OR POISONOUS? A LEAP INTO THE RELATIONSHIP BETWEEN DIET AND TOXICOLOGY OF PSEUDOPHRYNE

Presenter(s): Mikayla Sague
Integrative & Organismal Biology
Mentor(s): Justin Lawrence (Lyman Briggs College)

Research into poison frogs has led to the discovery of a unique poison producer known as Pseudophryne. Pseudophryne skin contains unique alkaloids pseudophrynamines (PSs). These frogs are the only known vertebrae to biosynthesize PSs. All other species of poison frogs must sequester alkaloids from their environment and diet. It is currently hypothesized that if Pseudophryne consumes high levels of dietary PTX alkaloids, this will cause a decrease in the synthesis of PSs. Alkaloids provide these frogs with protection from both predators and pathogens. It has been previously recorded during the breeding season that the male frogs breed in riverside burrows and feed on leaves, ants and termites. By examining the stomach contents and skin toxins of 40 Pseudophryne using microscopy and Gas Chromatography-Mass Spectroscopy GC-MS, we can further investigate patterns between their acquired alkaloid concentration in comparison to their biosynthesis of PSs. The stomachs were vastly empty, containing mostly soil and few partially digested insect parts. This indicates that the male frogs are reducing consumption of arthropods during the breeding season. Our data suggests that the decrease in dietary alkaloids produced is therefore compensated by the biosynthesized pseudophrynamines to allow the frogs to remain defended during the breeding season.

INDIVIDUAL AND SEASONAL VARIATION IN FEEDING BEHAVIOR IN SPOTTED HYENAS

Presenter(s): Campbell Melton
Integrative & Organismal Biology
Mentor(s): Julie Jarvey (College of Natural Science), Kay Holekamp (College of Natural Science), Sabrina Salome (College of Natural Science)

Foraging in social groups comes with costs and benefits. Among social carnivores, individuals may benefit from increased energy returns from group foraging. However, social carnivores experience more competition among conspecifics than do solitary species. The relative costs and benefits are also influenced by other factors such as prey availability and individual attributes. We investigated seasonal and individual variation in feeding behavior in spotted hyenas (Crocuta crocuta). Hyenas often hunt and feed in groups and access to resources is influenced by individual attributes such as age, sex, and rank. We studied a single clan of spotted hyenas in the Maasai Mara, Kenya where they experience seasonal fluctuations in prey availability, and where migratory herds of wildebeest and zebra are present in high numbers from July-November. We used 6 years of observational data to investigate how feeding behavior varied across seasons, and among hyenas of different ranks, ages, and sexes. Hyenas were most often found feeding alone, although they were also found in groups of up to 50 individuals. Hyenas fed in groups more often and in larger groups when migratory herds were present. Males and females fed alone and in groups, however, females were seen feeding in groups more often than males. Juveniles and adults fed alone and in groups, but hyena age was positively correlated with feeding group size. We found no relationship between feeding group size and social rank. Adult hyenas were more likely to feed on livestock than were younger hyenas, but otherwise they had similar diets.

NICHE PARTITIONING IN BOCAS DEL TORO, PANAMA BETWEEN DENDROBATES AURATUS AND OOPHAGA PUMILIO

Presenter(s): Lilja Plumert
Integrative & 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, there are two poison frog species that coexist in the same habitat in multiple locations, which have access to the same resources. As dendrobatid poison frogs get their defensive alkaloid toxins from their diet, we investigated how these diets varied among species and among populations. We syntopically sampled stomachs from 20 Dendrobates auratus and 20 Oophaga pumilio from two different locations in the Bocas del Toro archipelago in Panama. Syntopic sampling allows us to control for different invertebrate communities that could result in different alkaloid toxins 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, particularly with mites which are an important source of alkaloids, supporting the idea of niche partitioning. This research is the first of its kind for dendrobatid poison frogs and may help explain why some species are highly variable in color across their range while others are not.

CAROTENOID PROTEINS INVOLVED IN CYANOBACTERIAL PHOTOPROTECTION

Presenter(s): Marionna Bigelow
Integrative & Organismal Biology
Mentor(s): Cheryl Kerfeld (College of Natural Science), Damien Sheppard (College of Natural Science), Sigal Lechno-Yossef (College of Natural Science)

The Orange Carotenoid Protein (OCP) is an essential element in cyanobacterial photoprotection. This protein is composed of an N-terminal effector domain (NTD), a C-terminal regulatory domain (CTD), and a carotenoid, making it structurally and functionally modular. Helical Carotenoid Proteins (HCPs) are homologs to the NTD of the OCP, and four HCPs have been functionally characterized to date. While the functions of HCPs are not entirely known, detailed bioinformatic analysis suggests that HCPs might be the ancestors of the NTD of the OCP. The NTD of the OCP interacts with phycobilisomes (PBS), which are the light-harvesting antenna of cyanobacteria, to quench excess energy and protect the photosystems. Due to the structural similarity between HCPs and the OCP, we investigated whether some HCPs are able to interact with PBS and quench fluorescence, thus playing an important role in cyanobacterial photoprotection. HCPs from two different species of cyanobacteria were heterologously expressed in carotenoid-producing E. coli and purified by affinity chromatography. The purified proteins were mixed with PBS from different strains of cyanobacteria and the fluorescence was measured and compared to the fluorescence of the PBS alone. This experiment demonstrated that some HCPs are able to quench PBS from different strains of cyanobacteria supporting the hypothesis that some HCPs are involved in photoprotection

KINESIOLOGY

G-FORCE TOLERANCE OF ELITE MOTOR RACING DRIVERS

Presenter(s): Aidan Davis
Kinesiology
Mentor(s): David Ferguson (College of Education), Faith Houck (College of Arts & Letters)

Automobile racing is one of the largest spectator sports in the world with male and female drivers competing together. There are minimal physiological benchmarks published for the assessment of elite racers which include VO2peak, body composition, and neck strength. A unique physical stressor to automobile racing is elevated vertical gravitational (G) force exposure. Lower body negative pressure (LBNP) is a valid and reliable tool to assess G force tolerance. LBNP redistributes blood from the upper body to the lower body compartments; hence inducing lower central venous activity to replicate g-forces that drivers would experience in the race car. Using an LBNP chamber, we evaluated the G force tolerance of male and female race car drivers (n=15 males, n=7 females). Participants laid supine in the chamber with their waist sealed and lower extremities exposed to a vacuum that decreased pressure 10mmHg every 3 minutes. Heart rate and blood pressure were measured every three minutes. Tests were terminated when systolic or diastolic blood pressure dropped 10 mmHg between stages, heart rate decreased 10 bpm between stages, or participants asked to stop. G tolerance was defined as the highest negative pressure obtained. An unpaired t-test determined the difference between male and female race car drivers. Female drivers (-88.57 mmHg) were statistically higher than male (-72.00 mmHg) drivers. The physiological significance of this difference can equate to giving women a competitive edge when racing on high G force tracks.

PATELLAR TENDON THICKNESS CHANGES OVER AN ATHLETIC SEASON IN DIVISION I FEMALE 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 an athletic season, athletes experience excessive joint loads that may negatively affect the tendon. However, it is unclear how the patellar tendon structure changes over an athletic season. Therefore, the purpose of this study was to determine how patellar tendon thickness changes from pre to post-season in female Division I female athletes. Female Division I soccer and field hockey athletes participated in this study. A single investigator used bilateral sagittal infrapatellar scans with the participant positioned supine in 30 degrees of knee flexion to acquire patellar tendon ultrasound images at a pre- and post-season assessment. The first author used ImageJ software to assess patellar tendon thickness bilaterally at both visits. Dependent t-tests were used to determine change in patellar tendon thickness from pre- to post-season in both limbs. We included 26 female athletes (Age=20.0±1.3 yrs, Height=167±4.9 cm, Weight=63.5±5.4 kg). Patellar tendon thickness in the right limb increased over the season ($t=-2.34$, $p=0.028$), but there was no change in left limb ($t=-1.00$, $p=0.33$). Patellar tendon structure changed over the course of an athletic season in the right knees of female Division I athletes. This is likely influenced by limb dominance, as all but one of the participants were right leg dominant. Future studies should examine how patellar tendon thickness increase effects injury risk or athletic performance during a season.

THE RELATIONSHIP BETWEEN INJURY RELATED FEAR AND LANDING MECHANICS AMONG FEMALE DIVISION 1 ATHLETES

Presenter(s): Aleah Huse
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Female athletes have elevated injury-related fear and commonly demonstrate poor jump-landing mechanics related to lower extremity injury. Therefore, the purpose of this study was to evaluate the association between injury-related fear and jump-landing mechanics among female, Division I NCAA athletes. To assess jump-landing symmetry, participants completed a jump-landing mechanics assessment. Participants were positioned on a 30-cm box that was positioned half the participant's height away from a force platform. The participants were instructed to drop down onto the force platform then immediately perform a maximal height jump. Peak jump-landing force was extracted from both limbs during the jump-landing and normalized between limbs to by calculating the limb symmetry index (LSI, % = Non-dominant Limb / Dominant Limb *100%). To evaluate self-reported injury-related fear, participants completed the Tampa Scale of Kinesiophobia (TSK-11). Participants were dichotomized based upon TSK-11 score as experiencing elevated (TSK $\geq$17) and low (TSK<17) injury-related fear. We utilized a linear regression model to evaluate the influence of injury-related fear on peak jump-landing force symmetry. Forty-four percent of NCAA Division I female athletes

(16/36) reported elevated injury-related fear. Injury-related fear did not predict peak jump-landing force symmetry among our sample (P=0.67, F=0.19, R2=0.01). Athletes who reported elevated injury-related fear demonstrated 92.6± 16.5% jump-landing symmetry and athletes with low fear demonstrated 96.1± 28.7% jump-landing symmetry. Our hypothesis was not supported, perhaps because both groups were symmetrical (LSI>90%) during jump-landing. Future studies should investigate other patient-reported outcomes like knee function, symptoms, and quality of life that may be related to jump-landing mechanics.

THE ASSOCIATION BETWEEN PEAK GROUND REACTION FORCE AND KNEE CARTILAGE THICKNESS IN DIVISION ONE FEMALE ATHLETES

Presenter(s): Christian Burke
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Sex-based differences in landing mechanics are related to an increased risk of lower extremity injury in female athletes. However, it is unclear if landing mechanics are related to structural measures of knee joint health. Therefore, the purpose of this study is to investigate the association between peak landing force and ultrasound-assessed knee joint cartilage thickness among female Division I NCAA athletes. Participants completed a single research laboratory visited that included a knee cartilage ultrasound followed by a jump-landing assessment. 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. The average cartilage thickness for the right and left knees was reported. Next, participants completed a jump-landing assessment from a 30-cm box to the center of the force platform, then immediately jumped to attain maximal height. Peak landing force was normalized to participant body weight and is reported as the average across 5 trials. Pearson correlations were used to determine the association between peak landing force and knee cartilage thickness bilaterally. We included 40 female participants from Division I NCAA teams. There was a moderate, positive association between peak landing force and knee cartilage thickness in the left leg (r=0.37, p=0.02), but not the right leg (r=0.12, p=.47). We demonstrated that there is a relationship between peak landing force and knee cartilage thickness in the left leg, however, this association may be influenced by leg dominance.

RELATIONSHIP OF QUADRICEPS STRENGTH, LANDING FORCE, AND BONE MINERAL DENSITY AMONG NCAA DIVISION I FEMALE ATHLETES

Presenter(s): Albertas Klugas, Brody Lineman
Kinesiology
Mentor(s): Ashley Triplett (College of Education)

Evidence suggests that low bone mineral density (BMD) is associated with higher risk of bone injury. This may be an important consideration for female athletes because women are more likely to present with low BMD and have greater of bone injury as compared to males. Understanding the relationship between quadriceps strength, landing force, and BMD could help to identify modifiable indicators of BMD and provide an opportunity for improving bone health outcomes. To investigate the association between dominant limb quadriceps strength, peak landing force, and BMD among female, Division 1 NCAA athletes. Thirty-five female NCAA Division I athletes (ages: 20.4 ± 1.0 [18.9, 22.4]) participated. Quadriceps strength was measured as peak knee extension torque (N*m) was evaluated with an isokinetic dynamometer. Peak landing force (N) was measured as peak vertical ground reaction force with force platforms during a jump-landing. BMD (g/cm2) was measured using a Dual-energy X-ray Absorptiometry (DXA) whole-body scan. A correlation matrix was used to investigate the association between dominant limb quadriceps strength, peak landing force, and BMD. We identified a positive and moderate correlation between quadriceps strength and BMD ($r=0.421$, $P=0.006$) and a positive and weak correlation between peak landing force and BMD ($r=0.341$, $P=0.045$). No significant relationship was found between peak landing force and quadriceps strength ($r=0.199$, $P=0.251$). Biomechanical factors including quadriceps strength and peak landing force are related to BMD. Future studies may need to determine if modifying quadriceps strength and peak landing force can enhance BMD among this at-risk population.

REPORTED NUMBER OF POST CONCUSSION SYMPTOMS AND DURATION OF RECOVERY

Presenter(s): Arianna Paa, Giulia Castiglioni, Kate Ryan, Katie Koch, Shayna Menzer
Kinesiology
Mentor(s): Allie Tracey (College of Education)

The Sport Concussion Assessment Tool-5 (SCAT-5) is an instrument utilized in the evaluation of concussion in clinical and sideline settings and assesses the total number of symptoms an individual is experiencing as well as how severe these symptoms are. The purpose of this study was to determine the relationship between (1) total number of symptoms on the SCAT-5 at Day 0 and duration of concussion recovery and (2) symptom severity scores on the SCAT-5 at Day 0 and duration of recovery. A prospective cohort study of all NCAA divisions, club, intramural, and recreational college-aged athletes with a concussion was conducted. Participants completed demographic, medical history, and SCAT-5 at Day 0. Recovery information and the SCAT-5 were completed at the return-to-play (RTP) visit within 2 days of medical clearance. A Pearson correlation coefficient was computed to assess the relationship between total number of symptoms and symptom severity scores and duration of recovery. Sixty-two concussed college-aged athletes (mean age= 20.93, F=50%) were included. There was a moderately positive and significant correlation between total number of symptoms and duration of recovery ($r(60)= 0.32$, $p= 0.02$). Additionally, there was a weak positive correlation between symptom severity scores and duration of recovery ($r(60)= 0.19$) however, this was not significant ($p=0.18$). The results of this study suggest that while more symptoms reported at Day 0 influence a longer recovery, the severity of these symptoms do not. Future research should continue to explore components of the SCAT-5 which may predict the duration of concussion recovery.

EXAMINING THE DIFFERENCES IN FEMORAL SULCUS ANGLE BETWEEN LIMBS IN INDIVIDUALS FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Presenter(s): Kadra Balla
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Trochlea dysplasia is an effective indicator in evaluating early onset for osteoarthritis. Knee ultrasonography is an effective clinical tool in examining the changes in femoral sulcus angle that occur with trochlea dysplasia. There is limited knowledge of the extent of trochlea dysplasia in patients following ACLR. Therefore, the purpose of the study was to examine the femoral sulcus angle of ACLR patients 1-5 years following surgery. Fifteen participants (7 male and 8 female) ages 18-35 who had previously undergone ACLR were recruited. The ultrasound assessment occurred with the participants supine with their knee flexed to 140˚. Transverse ultrasound images of the femoral condyles were gathered from the involved and uninvolved limbs to evaluate the femoral sulcus angle. ImageJ was used to measure the angle between the apex of the medial and lateral femoral condyles and the lowest point of the intercondylar sulcus. Dependent t-tests were used to compare the femoral sulcus angle between ACLR and contralateral limbs. There was no significant difference found in femoral sulcus angle between the ACLR and contralateral limbs ($t=0.27$, $p=0.791$). No significant differences were found in femoral sulcus angle between the involved and uninvolved limbs. These findings may be due to the insufficient amount of time that is needed following ACLR for trochlea dysplasia to develop. Future research should look to examine the femoral sulcus angle in ACLR patients longitudinally.

BLOOD PRESSURE DIFFERENCES IN ELITE SHORT DISTANCE AND LONG DISTANCE SWIMMERS

Presenter(s): Ethan Weitzman, Hannah Penfold, Nabeeha Ali
Kinesiology
Mentor(s): Amy Boettcher (College of Education), Katharine Currie (College of Education)

Blood pressure (BP) is the pressure in blood vessels during the contraction [systolic BP (SBP)] and relaxation [diastolic BP (DBP)] phases of the heart. Seated BP and BP responses during exercise can give insight to an individuals' cardiovascular health. For example, a greater BP response to isometric handgrip (IHG) exercise may indicate an increased risk of developing cardiovascular disease. Athletes are typically viewed as having better cardiovascular health compared to non-athletes due to regular engagement in sport. The purpose of this study is to compare BP between two athlete groups (short distance (SD) and long distance (LD) swimmers) and a non-athlete control group. We will compare 1) seated SBP and DBP, and 2) the change in SBP and DBP during an IHG exercise bout. 21 non-athletes (52% male), 71 SD (59% male) and 20 LD (50% male) swimmers participated. BP was measured after a period of rest in the seated and supine positions and each minute throughout a 3-minute supine IHG contraction at 30% maximal voluntary contraction (MVC). Exercise BP was quantified as the change (Δ) in BP from supine to IHG for both SBP and DBP as (ΔBP= maxIHG BP-supineBP). One-way ANOVAs will be used to determine differences in seated BP and exercise BP between groups, with significance set at $P<0.05$. Results: Data analysis is ongoing. Seated BP will provide information about current cardiovascular health status while exercise BP may provide information about future risk. We anticipate both BP assessments will be better in the swimmers.

EXAMINATION OF PREVIOUS PSYCHIATRIC ILLNESS ON DAYS TO SYMPTOM RESOLUTION FOLLOWING A CONCUSSION

Presenter(s): Jack Dawson, Jenny Baer, Machus Turner, Sara Sherman, Wayne Jannette
Kinesiology
Mentor(s): Megan Loftin (College of Education)

Psychiatric illness, such as depression and anxiety, has been known to complicate recovery following a concussion and lead to prolonged recovery. However, there is still a need to explore this relationship in college aged individuals. Therefore, the purpose of this research was to examine a relationship between a previous diagnosis of a psychiatric illness and days to symptom resolution (DSR). College aged individuals were examined in a university laboratory setting within 5 days of a diagnosed concussion and following full medical clearance. Individuals completed demographics, injury and recovery information, and previous diagnosis of psychiatric illness. Linear regression was used to test if a previous diagnosis of psychiatric illness significantly predicted DSR. Seventy-five participants (48.0% female, 52.0% male, age=21.02+2.35, μ DSR =11.52+11.24 days) were included. 57 individuals (76.0%) reported no diagnosis of psychiatric illness with an average of 9.82+7.27 DSR and 18 individuals (24.0%) reported a diagnosed psychiatric illness with an average of 16.89+18.32 DSR. It was found that a previous diagnosis of psychiatric illness significantly predicted DSR ($\beta = 7.064$, $p = .019$). These results indicated that college aged individuals with a previous diagnosis of a psychiatric illness were likely to take longer to recover from a concussion. These results align with the previous research related to psychiatric illness and concussion recovery seen in youth athletes. Healthcare providers should be aware of an individual's mental health history as it is likely a risk factor for prolonged recovery and can be used to inform appropriate treatment of a concussion.

EVALUATING ECHO-INTENSITY OF THE FEMORAL SUBCHONDRAL BONE IN PATIENTS FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

Presenter(s): Saif Juma
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Knee osteoarthritis is a progressive musculoskeletal disease that can lead to severe disability within the adult population. Following anterior cruciate ligament reconstruction (ACLR), roughly half of the individuals with an ACLR will develop knee osteoarthritis within two decades. Knee ultrasonography is a non-invasive measure to detect changes in the femoral subchondral bone, however, ACLR effect on femoral subchondral bone composition is limited. Therefore, the purpose of this study was to evaluate echo-intensity of the femoral subchondral bone in individuals one-to-five years following ACLR. Fifteen participants (7 males, 8 females) aged 18-35 who have undergone ACLR were recruited. Participants were supine with their knees flexed at 140°. Transverse ultrasound images of the subchondral bone were taken in bilateral limbs. ImageJ was used to manually segment and assess the subchondral bone echo-intensity (i.e., brightness, 0 [i.e., dark] - 255 [i.e., white]) in two rectangular regions at the femoral intercondylar sulcus at a depth of 0-5 mm and 6-10 mm. Dependent t-tests were used to compare echo-intensity outcomes of the two depths between ACLR and contralateral limbs. Statistically significant differences were found at 0-5 mm between limbs for average echo-intensity ($t=-2.17$, $p=0.047$). However, the 6-10 mm region approached but was not significantly different between limbs ($t=-2.091$, $p=0.055$). There was significantly higher echo-intensity at the surface of the femoral subchondral bone (i.e., 0-5mm region) within the involved limb compared to the uninvolved limb. This increase in echo-intensity may indicate possible bone deterioration, however future research should examine increases in echo-intensity to the femoral subchondral bone longitudinally.

A COMPARISON OF ANTERIOR CRUCIATE LIGAMENT - RETURN TO SPORT AFTER INJURY (ACL-RIS) CONFIDENCE SUBSCALE SCORES OF INDIVIDUALS WITH ACL RECONSTRUCTION AND UNINJURED CONTROLS

Presenter(s): Charlotte Pohl, Emiko Oku
Kinesiology
Mentor(s): Francesca Genoese (College of Law), Matthew Harkey (College of Education)

Anterior cruciate ligament (ACL) tears are a sport-related injury that frequently require surgical intervention. The Anterior Cruciate Ligament Return to Sport After Injury (ACL-RSI) Scale measures psychological readiness to return to sport after ACL reconstruction (ACLR) and includes three subscales: Emotions, Confidence, and Risk Appraisal. Individuals with and without ACLR have reported poor total ACL-RSI scores; however, no literature has explored differences in ACL-RSI Confidence subscale scores. Decreased confidence may negatively impact sport performance and increase risk of injury among healthy individuals, as well as secondary ACL injury among individuals post-ACLR. The objective of this study was to explore differences in ACL-RSI Confidence scores between individuals with ACLR and uninjured controls. 20 individuals with ACLR (months since ACLR = 26.47±12.93; age = 21.45 ± 3.98 yr; 5 male) and 20 age and sex matched controls without ACLR (age = 21.3 ± 3.33 yr; 5 male) participated. Confidence was assessed with the ACL-RSI Confidence subscale. Confidence scores range from 0 - 100, where lower scores indicate decreased confidence in sport performance. Descriptive statistics (median [IQR]) were calculated for ACL-RSI Confidence scores and Mann-Whitney U Tests were used to compare Confidence scores between groups. A-priori ? was set at $p<0.05$. Individuals with ACLR reported lower ACL-RSI Confidence scores (68[17.5]) compared to uninjured controls (97[10]; $p < 0.001$). Individuals with ACLR exhibited lower ACL-RSI Confidence scores compared to uninjured individuals. These results provide normative ACL-RSI Confidence scores for rehabilitation specialists to use as a baseline when working with individuals post-ACLR.

THE INFLUENCE OF GENDER ON ACADEMIC ACCOMMODATIONS THROUGHOUT CONCUSSION RECOVERY IN STUDENTS

Presenter(s): Hope Koester, Matthew Sherry
Kinesiology
Mentor(s): Alyssa Pollard-Mcgrandy (College of Education)

Concussions can cause students' performance in the classroom to decline, therefore academic accommodations, such as extensions, may be needed. Furthermore, it is unknown how individual factors, such as gender, influence academic accommodations. Therefore, the purpose of this study was to determine the influence of gender on academic accommodations provided to students following concussion. A prospective study of students (18-30 years) diagnosed with concussion within 5 days of enrollment was conducted. Demographic, injury, and recovery information were completed at initial visit and at medical clearance. Chi-square analyses were used to assess associations between gender (identify as male/female), if academic accommodations were provided (yes/no), and if the student missed time from school (yes/no). Overall, 81 students (mean age=20.82 years, SD=1.58) were included. The sample was predominantly female (n=42, 51.9%), college juniors (n=18, 22.2%), and played a sport (n=72, 88.9%). Females had a significantly higher proportion of students who missed time from school compared to males (61.9% female, 33.3% male, X2=6.6, df=1, p=0.01). Additionally, females had a significantly higher proportion of students who received academic accommodations compared to males (57.1% female, 30.7% male, X2=5.7, df=1, p=0.017). Our results indicated that females represented a significantly higher proportion of students who missed time from school and received academic accommodations post-concussion. Future research should investigate reasons why female students received more academic accommodations compared to males.

THE INFLUENCE OF OBJECT PROPERTIES ON MANUAL EXPLORATORY BEHAVIORS IN INFANCY

Presenter(s): Emah Cassidy, Georgia Berger, Lina Heinzmann, Sabrina Badia
Kinesiology
Mentor(s): Jennifer Burns (College of Education), Mei Hua Lee (College of Education)

Infants explore objects in a number of ways including mouthing objects, banging toys together, and dropping food from their high chair. As development progresses, infants begin to explore objects to learn about their environment systematically. However, it is unknown how differing object properties influence infants' behavior when exploring objects. Therefore, the purpose of this study is to assess the effect of different object properties (size, shape, texture) on manual exploratory behavior in infancy. To address this, manual exploratory behaviors were observed longitudinally in infants ages six-to twelve- months of age. Video cameras captured participants' behaviors while they interacted with nine objects of varying size (2″ and 4″), texture (soft and hard), and shape (cube and ball). Reaching, grasping, and object manipulation behaviors were coded using Datavyu, an open-source behavior coding software. Object exploration was broadly categorized into actions involving the

fingers, wrist, or transportation of the object. Results showed that finger actions were most common across all age groups, followed by transportation activities. Object properties influenced how the toys were interacted with by the infant, as smaller objects afforded the ability to be transferred between hands. Age also influenced the infants' interaction with the objects with a greater variety of exploratory movements occurring with increased age. The information gained from this study can shed light on the developmental processes involved in object exploration during the first year of life, and also have clinical applications in early identification of children at risk for movement disorders.

EXAMINING THE DIFFERENCES IN PA LEVELS BETWEEN UNIFIED PARTNERS AND SPECIAL OLYMPIC ATHLETES AT THE 2022 SPECIAL OLYMPICS UNIFIED CUP SOCCER.

Presenter(s): Emma Anttila
Kinesiology
Mentor(s): Darice Brooks (College of Education), Janet Hauck (College of Education), Youngjun Lee (College of Education)

The goal of Special Olympics Unified Sports is to promote social inclusion for those with intellectual and developmental disabilities (IDD), in the context of sport1. This program joins those with IDD and those without IDD together to participate on one team with the same goal. Although this program has positive intentions, there are arguments that unified partners (those without disabilities) control game play and reduce the amount of participation by Special Olympics athletes. The purpose of this study is to examine differences in game play physical activity between unified partners and athletes during the Special Olympics Unified Cup. Participants included 89 male Special Olympic (SO) athletes (n=52) and male Unified Partners (n=37). Physical activity was tracked using Actigraph Accelerometers during each 60 minute game. Variables include minutes spent in light, moderate, moderate to vigorous (MVPA), vigorous and very vigorous physical activity based on validated cutpoints. ANCOVA (controlling for minutes of play) was used to examine differences in PA between groups. There was a statistically significant difference in vigorous [F (1, 252) = 11.801, p = .001] and very vigorous [F (1, 252) = 14.424, p < .001] PA, with SO athletes having more minutes of vigorous activity (9.63m vs 8.03m) and unified partners having more minutes of very vigorous activity (10.16m vs 8.60m). No differences were found for all other levels of PA. Results suggest that SO athletes contribute to game play equally compared to their unified partners, except for small differences in higher levels of PA.

EVALUATING ECHO-INTENSITY PIXEL DISTRIBUTION IN PATIENTS ONE-TO-FIVE YEARS FOLLOWING ANTERIOR-CRUCIATE LIGAMENT RECONSTRUCTION

Presenter(s): Natalie Blake
Kinesiology
Mentor(s): Matthew Harkey (College of Education)

Ultrasound echo-intensity is commonly measured as a mean value, however evaluating echo-intensity pixel distribution, or echo-intensity bands, is a novel

technique allowing further understanding of pixel distribution within an ultrasound image. Therefore, the purpose of our study was to evaluate the echo-intensity distribution between the involved and uninvolved limbs of patients 1 to 5 years following ACLR. Fifteen participants (7=males/8=females) ages 18-35 who have undergone ACLR were recruited. Participants were positioned supine with the knee at 30°. Panoramic ultrasound images of the rectus femoris were taken bilaterally at the participant's mid-thigh. ImageJ was used to manually segment the rectus femoris muscle cross-sectional area to assess the echo-intensity (i.e., brightness, 0 [i.e., dark] - 255 [i.e., white]). Our main outcomes were average echo-intensity, as well as the percentage of pixels falling into three echo-intensity bands (0-50, 51-100, 101-150). Dependent t-tests were used to compare echo-intensity outcomes between ACLR and contralateral limbs. There were no significant differences between limbs for the average echo-intensity ($t=0.70$, $p=0.25$) or the percentage of pixels in the 0-50 ($t=-0.22$, $p=0.42$), 51-100 ($t=-0.11$, $p=0.46$), and 101-150 ($t=1.21$, $p=0.12$) echo-intensity bands. However, there was a moderate effect size ($d=0.31$) in the difference between percentage of pixels in the 101-150 echo-intensity bands between groups. Though there were no significant findings for the echo-intensity outcomes, the moderate effect size indicates a larger percentage of pixels falling in the 101-150 echo-intensity band. This indicates a larger percentage of brighter pixels in the muscle, which may be related to greater intramuscular fat.

LEARNING A 'BAD' TECHNIQUE - HOW DO PRIOR MOVEMENT PATTERNS INFLUENCE RELEARNING OF NEW ONES?

Presenter(s): Allie Blackmore, Jeneia Dinglasan, Nabeeha Ali, Sky Payumo, Tim Earle
Kinesiology
Mentor(s): Brian Fox (College of Education), Rajiv Ranganathan (College of Education)

When learning to play sports or musical instruments, mentors often place a very high emphasis on developing the 'right' movement patterns, due to the belief that it is difficult to change 'bad' movement patterns once they are developed. However, how exactly do these prior movement patterns affect the development of new ones? Specifically, how does the amount of practice on the 'bad movement' pattern influence the ability to change to a new movement pattern? Here, we address this question in an experimental context where participants had to learn finger movement patterns to move a cursor to a specified group of targets. Participants learned one set of movement patterns for the task on the first day. On the second day, we switched the experiment so that the same task required a new set of finger movement patterns. Two groups will be tested - which manipulate the amount of practice on the first day. The 'short-practice' group will complete 4 sets (~250 trials) on Day 1, while the extended practice group will perform twice as many of the same protocol on Day 1. After a 24-hour break period, we examine how difficult it is to switch to new movement patterns. We anticipate that the extended practice group will show greater interference from their prior learned motor skill, and take longer to learn the new movement pattern. In the long term, such research will enhance our understanding of motor relearning and finding ways of 'breaking' these bad movement patterns, which is critical in neurorehabilitation.

IMMEDIATE MEMORY OR INITIAL CONCENTRATION SCORES ON LENGTH OF RECOVERY

Presenter(s): Pia Gandrothu
Kinesiology
Mentor(s): Allie Tracey (College of Education)

The purpose of the study was to determine if immediate memory and concentration scores on the SCAT-5 within 5 days of injury occuranceoccurrence predict the duration of concussion recovery and if history of psychiatric illness influence this. , and further see if psychiatric illnesses (e.g., depression, anxiety, ADD/ADHD) affect duration of concussion recovery. A prospective cohort study design of all NCAA athletic divisions, club, intramural, and recreational college-aged individuals with a concussion was conducted. Participants completed demographics information, medical history, and the SCAT-5 at the Day 0 visit (i.e., within 5 days of sustaining a concussion). The SCAT-5 was completed again, along with recovery information, at the return to play (RTP) visit. Simple and multiple linear regressions were conducted to determine if Day 0 immediate memory scores and concentration scores predicted duration of concussion recovery. Multiple linear regression was conducted to control for history of psychiatric illness in the model. Sixty-two concussed college-aged athletes (mean age= 20.93, F=50%) with a concussion were included. The linear regression models observed that Day 0 immediate memory scores ($R2= 0.036$, $F(1,51)= 1.912$, $p=0.173$) and concentration scores ($R2= 0.016$, $F(1,51)= 0.848$, $p=0.362$) did not significantly predict duration of recovery. When controlling for psychiatric illness, in the multiple regression model, the results remained insignificant for immediate memory ($R2= 0.089$, $F(3,49)= 1.597$, $p=0.112$) and concentration scores ($R2= 0.056$, $F(3,49)= 0.974$, $p=0.368$) predicting duration of recovery. These results suggest that iImmediate memory and concentration scores on the SCAT-5 at the initial visit, regardless of history of psychiatric illness, do not predict the length of concussion recovery.

DAY-TO-DAY RELIABILITY OF HEART RATE VARIABILITY FOLLOWING AN ACUTE BOUT OF RESISTANCE EXERCISE IN HEALTHY YOUNG FEMALES

Presenter(s): Allie Lumberg, Ethan Kaul
Kinesiology
Mentor(s): Katharine Currie (College of Education), Wesley Blumenburg (College of Education)

Heart Rate Variability (HRV) is a measure of the beat-to-beat changes in heart rate, which is modulated by the parasympathetic (i.e., rest and digest) and sympathetic (i.e., fight or flight) branches of the autonomic nervous system. Acute measures of HRV can give valuable insight into the autonomic control of the heart and identify possible underlying disease risk. In athletes, a single bout of resistance exercise (RE) has been shown to decrease HRV which indicates increased sympathetic activity and a stressed state, and these acute HRV responses have demonstrated day-to-day reliability. Presently there is insufficient literature examining HRV following RE, and its' reliability in untrained females. The primary aim is to determine if HRV following a single bout of RE demonstrates substantial day-to-day reliability in young healthy untrained females. A secondary aim is to explore how HRV changes following

RE. Ten non-resistance trained females (23±3yrs) participated in two, 60-min full body RE sessions on separate days. During each session, individuals were fitted with a single-lead electrocardiograph, and HRV was measured for 2-min at baseline (pre-RE) and at 30-min post-exercise (post-RE). Test-retest reliability of pre- and post-RE HRV values from the two sessions will be assessed using coefficient of variation and intraclass correlation coefficient (ICC); an ICC >0.60 will be considered as substantial reliability. Data are currently being analyzed. We predict that our data will show HRV of healthy untrained females have substantial day-to-day reliability both before and after a single bout of RE.

THE EFFECT OF AN EARLY LIFE INTERVENTION ON SKELETAL MUSCLE CALCIUM REGULATION

Presenter(s): Julian Ananyev, Katie Bobzin
Kinesiology
Mentor(s): Eric Leszczynski (College of Agriculture & Natural Resources)

Proper calcium regulation during skeletal muscle contractions is essential to engage in physical activity. As physical activity engagement significantly reduces incidence of chronic disease, determining regulators of physical activity engagement could elucidate therapeutic targets in populations at risk for sedentary behavior. Therefore, we exposed growth-restricted mice to an early life physical activity intervention and examined the abundance of calcium handling proteins (Calsequestrin 1 and Annexin A6) in the soleus muscle to determine the effect of an early life intervention designed to improve skeletal muscle growth on skeletal muscle function via calcium regulation. Mice growth-restricted in early life were exposed to an physical activity intervention in early life, or remained a sedentary control. Soleus samples were then collected from mice in adulthood, homogenized, and analyzed via Western Blot analysis targeting Calsequestrin 1 and Annexin A6 abundance.

LEARNED BALANCE IN FORMER GYMNASTS

Presenter(s): Makayla Hart, Nikhita Sharma
Kinesiology
Mentor(s): Florian Kagerer (College of Education), Simon Cone (College of Education)

The purpose of this study was to better understand the body's ability to learn motor control. We investigated a subject's learned balance response through two types of equipment; motion capture technology and the stabilometer balance platform (Lafayette Instruments Inc.). The motion capture technology involves video recording, electromyography (EMG) to measure lower body muscle use, and motion capture cameras to measure joint positions of the whole body. Through five sessions, with 15 trials each session, we were able to investigate how a person that has had previous experience with the sport of gymnastics was able to learn a new motor skill. We focused on the ability the subject had to stabilize themselves on the balance platform, which was defined as the ability to keep the platform in the center, within 3° of the left and right. This study aimed to determine if the participant had an increased ability to learn a new motor skill due to their background in the sport of gymnastics. Previous research suggests that subjects with experience in gymnastics were superior in balance to all other groups of subjects. We hypothesize that those with previous gymnastics experience will not only be superior in balance but will also possess a faster ability to learn how to balance on the platform.

IDENTIFYING WHO ATTENDS THE MICHIGAN STATE ADAPTIVE SPORTS AND RECREATION CLUB AND UNDERSTANDING HOW THE CLUB BENEFITS THEM

Presenter(s): Joan Rissman, Monique Karoub, Parker Pilat
Kinesiology
Mentor(s): Darice Brooks (College of Education)

Adapted sports and recreation is an environment that allows people with disabilities (PwD) to be active and create a social community that is uplifting and motivating. The Michigan State University Adapted Sport and Recreation Club (MSU-ASRC) offers an array of sports and recreational opportunities for PwD in the Greater Lansing area. Due to the lack of research regarding adapted sports and recreation, minimal knowledge is known about who these programs serve and how these opportunities impact their lives. To gain insight into the lives of PwD and their experiences in the adapted sport community, a qualitative study was conducted within the MSU-ASRC. The purpose of this study was to identify the population predominantly attending the MSU-ASRC practices, as well as to understand their personal experiences as a member. Thirteen athletes (males = 8, Mage = 33.5±12.66) participated in this study. After completing a demographic survey and a nine-question interview, researchers found that the program serves african-american and caucasian individuals with acquired and congenital physical disabilities (i.e: cerebral palsy and TBI) from not only the Lansing but nearby communities too. Through analyzing and coding the interviews, researchers observed two common themes among the athletes; many reported an increase in physical wellness as a result of attending the club's weekly practices. In addition to providing an opportunity for this community to become physically active, this program created a positive and motivating environment that allows for a great deal of social interaction among its members, many of whom have reported lasting benefits.

FANS' PERCEPTIONS OF THE COMPATIBILITY BETWEEN PICKLEBALL AND TENNIS: FROM A PERCEIVED FIT AND BRAND EXTENSION PERSPECTIVE

Presenter(s): Vineet Kumar
Kinesiology
Mentor(s): Jennifer Roth (College of Education), Sang Hoon Kim (College of Education)

The rapid rise of pickleball's popularity in the last decade has raised concerns about its place in the tennis area. In this regard, public and private clubs offer pickleball programs and build pickleball courts in place of tennis courts, which generate complaints from tennis enthusiasts. There is also a growing trend among organizations and clubs to develop new business strategies to integrate the two sports. However, there has been little agreement on conflicted issues between the two sports, and there is also little information about how individuals perceive the two sports and their compatibility. The purpose of this study is to examine fans' and participants' perceptions and future behavioral intentions regarding the compatibility of tennis and pickleball. To accomplish the purpose of this study, this study employs a perceived fit (Speed & Thompson, 2000) and brand extension approach (Spittle, et al., 2012) as a research backbone to (1) determine fans' and participants' perceptions of each sport and of the compatibility of the two sports and (2) investigate the relationship between their perceptions and their future behavior. A survey has been developed based on perceived fit and brand extension research, and data is currently being collected expecting to present the result at the presentation. This study will provide some valuable insights regarding the perception of tennis and pickleball as well as their compatibility. It is also expected that the findings of this study will provide some important insights into the practical field to develop better strategies to coexist tennis and pickleball.

SUMMER COACHES SCHOOL 2022: AN EVALUATION OF KNOWLEDGE, SKILL, AND AFFECTIVE OUTCOMES IN YOUTH SPORT COACHES

Presenter(s): Paige Eno
Kinesiology
Mentor(s): Alysha Matthews (College of Education), Lauren Secaras (College of Education)

Michigan State University's (MSU) annual Summer Coaches School (SCS) provides coaches a formal coach education program. The research team conducted a needs assessment during SCS 2021 and feedback facilitated the development of learning objectives for SCS 2022 to support positive athlete development. The purpose of this study was to evaluate the effectiveness of the 2022 program. This mixed-methods longitudinal study used surveys and interviews measuring knowledge, skills, and affective outcomes. Quantitative surveys were employed at the time of the program (n=20) and three month follow up (n=17), including open-ended questions about the program experience. Six months following the program, six coaches were interviewed. The data was analyzed using SPSS and a deductive coding process. The findings show increased levels in self-knowledge, sense of community, and sport confidence as well as an increase in understanding of coaching skills compared to pre-test data. But after three months confidence and sense of community decreased. Open-ended survey questions suggested coaches recalled content from the program. Specifically, coaches identified four techniques used to connect the SCS content to their coaching: planning, building relationships, supporting, and engaging with athletes. However, identifying the implementation of skills to coaching practices was not mentioned. This study demonstrates how coaches' affect, skills, and knowledge fluctuate post SCS. Future SCS programming can address coaches' feedback by managing the challenges that were found with implementing skills into coaches' sport contexts. Continued community engagement projects should be conducted to offer insight for organizations in designing or progressing their coach education programs.

GAZE CHARACTERISTICS DURING BIMANUAL REACHING III

Presenter(s): Alaina Roush, Kelley Titus, Kelsey Ureel, Sevak Thirunavukkarasu
Kinesiology
Mentor(s): Florian Kagerer (College of Education)

Using an exploratory study, we studied the relationship between eye movements with hand movements via a bimanual joystick task in college-aged participants. Eye movements were recorded via a screen-mounted Tobii eye tracker (Fusion Pro, sampling rate 120 Hz. The joysticks were placed on a table in front of the participants, 16 cm apart from one another, and controlled two cursors on the monitor (sampling rate 60 Hz) in front of the participants whose head was stabilized through a chin rest. Targets were located 7.5 cm away from each hand's starting position. The experiment consisted of three conditions: 1) Baseline condition, with targets located at 90 degrees with respect to the starting position, 5 blocks of 10 trials each: Both hands visible, only right hand visible, only left hand visible, both hands visible, but with lateral error gain increased in either the left or the right hand. 2) Bi-directional targets, located at either 40 degrees or 140 degrees in which both hands move in the same direction as one another. In this condition, there were three blocks of 20 trials each: both cursors visible, only the left cursor visible, or only the right cursor visible. 3) Bi-directional targets, again at 40 or 140 degrees, but placed in a mirror fashion so that participants have to move the hands (and cursors) in opposite directions. There were 20 trials with both cursors visible, 20 trials with the right cursor visible, and 20 trials with the left cursor visible.

GAZE CHARACTERISTICS DURING BIMANUAL REACHING I

Presenter(s): Anita Kompalli, Colin Koot, Megan Fuller, Sara Bauer
Kinesiology
Mentor(s): Florian Kagerer (College of Education)

Objective: Through an exploratory study, we investigated characteristics of eye movements and gaze characteristics during bimanual hand movements. Participants: 11 college-aged students. Apparatus: screen-mounted Tobii eye tracker, 120Hz sampling rate. Task: two joysticks controlling a cursor for each hand; sampling rate 60 Hz; two starting positions (16cm apart); 3 conditions: 1) 2 targets at 90 degrees with respect to the home positions (total of 50 trials); 2) 2 targets at either 40 degrees or 140 degrees with respect to home positions (isodirectional condition, 60 trials); 2 targets at these angles, but mirroring each other (aniso-directional condition, 60 trials); movement amplitude: 7.5 cm. Primary variable of interest: gaze duration with respect to each hand. Predictions: We expect to see eye movement shift towards the dominant hand when both cursors are visible in all 3 conditions. When the targets are at an angle, we predict eye movement to move between both hands but gravitate towards the dominant hand. When only one cursor is visible, we predict eye movement to shift toward the side that is visible to the participant.

YOUTH ATHLETE PERCEPTIONS OF COACHING BEHAVIORS AND THEIR INFLUENCE ON BASIC PSYCHOLOGICAL NEEDS AND MOTIVATIONAL OUTCOMES

Presenter(s): Ben Blessing
Kinesiology
Mentor(s): Meredith Wekesser (College of Education)

Many of the social and cognitive developments associated with youth sport participation have a relationship to the three basic psychological needs outlined in self-determination theory; these needs are competence, relatedness, and autonomy. Participating in sports can help youth to fulfill these basic psychological needs and promote social and cognitive development, given a facilitative social environment. Thus, the responsibility of cultivating such an environment can largely be attributed to the youth sports coach, and the coach-created motivational climate. The purpose of this study is to investigate how coaching behaviors influence motivational climates in youth sport. This study aims to address the following questions: 1) Do competence-supportive coach behaviors predict mastery-oriented motivational climates? 2) Do competence-thwarting coach behaviors predict performance-oriented motivational climates? Survey data were collected from 330 youth athletes between the ages of 9 to 14. Two simple linear regressions were run in SPSS software. Results demonstrated that competence-supportive coach behaviors significantly predicted coach-created mastery climates ($R2 = .34$, $F(1,288) = 146.14$, $p < .001$). Further, competence-thwarting coach behaviors significantly predicted coach-created performance climates ($R2 = .08$, $F(1,291) = 26.19$, $p < .001$). These findings may have significant implications for youth athletes in better understanding the nature of coach-athlete behavioral interactions and their effects on athletes' motivations for sport.

GAZE CHARACTERISTICS DURING BIMANUAL REACHING II

Presenter(s): Amy Liu, Anja Olsen, Ben Potts, Meagan Rockafellow
Kinesiology
Mentor(s): Florian Kagerer (College of Education)

This study explores characteristics of eye movements during bimanual movements. We used a screen-mounted eye tracker (Tobii Fusion Pro, sampling rate 120 Hz), to record eye movements, while participants controlled two cursors with two joysticks (sampling rate 60 Hz). The joysticks were table-mounted, with a cover blocking the participant's view of their hand movements; participants' heads were stabilized with a chin rest. They were required to use the joysticks to move the cursors in one swift motion from the starting positions to the targets. During the baseline condition, the targets appeared at 90 degrees; there were five blocks of ten trials each: both hands visible, only right hand visible, only left hand visible, both visible with increased lateral error gain either for the right or the left hand. The second condition consisted of isodirectional movements where the targets were located at either 40 or 140 degrees; there were three blocks of 20 trials each: both hands visible, only right hand visible, and only left visible. A third condition was nearly identical to the previous set of trials, the only change being the targets being positioned in opposite directions, so that the cursors had to be moved anisodirectionally. We predicted that participants preferentially look at their dominant hand when both cursors are visible. In conditions where only one cursor was visible, preference would shift to this cursor. Similarly, when the error gain was increased in one hand, participants would tend to look more at that hand.

LINGUISTICS, LANGUAGES & SPEECH

HEARING THE VOICES OF CHILDREN : UNCOVERING THEIR DESIRED GOALS IN STUTTERING THERAPY

Presenter(s): Madelyn Holmes
Linguistics, Languages & Speech
Mentor(s): Bridget Walsh (College of Communication Arts Sciences)

Evidence-based practice in speech-language pathology suggests that speech therapists should work with clients to develop specific and relevant communication goals to ensure that therapy approaches are tailored to meet individuals' unique needs. Achieving therapy goals can improve self-confidence, communication skills, and overall quality of life for those who stutter. Additionally, having client input in goal setting can boost motivation and provide a sense of accomplishment, leading to increased commitment to therapy and ultimately, better outcomes. Nevertheless, many adults who stutter harbor negative recollections and feelings toward the therapy they received as youth. The aim of this study was to gain children's perspectives on their speech therapy goals for stuttering. We sent online Qualtrics surveys to 39 children aged 9-18 years asking them to share opinions about their speech therapy including their goals across four themes: "Communication," "Speech," "Self-Advocacy and Bullying," and "Thoughts and Feelings." We analyzed the alignment between the goals children reported they are currently working on in therapy and the goals they would like to work on in therapy. The top two reported goals were "To develop confidence when I talk" and "To learn how to be a good communicator even if I stutter." Goals from the themes "Thoughts and Feelings" and "Communication" were selected by the most children as both a goal they are currently working on and desire to work on. These findings highlight the goals that are important to children who stutter and have implications for more efficacious treatment approaches.

TOXICITY IN LEAGUE OF LEGENDS: AN INSIDE LOOK AT COMPETITIVE INSULTING

Presenter(s): Whitney Kuta
Linguistics, Languages & Speech
Mentor(s): Betsy Sneller (College of Arts & Letters)

From the Olympics to modern-day professional sports, insults and taboo language have found a home in competitive culture. How, though, has this practice continued into the modern day? Background on the reasons behind and responses to insults will be analyzed and brought into the digital world through the lens of one of the world's most popular eSports: League of Legends. The community has grown over the years not only in number, but also in its reputation for toxic insults between players. From match to match in this five-on-five competitive game, players are commonly known to "flame"; a term for verbal harassment relating to mediocre performance in the game. A wide variety of insult styles, types, and manners will be brought to center stage and walked through with real segments of in-game text chat. Screenshots of toxic behavior from live games and pre-game lobbies among players will be examined through line-by-line breakdowns and sorted into categories of insult, such as dehumanization (reducing someone to something less than human, such as an animal), denying physical capabilities (e.g., calling someone "blind"), denying mental capabilities (insulting someone's mental capacity or assumed lack thereof), and lastly taboo (vulgarities). Through the years, new slang has come and gone for this ever-popular community, and as such, game-centric or community-centric language will be explained on an example-by-example basis.

STORIES OF IDENTITY: ETHNIC IDENTITY AND HERITAGE LANGUAGE LEARNING

Presenter(s): Mikayla Thompson
Linguistics, Languages & Speech
Mentor(s): Suzanne Wagner (College of Arts & Letters), Yongqing Ye (College of Arts & Letters)

Throughout history, colonial powers across the globe have encouraged the degradation of numerous minority languages, leaving millions of people without a connection to their ancestral cultures, land, and languages. Many families have forgone their heritage languages in exchange for assimilating to speak larger majority languages. My own relative disconnection from my culture and community has largely informed my own motivations to learn my language, so I look to explore the extent to which the degree of connection, or lack thereof, impacts someone's motivation to learn their heritage language. Indigenous communities have maintained their teachings through storytelling as a primary method of knowledge transfer. Despite the long-standing tradition of storytelling as methodology, oftentimes we forget the importance of such qualitative data. Utilizing Indigenous practices of knowledge gathering and sharing, as well as nurturing a reciprocal dialogue between the researcher and subject, I intend to honor this Indigenous method by sharing peoples' personal narratives surrounding the issue of identity and heritage language learning. From a survey of 20 questions, I look to construct this dialogue with three people, all of varying ethnic backgrounds; detailing their unique ideas of identity, their connections with their communities, and their individual sentiments surrounding their heritage languages.

"TELL ME." VS "COULD YOU TELL ME?": OBLIGATORY FORCE IN DIARY PROMPTS

Presenter(s): Newt Kelbley
Linguistics, Languages & Speech
Mentor(s): Suzanne Wagner (College of Arts & Letters), Yongqing Ye (College of Arts & Letters)

The way requests are phrased can oblige people to feel varying levels of pressure to respond. Obligatory force can be communicated using imperative verbs (e.g. "Start the test now") or modal verbs (e.g."You can/should/must start the test now"), among other strategies. I will test whether the presence of a modal verb in a request to tell a story primes a longer written response than the same request with an imperative verb. In this study, Amazon Turk respondents (age 18+, US English-speaking) were randomly assigned prompts in one of two conditions (Imperative, Modal) and asked to record their response, as in (1): (1a) [Imperative] Have you ever been to a movie theater? Tell me about the experience. or (1b) [Modal] Have you ever been to a movie theater? Could you tell me about the experience? I hypothesized that the questions with modals (1b) would receive longer responses on average. This is because (1b) has lesser obligatory force, motivating respondents to preserving their positive self-identity by responding at length. The results did not show the hypothesized effect, so I cannot say anything conclusive about the effect of obligatory force through the Amazon Turk survey format. I will discuss some shortcomings of the method, and directions for future work.

MULTILINGUAL PROJECT

Presenter(s): Amber McAddley
Linguistics, Languages & Speech
Mentor(s): Meagan Driver (College of Arts & Letters)

The progressive research being conducted is a creative exploration that spearheads an initiative through the multilingual lab. In order to support intercultural communication and a more inclusive campus environment, it was important that the participants were individuals that engage in more than one language on a daily basis. Voluntary members including students and faculty of the local community took part in conversations that happened either in-person or virtually. This process followed a recording protocol to collect voice memos of welcome messages to campus in languages from all over the world. These findings will later be organized during the final stages for public dissemination. The project aims to 1) increase support and visibility of multilingualism on campus, 2) increase awareness on campus of multilingual and multicultural groups on and off campus, and 3) connect members of different language and cultural identities and interests with each other. Occurring naturally, interactions in the world emphasize and dissect the depths and unique components of multilingual communication. In hopes of encouraging diversity and inclusion, the project is continuously working towards sustainable resources that are readily accessible to students like common places for cultures to connect and engage with one another, for instance. The presentation will outline the investigative tasks, as well as provide a preview of what is to be distributed around campus at the beginning of the Fall 2023 semester. Additionally, it will focus on promoting and developing communities for groups that are underrepresented, so other researchers will be highly advised to collaborate.

HOW TO SPEAK MICHIGANDER: EVALUATING THE ACCURACY OF SPEAKERS' SELF-PERCEPTION OF THEIR OWN ACCENT

Presenter(s): Caroline Zackerman
Linguistics, Languages & Speech
Mentor(s): Betsy Sneller (College of Arts & Letters)

Metalinguistic commentary is when speakers talk about and reflect on how they talk. Most speakers have opinions about their speech and assign social meaning to certain pronunciations. However, Labov (2001) found that speakers are not always highly accurate when describing how they talk. In this study, I ask Michiganders across the state to describe their own speech. Following the common folk linguistic perception of Michigan English, I predict that many Michiganders will describe their speech as sounding "nasally." The accuracy of this perception is debated and potentially undergoing a change. While Plichta (2004) argued that Michigan English has higher degrees of nasality than other dialects, Ye (2022) found that nasalization is decreasing for younger speakers of Michigan English. In order to evaluate social perceptions of Michigan English, I will collect 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. Participants will be asked if their accent has been identified as being from Michigan, and what kind of features they associate with a Michigan accent. I will analyze participants' responses to see how consistent answers are for different speakers. I will also conduct acoustic analysis to determine the degree of nasality in the recorded speech, which will be compared to the metalinguistic descriptions provided. Taken together, the results of these analyses will allow us to assess Michiganders' social perceptions of their own speech, as well as the accuracy of these perceptions.

UNDERSTANDING THE ROLE OF LITERACY IN SEMANTIC PREDICTION

Presenter(s): Pamela Calderon
Linguistics, Languages & Speech
Mentor(s): Brittany Finch (College of Arts & Letters), Paula Winke (College of Arts & Letters)

Amongst a multitude of other skills, literacy can have deep effects on language and memory, which can strengthen the brain's ability to make predictions (Huettig & Pickering, 2019), as one reads and listens (Altmann & Kamide, 1999) following the principles of Hebbian plasticity, leading to improved comprehension and processing speed (Altmann & Mirkovi?, 2009). However, despite its importance, the effects of literacy on prediction have been severely under-researched (Huettig et al., 2011; Mishra et al., 2012). This study aims to add to the pool of data by focusing on low and high literate adult English speakers. This study applies the visual-world paradigm through two sets of audio stimuli that counterbalance each other and four visual images on screen. Constraining sentences (Mary eats a cake), where the verb is semantically related to only one of the four images, will allow us to track the eye movements of the subject and determine whether or not they can predict the object to which the sentence refers. Neutral sentences (Mary sees a plane), where the verb could apply to any of the four images, will act as a control. Subject's data will then be analyzed and compared to their literacy levels and years of formal education. Results will discuss monolingual language processing, the effect of literacy levels on the brain's ability to make predictions, and the possible explanations for these findings.

SENSORIMOTOR SYNCHRONIZATION IN ADULTS WHO DO AND DO NOT STUTTER

Presenter(s): Bailey Rann, Frank Dolecki
Linguistics, Languages & Speech
Mentor(s): J McAuley (College of Social Science), Toni Smith (College of Social Science)

A recent line of work by Chang et al. (2016) evaluated children who stutter (CWS) and their ability to make same/different judgements about auditory rhythms. It was found that CWS had a more difficult time making same/different judgments compared to controls. Another line of work by Garnett et al. (2023) examined adults who stutter (AWS) and their performance on a similar rhythm discrimination task. Results showed that AWS had a poorer performance on rhythm discrimination tasks with complex (but not simple) rhythms in comparison to controls. Findings from both studies support an internal beat deficit hypothesis which suggests that people who stutter have difficulty generating an internal beat, which makes producing fluent speech without an external pacing signal (e.g. a metronome) difficult. Our current research entails comparing AWS and adults who do not stutter. We asked participants to synchronize their tapping to tones and continue tapping in synchrony after the tones stop. This forces participants to maintain an internal beat. Controls and AWS were presented to a range of tempos from 506ms to 1,709ms. This range of tempos includes slower rates which will require participants to mentally subdivide to maintain the target tempo. We hypothesize that AWS will show difficulty synchronizing when presented with tapping tasks that force them to mentally subdivide at slower rates with and without the presence of tones. Results will be discussed in terms of internal beat deficit hypothesis.

MICROBIOLOGY, IMMUNOLOGY & INFECTIOUS DISEASE

INVESTIGATING POTENTIAL PRECURSOR MOLECULES IN THE BIOSYNTHESIS OF TETRODOTOXIN IN NEWT-ASSOCIATED BACTERIA

Presenter(s): Faheed Shafau, Fernanda Lopez Bermejo
Microbiology, Immunology & Infectious Disease
Mentor(s): Heather Eisthen (College of Natural Science)

Tetrodotoxin (TTX) is a potent neurotoxin found in organisms such as pufferfish, mollusks, and some amphibians. TTX blocks voltage-gated sodium channels, preventing action potentials and thereby causing paralysis. Little is known about how TTX is synthesized, and no genes involved in synthesizing this molecule have been identified. The Eisthen lab discovered that TTX-producing bacteria can be isolated from the skin on rough-skinned newts (Taricha granulosa), and we are using strains of these bacteria to identify possible precursors in the TTX biosynthesis pathway. Previous researchers have suggested that arginine is a potential TTX precursor because both arginine and TTX contain a guanidinium group, an unusual molecular structure, and because arginine serves as a precursor for other guanidinium-containing toxins. However, before we test whether arginine contributes to TTX synthesis we must determine how it affects baseline growth of these strains. We measured growth patterns in 3 replicates of both Pseudomonas and Aeromonas strains in media supplemented with both L- and D-arginine, as both forms of the amino acid may be available to the bacteria in the environment on the newts' skin. We are currently repeating this experiment with L- and D-histidine supplemented media as a negative control, as histidine is positively charged like arginine, but lacks the guanidinium group that is hypothesized to enable TTX synthesis. After quantifying the effect of these amino acids on bacterial growth, we will assess the effect of amino acid supplementation on TTX production using LC-MS/MS to determine if TTX production is increased by supplementation of arginine.

IDENTIFYING ATP-INSENSITIVE AVCD MUTANTS

Presenter(s): Aubree Muethel
Microbiology, Immunology & 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 V. 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 while AvcI (AvcD Inhibitor) is a small regulatory RNA that inhibits deamination. During infection AvcI is lost, releasing AvcD to deplete dCTP pools starving phages of nucleotides necessary for replication. There are two domains present in AvcD, a C-terminal deoxycytidylate deaminase (DCD) domain and an N-terminal P-loop NTPase (PLN) of unknown function. Purified AvcD was found to be inhibited by high concentrations of ATP while AvcD expressed in E. coli did not exhibit toxicity until the stationary phase when cellular energy levels decline. We hypothesize that AvcD deaminase activity is regulated by the cell's energy state through ATP binding to the PLN domain. Our goal is to identify ATP-insensitive AvcD mutants exhibiting growth arrest in the exponential phase consistent with activity in the presence of high ATP levels. Identified mutant enzymes are expressed and characterized by dCTP deamination assay in the presence and absence of ATP. Assessing mutations in the domains of AvcD will further understanding of phage defense by AvcID toxin-antitoxin systems necessary for effective use of phages as therapeutics.

EXAMINING PERSISTENCE OF CORONAVIRUS IN SEPTAGE

Presenter(s): Emily Zak
Microbiology, Immunology & Infectious Disease
Mentor(s): Matthew Flood (College of Agriculture & Natural Resources)

The COVID-19 pandemic has threatened the health of millions of people worldwide in the last 3 years. Throughout the pandemic, participating labs across the state of Michigan have been monitoring SARS-CoV-2 levels in wastewater. These samples were found to reflect trends true to the reported cases with some early warning, with a way to include asymptomatic cases that otherwise would not have been reported. However, approximately 35% of Michigan's population uses septic tanks in mostly rural communities and have not been included in the wastewater surveillance. As the pandemic continues there is less testing but there is still a need to keep track of reported cases. The goal of this study was to understand how long the virus signal could last in septage. This observational study examined the degradation of spiked OC43 virus signal in 7 different septage samples over a span of 70 days. Samples were tested at both room temperature (~22°C) and 4°C. Preliminary results show that over a 2 month period, virus levels in samples kept at room temperature degraded an average of approximately 2 log gene copies per liter of sample. There is not yet a significant difference seen in virus concentrations in samples kept refrigerated over the same period of time, suggesting that coronavirus persists for a much longer period in samples kept in a colder environment.

EFFECTS OF MICROBES IN THE FORMATION OF SERPCARBONATES

Presenter(s): Alli Elkins
Microbiology, Immunology & Infectious Disease
Mentor(s): Matthew Schrenk (College of Natural Science)

Serpcarbonates are a type of rock that have been found at the Tablelands Ophiolite ultrabasic serpentinite springs located in Canada. At these springs it has been found that the fluids that are seeping out of land has a pH of 12 and creating what is called "fluff". Within our research we plan to indicate if the microbes that are present in the serpcarbonate rock are also present in the fluff. We hope to discover that these microbes that are present in the fluff are also contained within the serpcarbonates are aiding in the creation of the rocks by taking carbon from the air.

ANALYSIS OF KNOCKOUT MACROPHAGE LIBRARY TO DETERMINE THE IMPACTS OF ANTIBIOTICS ON INTRACELLULAR KILLING MECHANISMS OF MYCOBACTERIUM ABSCESSUS

Presenter(s): Olivia Beckman
Microbiology, Immunology & Infectious Disease
Mentor(s): Andrew Olive (College of Osteopathic Medicine), 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. Mab presents a challenge clinically during infections as it is extremely resistant to antibiotic therapy. Thus, new strategies to target and kill Mab are a critical need. To identify new therapeutic targets that might aid infected patients, we are examining whether host genes may be targeted to increase antibiotic efficacy against Mab that is replicating within macrophages. To identify macrophage genes that may contribute to antibiotic mediated killing of Mab, we conducted a genetic screen using a genome-wide knockout library. We enriched for knockout macrophages that enhanced or inhibited antibiotic-mediated killing of Mab against two key drugs: Bedaqualine and Linezolid. To aid these studies, I first determined the minimum inhibitory concentration for Bedaqualine against Mab in a liquid broth culture and am now dissecting changes in antibiotic efficacy during Mab infection of wild type macrophages. Follow-up studies are now being conducted to validate candidate genes from the screen and to determine if knockout macrophages have altered minimum inhibitory concentrations compared to wild type cells. The goal is to better understand how the host environment alters intracellular killing of Mab by distinct antibiotics to find new mechanisms or pathways that can be targeted to improve drug therapies during Mab infection.

HIGH THROUGHPUT TRANSPOSON MUTAGENESIS TO IDENTIFY GENES REQUIRED FOR DESICCATION TOLERANCE IN CARBAPENEM-RESISTANT ENTEROBACTER

Presenter(s): Dylan Luce
Microbiology, Immunology & Infectious Disease
Mentor(s): Beth Ottosen (College of Natural Science), Victor DiRita (College of Veterinary Medicine)

Enterobacter hormaechei is a Gram-negative, opportunistic pathogen that is ubiquitous in the environment and a common member of the gastrointestinal microbiota. Carbapenem-resistant Enterobacter pose a serious threat to human health due to increasing levels of antibiotic resistance, therefore requiring new methods of fighting infections. Frequently the cause of hospital associated infections, E. hormaechei can be transmitted between patients through contaminated hospital surfaces. To survive on fomites, it must overcome the stress of desiccation as well as treatment with disinfectants. We demonstrated that Enterobacter remains viable after up to 140 days of desiccation, significantly longer than a non-pathogenic laboratory strain of Escherichia coli. This suggests that persistence on hospital surfaces could facilitate Enterobacter transmission between patients. To control for outside variables impacting our results, we developed a desiccation chamber to stabilize humidity using Drierite desiccant and investigated the best methods of resuspending desiccated E. hormaechei cells. We will build on our preliminary results by screening a transposon mutant library of E. hormaechei to identify mutants unable to resist desiccation like wild type. Our mutagenesis approach (TnSeq) allows rapid identification of genes essential for desiccation resistance of E. hormaechei. This work has the potential for identifying novel targets to fight the spread of clinical infections and improve decontamination strategies in hospital settings.

3D PASSIVE SAMPLING FOR SARS-COV-2 DETECTION IN WASTEWATER

Presenter(s): Corrine Caponigro
Microbiology, Immunology & Infectious Disease
Mentor(s): Joan Rose (College of Agriculture & Natural Resources)

New sampling methods are being explored for wastewater surveillance as the rise of SARS-CoV-2 has expanded. Automatic sampling methods are typically utilized in surveillance monitoring, but many challenges such as high costs and prolonged sampling and processing times are associated with these automated instruments. To aid in these issues, passive sampling methods have been explored. This study compared detection limits of the SARS-CoV-2 pathogen among two sampling types: autosampler composites and 3D passive samplers. Forty-three wastewater samples were evaluated across 6 sewer sites (3 community and 3 dormitory) serving populations of 492-10,092 on the campus of Michigan State University. Autosampler composites were processed using polyethylene glycol (PEG) and the passives used a bead beating method. From the processed samples, viral RNA was extracted, and N1/N2 genes were quantified with digital droplet polymerase chain reaction (ddPCR). Each sampler detected levels of N1/N2 (5.4x101-1.61x104 gene copies/filter for passives and 3.84x102-3.83x104 gene copies/100 mL for composites). Autosampler composites detected higher concentrations than passive samplers; however, similar trends were observed using both methods. With similar trends, passive samplers can be employed as a cost-effective sampling approach to monitor population trends of SARS-CoV-2.

INVESTIGATION OF ANTIBIOTIC RESISTANCE AND VIRULENCE GENES USING WHOLE-GENOME SEQUENCING OF HUMAN SHIGA TOXIN-PRODUCING ESCHERICHIA COLI ISOLATES FROM WYOMING, 2002-2020

Presenter(s): Bailey Bowcutt
Microbiology, Immunology & Infectious Disease
Mentor(s): Shannon Manning (College of Natural Science)

Shiga toxin-producing Escherichia coli (STEC) are linked to ~265,000 illnesses per year in the United States. STEC infections can cause enteric symptoms and, in some cases, hemolytic uremic syndrome (HUS), especially in vulnerable populations like children under 5 years of age and the elderly. Unlike with other enteric infections, antibiotic treatment is not recommended because it is associated with increased risk of HUS. Antibiotics can enhance the production of Shiga toxins by stressing the bacterial cells, resulting in the activation and spread of bacteriophages incorporated in the STEC genome that encode for Shiga toxin production. Despite the guidance against antibiotic treatment, antibiotic resistance has been reported in STEC strains, which is likely due to the presence of resistance genes acquired via natural selection. Therefore, it is important to enhance understanding of circulating antibiotic resistance genes in clinical STEC strains and define factors that increase the likelihood of infection. Herein, we used whole-genome sequencing and genomic processing pipeline Bactopia to analyze 260 strains from Wyoming patients collected between 2002-2020. All patient data have been extracted and genomes have been quality checked, assembled, and annotated to detect resistance and virulence genes as well as genes that dictate the serotype. An analysis of gene frequencies and trends over time is ongoing, while future analyses will examine trends by geographic location and cattle density, as cattle are an important STEC reservoir and ranching/farm work is a major industry in Wyoming.

SLAMF7 REGULATES T CELL EXHAUSTION IN A TOX DEPENDENT MECHANISM

Presenter(s): Brianna Smith
Microbiology, Immunology & Infectious Disease
Mentor(s): Yasser Aldhamen (College of Osteopathic Medicine)

Constant stimulation of the T cell receptor induces T cell dysregulation and exhaustion, a mechanism that alters their responses to chronic viral infections and cancer. This mechanism can be seen in the tumor microenvironment (TME) to evade the immune response and in chronic viral infections such as HIV, hepatitis C, and hepatitis B. Exhausted T cells are characterized by limited cytokine function, lower proliferation, high co-expression of inhibitory receptors, and epigenetic changes. The transcription factor TOX has been identified as a master regulator of T cell exhaustion, yet the mechanism is not fully defined. Some inhibitory receptors that TOX is known to upregulate include programmed cell death (PD-1). We recently demonstrated that SLAMF7, a receptor on CD8+ cells, induces exhaustion and upregulates PD-1 expression in T cells. As SLAMF7 and TOX are both known to induce differentiation of T cells into exhausted phenotype, we hypothesize that SLAMF7 might upregulate factors associated with exhausted T cells through TOX. In order to test this hypothesis, we stimulated murine CD8+ T cells with the SLAMF7 agonistic antibody and activated with CD3/CD28 beads and compared the expression levels of various inhibitory receptors and TOX using flow cytometry. Interestingly, we found that SLAMF7 signaling in T cells upregulates TOX and PD-1, and SLAMF7 expression levels were positively associated with TOX expression. Compellingly, SLAMF7-KO CD8+ T cells lack TOX and fail to induce it following T cell stimulation. Our data implicate SLAMF7 as a potent inducer of CD8+ T cell exhaustion during chronic infections and cancer.

ENVIRONMENTAL TEMPERATURE ALTERS THE HOST RANGE OF A VIRULENT BACTERIAL PATHOGEN

Presenter(s): Anne Lemek
Microbiology, Immunology & Infectious Disease
Mentor(s): Nina Wale (College of Natural Science)

Understanding the conditions that enable pathogens to infect more than one host species is critical for predicting the emergence of zoonotic diseases, such as COVID-19. Spirobacillus cienkowskii is a shape-changing, pigment-producing bacterial pathogen of zooplankton, Daphnia sp.. In Michigan lakes, S. cienkowskii commonly infects Daphnia dentifera but it has also been observed at a lower frequency in other host species. Little is known about the conditions that facilitate or restrict its host range. To test whether temperature affects the capability of S. cienkowskii to infect different host species, we performed an in vivo infection experiment. We exposed three species of Daphnia, two from "native" hosts from Michigan and one "foreign" host from Switzerland, to S. cienkowskii at 4˚ and 20˚ and examined them daily for signs of infection. When comparing infection rates collectively, Daphnia exposed at 4˚ were more than twice as likely to become infected than those exposed at 20˚. However, whereas the infection rate in the common native host increased from 64% to 80% in the cold treatment, the infection rate in the foreign host increased from 12% to 76%. These results suggest that cold temperatures facilitate S. cienkowksii infection in Daphnia and allow it to expand its host range.

EXPLORATION OF COULTER COUNTER METHODS SUGGESTS OVERESTIMATES OF RBC ABUNDANCE

Presenter(s): James Suggitt
Microbiology, Immunology & Infectious Disease
Mentor(s): Madeline Peters (College of Natural Science), Nina Wale (College of Natural Science)

The invasion of red blood cells by Plasmodium parasites causes malaria, a disease which affects over 220 million people annually. Quantifying the number and type of red blood cells present over the course of a malaria infection is crucial to understanding within-host infection dynamics and how resource limitation may limit infection severity. Currently, the in vivo murine model for Plasmodium spp. infection relies on Coulter counting to measure the daily variability in blood cell composition;

however, apparent disparities between the Coulter counter and complete blood counts call this method into question. By comparing whole and hemolyzed blood processed by a Coulter counter, the degree of error in the Coulter method of counting can be determined. Current data indicate that up to one-third of objects previously considered red blood cells using the Coulter method are not, in fact, red blood cells. Ultimately, this study utilized healthy host blood, meaning that future studies considering active malarial infections are necessary to determine how these discrepancies play out in infection, e.g., with host immunity and parasite activity.

COMBATING STAPHYLOCOCCUS ANTIBIOTIC RESISTANCE BY TARGETING NUTRIENT SULFUR TRANSPORT USING THE HERBICIDE BIALAPHOS

Presenter(s): Rosemary Northcote
Microbiology, Immunology & Infectious Disease
Mentor(s): Neal Hammer (College of Natural Science), Paige Kies (College of Natural Science)

The opportunistic pathogen Staphylococcus aureus propagates within numerous host tissues and is the leading cause of skin and soft tissue infections, bacteremia, endocarditis, and osteomyelitis. To combat this antibiotic resistant bacterium, the development of new therapeutics is essential. The herbicide bialaphos is a tripeptide that inhibits the enzyme glutamine synthetase, which is essential in glutamine-deprived environments. We previously demonstrated that S. aureus sensitivity to bialaphos is glutamine- and transport-dependent. Genetic studies revealed that the di-tripeptide transporter, DtpT, is responsible for bialaphos import into S. aureus. DtpT also promotes S. aureus utilization of the di-peptide cysteinyl-glycine (Cys-Gly) and tripeptide glutathione (GSH) as sources of nutrient sulfur and a dtpT mutant exhibits decreased pathogenesis. Another staphylococcal species, Staphylococcus epidermidis, also causes nosocomial infections and encodes a DtpT homologue. Therefore, I hypothesized that S. epidermidis displays glutamine-dependent sensitivity to bialaphos. I show that S. epidermidis is more sensitive to bialaphos than S. aureus and increased incubation times are required to isolate colonies resistant to the herbicide. Phenotypic characterization of S. epidermidis bialaphos resistant mutants reveals decreased utilization of DtpT-dependent substrates Cys-Gly and GSH, which strongly suggests that the DtpT homologue has been mutated. To identify mutations that promote bialaphos resistance, Whole Genome Sequencing (WGS) of these S. epidermidis bialaphos resistant strains is being conducted. Mutations identified via WGS will be confirmed by generating single mutants and testing the contribution of each mutation to S. epidermidis bialaphos susceptibility. Collectively, these results demonstrate that peptide transporters in these bacteria can be targeted by toxic tripeptides.

RANGE OF SALINITY TOLERANCE OF PYTHIUM INSIDIOSUM

Presenter(s): Anastasia Franklin, Natalia Amador, Qasim Motan, Udai Kapoor
Microbiology, Immunology & Infectious Disease
Mentor(s): Alberto Mendoza (College of Natural Science)

Testing P. insidiosum in different concentrations of salt to analyze its ability to withstand conditions of salinity.

CHARACTERIZING THE IMMUNE RESPONSE UPON BENZENE EXPOSURE DURING PREGNANCY

Presenter(s): Laura Stephan
Microbiology, Immunology & Infectious Disease
Mentor(s): Anthony Maxwell (Wayne State University)

There are a number of physiological and immunological changes that occur during pregnancy to support the fetus. Thus, when exposed to a bacterial or viral infection during pregnancy, the placenta induces an immunological response via the type I interferon signaling pathway. The activation of the maternal immune system due to environmental challenges has been associated with fetal developmental complications and adverse pregnancy outcomes. Acute and occupational exposure to the toxic air pollutant benzene has been associated with reproductive issues, such as miscarriages. Our lab has verified that benzene exposure during pregnancy is associated with low birth weight and an increase in fetal resorptions, using an in vivo model. Our objective is to elucidate the molecular mechanism of the maternal immunological response associated with benzene exposure. Using an in vitro model of trophoblast cells, we have exhibited the presence of maternal inflammation, as inflammatory markers IL-6 and IL-1β were both upregulated due to ER stress. Additionally, the type I interferon signaling pathway and Aryrl Hydrocarbon Receptor pathway have both been impacted. The overexpression of ISGs is arising due to the non-canonical ubiquitnation of IRF-3/7 and the AhR transcription factor. Together, these findings illustrate the existence of excessive inflammation at the maternal-fetal interface, which may lead to pregnancy complications and abnormal fetal development. In understanding the molecular mechanisms of this type of infection, it may help faciliate the derivation of novel therapies in mitigating the adverse pregnancy outcomes and fetal developmental complications.

DETECTION OF THE MYXOZOAN PARASITE TETRACAPSULOIDES BRYOSALMONAE IN WILD SALMONID SPECIES FROM LAKE HURON

Presenter(s): Montserrat Bonfante Malpica
Microbiology, Immunology & Infectious Disease
Mentor(s): Bartolomeo Gorgoglione (College of Veterinary Medicine)

Tetracapsuloides bryosalmonae is a myxozoan (Malacosporea) parasite with a two-host life cycle and causing Proliferative Kidney Disease (PKD) in susceptible species under adequate environmental conditions. Many salmonid species including Rainbow Trout (Oncorhynchus mykiss) and Brown Trout (Salmo trutta) living in the Great Lakes are well-known susceptible hosts across Western North America and Europe. The objective of this project was to assess T. bryosalmonae infection in Great Lakes salmonids with relevance for local fisheries but with an unknown susceptibility to the infection, such as Lake Whitefish (Coregonus clupeaformis) and Lake Trout (Salvelinus namaycush). We retrieved fish from wild salmonid population tagging programs carried out by USGS researchers in Lake Huron. DNA was extracted from posterior kidney samples and used to detect specific T. bryosalmonae 18S rDNA as a proxy of the infection. Using a specific and sensitive qPCR protocol, 14 positive fish were detected out of 64 samples tested, including 9 adults of Lake Trout and 5 adults of Lake Whitefish. Positive samples were further processed by cPCR for amplicon sequencing, thus for BLAST analysis purposes. Sequences analysis confirmed the detection of T. bryosalmonae from these salmonid species (with 100% similarity to T. bryosalmonae sequences deposited in GenBank). This is the first report of a T. bryosalmonae detection from Lake Trout and Lake Whitefish from the Great Lakes. Further study is needed to characterize the specific susceptibility of these hosts towards understanding the relevance that T. bryosalmonae may have for fisheries management in the Great Lakes.

MICROSCOPE IMAGING OF MNP-BOUND BACTERIA IN FOOD MATRICES

Presenter(s): Chloe Zaborneykline
Microbiology, Immunology & Infectious Disease
Mentor(s): Evangelyn Alocilja (College of Agriculture & Natural Resources)

The Centers for Disease Control and Prevention (CDC) estimates that foodborne diseases cause 48 million people to fall ill, 128,000 to be hospitalized, and 3,000 people to die each year in the US. According to the World Health Organization (WHO), this number increases to 600 million illnesses and 420,000 deaths yearly from contaminated food products when considering the worldwide population. Common foodborne pathogens such as Escherichia coli, Salmonella spp., and Staphylococcus aureus greatly contribute to this total. As a result, it is important to understand the mechanisms of these bacteria and how they perform in different food matrices. This is also important in order to determine the best way to rapidly isolate and diagnose the bacteria. In this study, the interaction between magnetic nanoparticles (MNPs) and living bacteria were observed under a laser microscope to understand the varying interaction within different food matrices. Preliminary data showed that in milk matrices, the bacteria and MNPs clumped into linear lines, while in neutral media they clumped into smaller clusters. This indicates the potential for differentiating bacterial behavior in different matrices, and the potential for further understanding how bacteria that cause foodborne illness behave.

PSEUDOMONAS AERUGINOSA PHAGE RESISTANCE

Presenter(s): Tara Ott
Microbiology, Immunology & Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

Pseudomonas aeruginosa Infects the lungs that cause cystic fibrosis. Cystic fibrosis is a debilitating disease that children will continue having for their entire lives. Pseudomonas adhere to surfaces where a matrix is formed to help create a biofilm. Biofilms increase resistance to antibiotics. Pseudomonas was observed in vivo bioluminescence imaging in order to test alternatives to antibiotics. Some alternatives to antibiotics are using a phage, which infects viruses. Pseudomonas aeruginosa is phage resistant and the phage resistance mechanism is not understood very well. Phage-resistant Pseudomonas was isolated and observed. The phage-resistant isolates form biofilms in a different way. The next steps will be to determine the mechanism of resistance by sequencing the multiple phage-resistant variants. Understanding the biofilm formation will also be an important topic to study as well.

CYSTIC FIBROSIS AND THE RESEARCH OF ANTIBIOFILM SUBSTANCES

Presenter(s): Julia Cameron
Microbiology, Immunology & Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine)

The goal of this project is to research Pseudomonas aeruginosa, a bacteria that commonly causes lung infections in children with cystic fibrosis. Pseudomonas aeruginosa is known to form a biofilm that is extremely resistant to antibiotics, therefore making the infection difficult to treat. 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. For this project, we are focusing on plant products, specifically berberine and creosote, as they have previously been used for various medical reasons around the world. In order to research the ability of these substances and their antibiofilm agents, we will be using bioluminescent Pseudomonas aeruginosa.

AUTOIMMUNE REGULATOR DEFICIENCY CAUSES T AND B CELL INFILTRATION INTO THE EPIDIDYMIS AND PROSTATE

Presenter(s): Katrina Halgren
Microbiology, Immunology & Infectious Disease
Mentor(s): Margaret Petroff (College of Veterinary Medicine)

The thymus is responsible for generation of T cells that are reactive to foreign antigens but tolerant towards self-antigens. Aire is a transcription factor that induces expression of tissue-specific proteins in the thymus. Expression of these proteins ensures that tissue-specific T cells that develop in the thymus are deleted. Mutations in Aire can cause autoimmune polyendocrine syndrome type I (APS-I), which is characterized by tissue-specific immune responses to self-antigens. Men and women with this condition often suffer from infertility, though the mechanism of this is not fully understood. Using mice containing a targeted deletion of Aire we investigated a potential mechanism of infertility in males. Prior studies in the lab showed minimal effects of Aire depletion on the testes. However, epididymides and prostate glands of nearly all males exhibited extensive immune cell infiltration and fibrosis. To determine the infiltrating cell types, we used immunohistochemistry to detect CD4+ and CD8+ T cells, as well as CD19+ B cells. We found that immune infiltration was composed primarily of CD8+ T cells and CD19+ B cells, with fewer CD4+ cells. These data suggest that Aire is important in controlling expression of reproductive tract-specific antigens in the thymus, and that a deficiency in Aire results in production of T and B cells that target the epididymis and prostate gland. Further, our results reveal a potential mechanism of infertility in Aire-deficient mice, which will lead to further understanding of infertility in humans with APS-I and the importance of immune tolerance to the male reproductive system.

EXTRACTION AND CONCENTRATION OF SALMONELLA FROM POULTRY PLANT SAMPLES USING MAGNETIC NANO-PARTICLES

Presenter(s): Lillian Bieszke
Microbiology, Immunology & Infectious Disease

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

Salmonella is a bacterial pathogen that causes around 93.8 million infections and 155,000 deaths worldwide each year. Monitoring its presence in food is essential to minimize contamination and outbreaks. However, with the lack of access to technologies that can deliver fast and reliable detection, farms and processing plants are using laborious and time-consuming detection methods that require the samples to be enriched in different selective media to increase the sensitivity of detection. This study aims to eliminate the need for enrichment by using magnetic nanoparticles (MNPs) to extract cells from the complicated sample matrix and concentrate them into a small volume. The method works based on the ability of the glycan-coated MNPs and the microorganisms present in the sample to form a stable complex that can be collected by using a magnet. Preliminary experiments show that using the MNPs, Salmonella was successfully concentrated from sponge swabs, processing water, and comminuted meat samples obtained from poultry processing plants. In some samples, colonies were observed to grow from MNP-concentrated cell suspension while no growth was observed in directly plated cell suspensions. This procedure can be conveniently coupled with other detection techniques to improve their sensitivity without the need for enrichment.

THE ROLE OF INLP IN LISTERIA MONOCYTOGENES COLONIZATION

Presenter(s): Pam Jones
Microbiology, Immunology & Infectious Disease
Mentor(s): Jonathan Hardy (College of Human Medicine), Kayla Conner (College of Osteopathic Medicine)

Pregnancy is a very strenuous physiological state for the body. It comes with various side effects like vomiting, high blood pressure, diabetes, and immune system deficiency. Additional issues like prenatal infections can lead to adverse pregnancy outcomes such as miscarriage, stillbirth, and pre-term labor. A pathogen commonly associated with prenatal infections is Listeria monocytogenes (Lm). Listeria monocytogenes is commonly found as a food contaminant. Lm infections are very dangerous to immunocompromised people, such as pregnant women. Animal models of pregnancy-associated listeriosis have demonstrated its ability to induce pre-term labor but the exact mechanisms underlying this outcome are unknown. It is known that Lm can cross many physiological barriers, allowing it to colonize the placenta. A gene rumored to aid in Listeria's ability to cross the placenta's layers is Internalin P (InlP). Our lab has found natural variations of InlP present in even avirulent Listeria. The goal of this project is to investigate the effects/usage of this gene in the process of cell invasion. These variants might carry out differing degrees of cell invasion and can clue us in about the evolution of Lm's virulence.

EVALUATING THE EPEDEMIOLOGICAL ASSOCIATIONS OF NON TYPHOIDAL SALMONELLA

Presenter(s): Veona Cutinho
Microbiology, Immunology & Infectious Disease
Mentor(s): Shannon Manning (College of Natural Science)

Non-typhoidal Salmonella (NTS) is a leading cause of gastroenteritis, resulting in an estimated annual 153 million infections and 57,000 deaths globally. In the United States alone, NTS antibiotic resistance is on the rise with 16% of strains resistant to at least one essential antibiotic, causing approximately 212,500 infections each year. As a result, it is essential to identify epidemiological associations with antibiotic resistant NTS infections to mitigate risk in populations and develop rapid approaches for detecting resistance. In collaboration with the Michigan Department of Health and Human Services (MDHHS), we obtained 198 NTS isolates from 4 Michigan hospitals between the years 2011 and 2014. These 198 isolates were recovered from patients ranging in age from 2 months to 91 years. Over 35 serogroups were identified with S. enteritidis (36%), S. typhimurium (19%), and S. Newport (9.6%) predominating; 30 (15.1%) had phenotypic resistance to at least one of the 24 antibiotics tested. Whole genome sequencing (WGS) will be used to determine whether there is a correlation between resistance phenotypes and genotypes. A random subset of these isolates (n=177) was sequenced with Illumina (2x250 bp), and FastQC and Trimmomatic were used for sequence quality control and filtering, respectively. Sequences will be assembled and annotated to identify the resistance genes for comparison to the phenotypic data. Together, these data highlight the importance of surveillance studies, which can define frequencies of specific pathogen traits for a particular geographic location and for informing public health practices and interventions.

THE BACTERIAL OUTER MEMBRANE AS A TARGET FOR ANTIMICROBIAL DRUG DISCOVERY

Presenter(s): Anna Barker
Microbiology, Immunology & Infectious Disease
Mentor(s): Victor DiRita (College of Veterinary Medicine)

Enterobacter hormaechei is a Gram-negative bacterium, from the Enterobacter cloacae complex E. hormaechei is a nosocomial, opportunistic pathogen that can cause infection in young children and elderly adults. With increasing resistance to many antibiotic drugs, including carbapenem, Enterobacter is becoming an increasing challenge in hospital settings. New antimicrobials are need to combat this pathogen. Because the outer membrane is a barrier to many antimicrobial therapeutics, one approach to developing new molecules against Gram-negative pathogens is to include an adjuvant to act on the outer membrane. Further, the outer membrane per se is a good target for antimicrobial discovery. We are using transposon mutagenesis to identify E. hormaechei mutants with weakened outer membranes. The anticipated phenotype of such mutants is generalized envelope stress, which we will be able to monitor on selective and differential media, enabling us to identify mutants using high-throughput screens. Upon isolating mutants with envelope-stress phenotypes we will carry out further genomic analysis to map the transposon insertion and identify the gene(s) whose disruption led to the envelope stress phenotype. Once characterized, these genes will serve as targets for drug discovery approaches for molecules that potentiate the effect of other antimicrobials or that themselves kill E. hormaechei.

CHARACTERIZING THE GUT RESISTOME OF 3MOS OLD INFANTS AND MATERNAL ANTIBIOTIC USE DURING PREGNANCY

Presenter(s): Madeleine Russell
Microbiology, Immunology & Infectious Disease
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

The emergence and dissemination of pathogens resistant to antimicrobials has become a forefront concern for clinicians and researchers alike. Antimicrobial resistance (AMR) is exacerbated by the misuse and overuse of antibiotics. Pregnant women and their infants are an important area of focus, as antibiotic use during this vulnerable period of development may generate reservoirs of AMR genes which would contribute to future risk. It is thus imperative to identify the extent of antibiotic use and its association with AMR gene abundance and persistence. The first aim of our study was to characterize the resistome of 3-month-old infants (n=267), women in their third trimester (n=99), and pairs of mothers and their infants (n=24 pairs). The second aim of our study is to assess the antibiotic classes prescribed and the extent of antibiotic use during pregnancy in a cohort of women currently living and receiving prenatal care in Michigan. Medical record abstraction was used to determine the types and extent of antibiotic use during pregnancy. DNA was extracted from fecal samples and was utilized for antimicrobial gene detection using quantitative real-time polymerase chain reactions. Preliminary analyses demonstrated differences in antimicrobial resistance genes between mothers and their infants as well as by antibiotic administration by hospital system. Ultimately, the purpose of this research is to inform clinical providers so that they may choose to use antibiotics and/or treatment regimens that minimize the risk of antibiotic resistance during critical stages of development where use of antibiotics is common.

NEUROSCIENCE

THE EFFECT OF SPY555 ON NEURITE OUTGROWTH

Presenter(s): Ashley Ziemer, Bashar Jawich
Neuroscience
Mentor(s): Kyle Miller (College of Natural Science)

The ability to observe how individual neurons grow is a fundamental step in understanding how the nervous system is wired during development. Given the importance of microtubules in providing structural support and as tracks for the long-distance delivery of intracellular cargoes how they are formed during neurite outgrowth has been a central question. For decades, the bright inorganic dye rhodamine tubulin has been the standard for fluorescent speckle microscopy tracking of microtubules. Its major limitation has been that because it cannot pass through the plasma membrane it needs to be microinjected into neurons. Here, we investigated the feasibility of the cell permeable inorganic, taxol-based dye, SPY555 for tracking the motion of microtubules within neurons. Using six different concentrations of SPY555, we found microtubule motion could be tracked without significantly impairing neurite outgrowth. This suggests that SPY55 is a promising label for tracking the motion of MTs during neuronal development.

THE ROLE OF NEUROTENSIN IN THE LATERAL HYPOTHALAMIC AREA FOR REGULATION OF BODY WEIGHT

Presenter(s): Katherine Moran
Neuroscience
Mentor(s): Gina Leinninger (College of Natural Science), Raluca Bugescu (College of Natural Science)

Obesity is a disease that shortens lifespan and predisposes individuals to develop chronic comorbidities such as type II diabetes, hypertension, and cardiovascular disease1 . The brain controls the motivation to eat and move, and alteration in the neural pathways governing these behaviors likely contributes to the development of obesity. While some progress has been made in determining the underlying neural circuits, particularly those in the hypothalamus of the brain2 , more information is necessary to understand the normal regulation of feeding and movement, and how these normal behaviors may be altered in disease. The Leinninger Lab has characterized neurons in the lateral hypothalamic area (LHA) that express the neuropeptide Neurotensin (Nts), and when activated, these "LHA Nts neurons" suppress feeding and promote locomotive activity in mice that causes them to lose weight. These data suggest that increasing activity of LHA Nts neurons can support weight loss, but it remains unclear if the Nts released from the neurons is the critical signal for the weight loss behaviors. To investigate this, we will site-specifically delete Nts from Nts-expressing neurons within the LHA in adult Ntsflox/flox mice by injecting AAV-Cre to both sides of the LHA. Each subject will be placed on standard chow diet for 14 weeks, then moved to high fat diet chow (HFD) to observe any alterations in feeding behavior and body weight. In testing the difference in the effects of standard chow and HFD in subjects with reduced Nts, we can determine whether Nts is an important influence on obesity.

COMPARATIVE GENE EXPRESSION ANALYSIS OF DUPLICATED GLUTAMATE RECEPTOR GENES IN THE BRAINS OF ZEBRAFISH AND SPOTTED GAR

Presenter(s): Keyana Blake
Neuroscience
Mentor(s): Ingo Braasch (College of Natural Science), Jamily Ramos De Lima (College of Natural Science), Julia Ganz (College of Natural Science)

Genome duplication is an important factor in the evolution of organisms. It is hypothesized that genome duplication causes the evolution of higher cognitive functions and emerging complex brain structures in vertebrates. The teleost fish zebrafish (Danio rerio), an important biomedical model species, went through an ancestral teleost genome duplication (TGD). Over evolutionary time, ~80% of teleost gene duplicates have been lost (non-functionalization), and the remaining single gene serves the primary function. In contrast, metabotropic glutamate receptor (grm) genes have a particularly high rate of 70% retained duplicates from the TGD . Grms regulate synaptic transmission and memory, so it is essential to understand how grm evolved. Generally, retained gene duplicates are thought to evolve by neo-functionalization (gain of new functions) and/or sub-functionalization (distribution of ancestral functions among duplicates). To identify grm gene evolution before and after the TGD, we analyze grm gene expression in spotted gar (Lepisosteus oculatus), an 'unduplicated', non-teleost fish outgroup that diverged before the TGD. Gar thus can be used as a proxy to the pre-TGD condition to identify the functionalization in teleosts like zebrafish. Using RNA in-situ hybridization on brain sections, we aim to identify the gene expression of grm duplicates in zebrafish and compare to the single grm genes in spotted gar to make inferences about the type of functionalization of grm gene duplicates in teleost. Our results will not only identify the expression patterns of grm genes in two important biomedical models but broaden our understanding of genome duplication and its evolutionary potential.

THE ROLE OF NTSR1 SYSTEMIC β-ARRESTIN BIASED AGONISM ON ENERGY BALANCE

Presenter(s): Pooja Menon
Neuroscience
Mentor(s): Gina Leinninger (College of Natural Science), Jariel Ramirez-Virella (College of Natural Science)

The role of NtsR1 systemic β-arrestin biased agonism on energy balance nderstanding the brain's function in regulating feeding and body weight is essential to address the alarming and increasing rates of obesity. Neurotensin receptor 1 (NtsR1) is a G-protein coupled receptor (GPCR) that signals via Gq-coupled and/or β -arrestin pathways. Administering systemic NtsR1 agonists restrains feeding, however, the activation of the NtsR1 Gq-signaling pathway can invoke hypothermia and vasodepression. A new ß-arrestin biased NtsR1 positive allosteric modulator (SBI-553) bypasses these adverse effects but the impact it may have on feeding and regulating body weight remains to be elucidated. We hypothesized that treating mice with SBI-553 will reduce body weight and feeding in both normal and fasted states. To examine the effects of SBI-553, normal weighing mice were treated daily for 3 days with vehicle (control) or SBI-553 (n=32) using PhenoMaster metabolic cages. Mice were also tested for their fasting induced refeeding after treatment with vehicle or SBI-553. Statistical analysis for feeding, body weight, and other calorimetric variables was assessed using Students' paired t-test and two-way ANOVA was applied to data from fasting induced refeeding. We found that SBI-553 modestly reduced food intake only on females in the light cycle, with no effects on fasting-induced refeeding in either sex. Together, these findings suggest a previously unreported time-dependent effect from modulating the neurotensin system, but that ß-arrestin biased NtsR1 agonism does not dramatically impact food intake and body weight

SEXUAL DIMORPHIC EXPRESSION OF INTERLEUKIN-1β IN MOUSE MODEL OF INFLAMMATORY PAIN

Presenter(s): Oluwabusola Ajagbe
Neuroscience
Mentor(s): Geoffroy Laumet (College of Natural Science)

Chronic pain is reported to affect at least 10 percent of the world's population and about 50.2 million Americans daily. Chronic pain is reported to be more prevalent in females than males. Chronic pain occurs as a result of unresolved inflammation, an immune system response to injury or infection. Interleukin-1β (IL-1β) is a cytokine that regulates inflammation through various immune responses and an important mediator of pain. We hypothesized that the immune response associated with pain, more specifically the expression of IL-1β, will be different between male and female mice. To test this hypothesis, we induced inflammatory pain in adult female and male mice by injecting complete Freund's adjuvant (CFA) into the pain. CFA is known to induce inflammation and pain. Pain sensitivity was measured by von Frey filaments and expression of IL-1β was assessed by qPCR from skin samples. Results: Inflammation resolved faster in male than female mice. IL-1β is upregulated in the skin in response to CFA but IL-1β expression remained higher in female than male mice. To test if this effect is mediated by androgen hormone, male mice underwent orchidectomy (Orx, castration) and female mice ovariectomy and implanted with dihydrotestosterone pellet (Ovx + DHT). Orx increased the upregulation of IL-1β compared to control males, while Ovx+DHT treatment reduced IL-1β upregulation in females to a level similar to males. Identifying the difference in the sensitivity of pain in males and females may provide ways to further identify how to develop sex-specific treatments and help combat pain more effectively.

DISRUPTING COCAINE-SEEKING BY DEVALUING MEMORIES OF COCAINE REWARD THROUGH MESOLIMBIC CIRCUITRY

Presenter(s): Toria Fex
Neuroscience
Mentor(s): Alexander Johnson (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 and 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 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 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). Notably, inactivation immediately prior to memory devaluation phase led to rats displaying drug-seeking behavior similar to that seen in the controls that received saline during the memory devaluation phase. Thus, we reveal that the VTA to NAc circuitry underlies memory devaluation effects that disrupt cocaine-seeking. Overall, these studies lay the foundation to develop novel approaches to attenuate addictive behaviors.

INVESTIGATING THE ROLE OF GCG IN THE VENTRAL TEGMENTAL AREA IN MORPHINE BEHAVIORS

Presenter(s): Olivia Dodson
Neuroscience
Mentor(s): Michelle Mazei-Robison (College of Natural Science)

Although opioid dependence is a major health and economic burden, our limited understanding of the underlying neurobiology limits better interventions. Dysregulation of the mesocorticolimbic reward circuit contributes to addiction, with alteration in the activity and output of dopamine (DA) neurons in the ventral tegmental area (VTA) contributing to the rewarding aspects of drug use. However, the molecular mechanisms underlying changes in VTADA function remain relatively unexplored. Thus, we used translating ribosome affinity purification to identify gene expression changes in mice that occur in VTADA neurons following chronic morphine. We found that expression of glucagon-like peptide-1 (GCG) was enriched in VTADA neurons, and its expression was robustly increased following chronic morphine. Thus, we hypothesize that activity of VTA-GCG neurons contributes to morphine-elicited behaviors. To test this, we're using GCG-Cre mice and Cre-dependent viral vectors. Specifically, we're using DREADDs, designer receptors exclusively activated by designer drugs, to selectively activate or inhibit VTA-GCG neurons. We stereotaxically injected the excitatory DREADD hM3Dq into the VTA of male and female wild-type and GCG-Cre mice and found that acute activation of VTA-GCG neurons does not affect general locomotion or elicit conditioned place preference or aversion. We're now assessing whether activation of VTA-GCG neurons alters morphine-elicited behaviors. Our preliminary data suggest there's a decrease in morphine-induced locomotion and morphine CPP in animals whose VTA-GCG neurons were activated. Together, these studies will set the stage for future work investigating the role of specific VTA-DAGCG circuits, their activity during behavior, and their potential as targets for therapeutic intervention.

ROLE OF AN ENTORHINAL CORTICAL CIRCUIT IN CONTEXTUAL AND SPATIAL MEMORY

Presenter(s): Kelly Kilkenny
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 for associative memory. A subpopulation of neurons in the LEC send axonal projections onto medium spiny neurons in the nucleus accumbens (NAc), a region important in motivated behavior; however, these LEC-NAc neurons have not been well characterized. We have recently identified that this poorly understood population of LEC-NAc neurons is necessary for cocaine-context associative memory, suggesting a role for LEC-NAc in motivated behavior. However, it is unclear whether LEC-NAc neurons are also necessary for other types of memories, including contextual fear and spatial memory. In order to address this question, we used a circuit specific DREADD (Designer Receptors Exclusively Activated by Designer Drugs) approach in mice to inhibit LEC-NAc neurons to determine the effects of LEC-NAc inhibition on spatial and contextual fear memory. To assess contextual fear memory, we measured freezing behavior in a context associated with an aversive stimulus. To assess spatial memory, we measured the learning and recall of location of a submerged hidden platform using spatial cues in a water maze. LEC-NAc inhibition during contextual fear memory encoding decreased freezing behavior, suggesting that LEC-NAc neurons are necessary for contextual memory formation. However, LEC-NAc inhibition during contextual fear memory recall did not affect freezing behavior. Furthermore, LEC-NAc inhibition does not impair spatial memory formation or recall. These studies demonstrate that LEC-NAc neurons are important in contextual encoding, including drug-context and aversive-context associations, but are not necessary for spatial memory.

ANDROGEN HORMONE REGULATES THE RESOLUTION OF INFLAMMATORY PAIN IN MICE

Presenter(s): Lizzy O'guin
Neuroscience
Mentor(s): Geoffroy Laumet (College of Natural Science), Jaewon Sim (College of Natural Science), Joseph Folger (College of Natural Science)

Women experience chronic pain at a 20% higher rate than men. Therefore, it is crucial to examine the mechanisms underlying this sexual dimorphism to narrow the discrepancy in pain-suffering. The immune system contributes to pain through its interactions with the nervous system. Immune responses vary by sex, suggesting that sex difference in pain may result from sex difference in the immune response. In a mouse model of inflammatory pain, males recovered faster than females. Preliminary data from the lab discovered that production of the molecule interleukin-10 is necessary for the resolution of pain. Additionally, we observed that the skin of males expresses higher levels of IL-10 compared to female mice. Given these sexual dimorphic effects on pain resolution and IL-10 production, we hypothesized that the androgen hormone testosterone is a key regulator of the resolution of pain and IL-10 production. To test this hypothesis, we compared male mice that underwent sham (control) or orchiectomy surgery to remove the testicles. Eight weeks after the surgery, mice were injected with Complete Freund's adjuvant into one hind paw to induce inflammatory pain. Pain sensitivity was monitored by von Frey filaments and expression of IL-10 was assessed by quantitative polymerase chain reaction. Pain testing showed that ORX procedures delayed the resolution of pain. PCR analysis of paw and spinal cord tissue samples showed that ORX surgery did not affect the expression of IL-10 in response to CFA. Our findings demonstrate that while sex hormones contribute to pain resolution, it is not through IL-10 signaling.

THE EFFECTS OF BRIGHT AND DIM LIGHT ON FERTILITY IN FEMALE MICE

Presenter(s): Krystal Jang
Neuroscience
Mentor(s): Alexandra Yaw (College of Agriculture & Natural Resources), Hanne Hoffmann (College of Agriculture & Natural Resources)

Light is an important coordinator for the timing of reproductive events. When light enters the eye, photic information is relayed to the reproductive axis to modulate hormone release and reproductive function. With infertility rates on the rise, my goal is to determine how light intensity modulates the reproductive axis. In humans, fertility deficits are linked to times of the year with reduced light exposure, including lower light intensity. As mice are nocturnal, I hypothesize that lower intensity light will correlate with improved reproductive axis function. To observe the effects of light intensity on reproductive mechanisms, female mice are placed under standard dim light (300 lux) for three weeks, followed by three weeks on bright light (~1000 lux). To measure ovarian function of the mice, daily vaginal smears will be collected. Disruption to the regular estrous cycle will indicate abnormal reproductive axis function. Luteinizing hormone (LH) and follicle stimulating hormone (FSH) are two hormones required for fertility. Reduced pulsatile release of LH and FSH is indicative of reduced fertility. To assess LH and FSH release, I will collect tail blood during the 2 hours before lights off in diestrus during each light condition. Following the end of both light conditions, tissues will be collected at diestrus and fixed, sliced, and stained. By manipulating the intensity of the light, this project aims to provide a deeper understanding of the impact of light on the modulation LH and FSH release and estrous cycles.

UURAF 2023 LY6G PROJECT ABSTRACT

Presenter(s): Hari Ramakrishnan
Neuroscience
Mentor(s): Geoffroy Laumet (College of Natural Science), Jaewon Sim (College of Natural Science)

Chronic pain is a pervasive and debilitating health issue that affects millions of individuals globally, leading to decreased quality of life, reduced productivity, and significant economic costs. Despite the widespread impact of chronic pain, the underlying mechanisms behind its transformation from acute pain remain largely elusive. Chronic pain often manifests in cyclic patterns, with periods of heightened pain sensitivity followed by periods of relative pain relief and remission. However, the biological mechanisms underlying the recurrence of pain remain unknown. To better understand this phenomenon, we established a mouse model of chronic pain by administering cisplatin, a common chemotherapy drug, through intraperitoneal injection (2mg/kg) for three consecutive days to induce pain hypersensitivity and allowed time for remission. Von Frey filaments were used to measure pain sensitivity. Preliminary data from the lab indicate an increase in neutrophils in the spinal cord during pain remission, suggesting a potential role for neutrophils in the development of chronic pain. To further investigate the involvement of neutrophils, we depleted them in cisplatin pain remission by administering Ly6G antibody into the spinal cord. Our data showed that pain sensitivity can be reinduced in mice in remission through neutrophil depletion. Our findings offer novel insights into the mechanisms of chronic pain recurrence and the potential involvement of neutrophils, which may inform the development of new and effective treatments for chronic pain. However, further research is required to fully understand the implications of our findings and validate the role of neutrophils in the development of human chronic pain.

EXPRESSION OF MAST CELL PROTEASES IN A MOUSE MODEL OF INFLAMMATORY PAIN

Presenter(s): Hannah Hua
Neuroscience

Mentor(s): Geoffroy Laumet (College of Natural Science), Kufreobong Inyang (College of Natural Science), Sabrina de Souza (College of Natural Science)

Chronic pain can significantly impact someone's quality of life. Patients with chronic pain experience reduced physical activity and limited ability to perform daily tasks. Chronic pain results from a failure to resolve acute pain. Pain resolution is important because chronic pain impacts patients emotionally, socially, and economically (Duenas, 2016). Understanding the biological mechanisms behind pain resolution can create more versatile treatment options. The resolution of pain is regulated by complex interactions between neurons and immune cells. Preliminary data from the lab showed that mice that lack mast cells, a type of immune cell, have an impaired resolution of pain. One specificity of mast cells is their ability to produce and release certain types of proteases. We hypothesized that mast cell proteases are key factors for the resolution of pain. As a first step, we measured the expression of 2 proteases that are specific to mast cells; chymase 1 (Cma1) and Mast cell protease 4 (Mcpt4), and a transcriptional factor that regulates mast cell activity (Fosb). Inflammatory pain was induced in mice by injection of Complete Freund's Adjuvant (CFA) into one hind paw. We used polymerase chain reaction (PCR) to assess the expression of Cma1, Mcpt4, and Fosb in the skin of mice at different time points after CFA or saline (control) injection. Thus, analyzing the proteases that are expressed after a certain amount of days would reveal how proteases are expressed during pain resolution.

EFFECTS OF RAI-1 GENE DELETION ON SLEEP AND CIRCADIAN RHYTHM IN DIURNAL RODENTS

Presenter(s): Nolan Lucera

Neuroscience

Mentor(s): Katrina Linning-Duffy (College of Social Science), Lili Yan (College of Social Science)

Smith-Magenis Syndrome (SMS) is a developmental disorder characterized by intellectual, speech, and social development, as well as sleep and circadian rhythm disruptions including decreased total nighttime sleep, early-morning sleep offset, and decreased daytime wakefulness. These symptoms of SMS are thought to be due to a missing gene, Rai-1. In order to better study the neural mechanisms and circadian consequences of this syndrome, our lab developed a diurnal grass rat (Arvicanthis niloticus) SMS model carrying Rai-1 gene deletion. Grass rats are naturally awake during the day and asleep at night, making them a translatable model for humans. The current study explores how Rai-1 deletion impacts sleep, locomotor activity, and circadian rhythm. To accomplish this, we housed wild-type and Rai-1 mutant grass rats in 12:12 hr light/dark cycle. Animals were continuously recorded using infrared motion sensors to monitor in-cage locomotor activity, and a Piezoelectric system to monitor their sleep/wake status. We expect the knockout transgenic rats' sleep quality, quantity, and daily rhythm in locomotor activity will be disrupted compared to the wildtype controls. Preliminary results suggest that there is a difference between genotypes in sleep bout lengths and sleep percent, however further analysis is required to strengthen and solidify these results. If this model is consistent with SMS symptoms, it could be the framework for better understanding the effects of SMS in humans and investigation of therapeutic targets.

THE ROLE OF NUCLEUS ACCUMBENS OXYTOCIN RECEPTOR-EXPRESSING CELLS IN THE REGULATION OF JUVENILE SOCIAL PLAY

Presenter(s): Alex Shemke
Neuroscience
Mentor(s): Samantha Bowden (College of Social Science)

Juvenile social play, also known as rough-and-tumble play, is an important and rewarding behavior displayed in many animal species, including humans and rats. Social play is known to contribute to social competency in adults. Children with autism spectrum disorder (ASD) show deficits in social play, which can cause difficulty navigating later social situations as evidenced by higher rates of social anxiety and depression. Thus, understanding how the brain regulates social play could inform potential therapeutics for social deficits associated with ASD. Oxytocin (OXT) has shown to regulate various social behaviors, however, its role in juvenile social play is relatively understudied. The nucleus accumbens (NAc), a brain region associated with reward and motivation, has a dense population of neurons expressing OXT receptors (OXTR). Preliminary findings from our lab indicate that blocking OXTRs in the NAc alters social play at sex-specific doses, but the necessity of NAc-OXTR neuronal activity during social play is unknown. To explore this, we used a technique called Designer Receptors Exclusively Activated by Designer Drugs (DREADDs). DREADDs target specific cells by inserting a "designer receptor" which is only activated by binding of the "designer drug", Clozapine-N-Oxide (CNO). In this way, we were able to inhibit the activity of OXTR-expressing neurons in the NAc to study how changes in NAc-OXTR activity alter the expression of social play, and if this occurs sex-specifically. These findings would further suggest the NAc-OXTR system's involvement in the modulation of social play behavior, and could be used to better design sex-specific treatments for ASD.

TO PLAY OR NOT TO PLAY? UNDERSTANDING OPTIMAL CONDITIONS FOR STUDYING SOCIAL PLAY BEHAVIOR IN DIFFERENT LABORATORY RAT STRAINS

Presenter(s): Bella Orsucci, Kira Becker
Neuroscience
Mentor(s): Jessica Lee (College of Social Science), Samantha Bowden (College of Social Science)

Social play, or "rough-and-tumble" play, is a common social behavior observed in juveniles of many mammalian species, including rats and humans. Engagement in social play builds social awareness and helps establish flexible social problem-solving skills. Deficits in social play are observed in social disorders like autism spectrum disorder, allowing individuals fewer opportunities to learn and practice social skills during childhood. Despite the documented importance of social play, little is known about the brain mechanisms regulating this behavior. A better understanding of these mechanisms could lead to developing therapeutics that aim to restore deficits in social play. Considering that juvenile rats naturally show social play, rats are the model species to study social play in laboratories. Nevertheless, there is limited comprehensive knowledge on how to best test social play for commonly used rat strains. Therefore, this study focused on optimizing procedures for studying social play in two common laboratory rat strains: Long-Evans and Sprague Dawley. All experiments utilized 10-minute social play tests, where a sex-, age- and strain-matched stimulus rat was introduced into an experimental rat's home-cage. We determined the effects of two factors on social play behavior, namely the familiarity level of the stimulus rat (i.e., familiar vs unfamiliar) and the length of social isolation before testing (2-h vs 24-h). Overall, our goal is to provide recommendations for optimal conditions to measure social play behaviors in different rat strains, so researchers can more efficiently work toward the big-picture goal of understanding the brain mechanisms regulating social play behavior.

EFFECTS OF MILD TBI AND TREATMENT OPTION MODELED IN MINI YUCATAN PIGS

Presenter(s): Lexi Zydeck
Neuroscience
Mentor(s): Lauren Wade (College of Natural Science)

Mild traumatic brain injuries (TBI) are extremely common and exhibited by individuals of all age groups. The effects of even a mild head trauma such as this can be substantial. Long-term behavioral effects such as mood disorders, anxiety, attention deficit disorder (ADD), and more can arise as a result from a TBI. Once developed, these disorders can persist years after the initial injury. In the current study, pediatric concussion and their long-term outcomes are modeled using mini Yucatan pigs. One month into this double blind study, two of the four pigs receive a closed head injury at the location of the primary somatosensory cortex (S1). The pigs are housed for one month pre-injury and five months post-injury. Over the course of these months, differences in behavior, ranking of social hierarchy, and performances in several long- and short-term memory tests are documented to allow for the analysis of changes pre- and post-injury. Beginning with this cohort, the pigs will be treated with transcranial magnetic stimulation (TMS). TMS will be administered using 10Hz stimulation over the frontal cortex for a duration of twenty minutes five days each week. This treatment aims to increase excitability of neuronal cells in the S1 region of the brain in order to reverse damage caused by a TBI. It is predicted in this project that the pigs who received TBIs will experience more changes in behavior, memory, and daily activities. As a result, the proposed mechanism for treatment is the utilization of TMS.

THE EFFECTS OF DILUTION OF GDCL3 ON THE CONTRAST SHOWN IN MRI IMAGING

Presenter(s): Suraj Thirumala
Neuroscience
Mentor(s): Nir Dayan (College of Engineering)

We will be obtaining MRI scans of six different test tubes to confirm whether the Gadolinium sticks to the glass beads. This will be done by conducting multiple trials. There are two test tubes filled with $GdCl3$. (0.2 mM). One of these test tubes will be used to extract the $GdCl3$ using a pipette. Then the test tube is filled with water to try to wash off the $GdCl3$. The extracted $GdCl3$ solution will be transported in to the

Trial 1 test tube. Then the test tube with the beads is refilled with H_2O. The refilled H_2O is extracted into Trial 2. The test tube with beads is once again refilled with H_2O. The H_2O in the test tube with the beads is then extracted into Trial 3. Resuspend original $GdCl_3$ beads test tube with H_2O. Results are then obtained via MRI scanning.

DEVELOPMENT OF FINE MOTOR SKILLS IN CHILDREN AGED 2-5 YEARS USING TOUCH-DEVICES

Presenter(s): Mariam Shahab
Neuroscience
Mentor(s): Emily Jensen (College of Social Science)

This project is a literature review of 3-4 empirical research articles focusing on the relationship between using touch devices and the development of fine motor skills in young children. The review is composed of an introduction, summary of each of the article, and critique of each article. The content will also be related to class content learned in HDFS 212.

AN ANATOMICAL CHARACTERIZATION OF GROWTH HORMONE SECRETAGOGUE RECEPTOR IN MICE THAT ARE VULNERABLE OR RESISTANT TO DIETARY OBESITY

Presenter(s): Malavika Eswaran
Neuroscience
Mentor(s): Alexander Johnson (College of Social Science)

The obesity epidemic is an extremely prevalent issue that is expected to worsen in the next decade. It is estimated that over 50% of the United States population will have obesity by 2030. Obesity has been correlated to the western diet, which consists of high levels of fat and processed sugars. Although these diets can lead to obesity, not everyone responds the same, with some individuals more vulnerable than others, to the effects of these diets on weight gain. In this study, we examined whether mice that were either resistant or vulnerable to dietary obesity expressed differences in the expression of the growth hormone secretagogue receptor (GHSR). GHSRs control the biological actions of the gastric hunger signal, ghrelin. Interestingly, GHSRs are abundantly expressed in the ventral hippocampus, where they function to regulate brain control over food intake. Using a viral-mediated labeling technique, we revealed that the expression of GHSRs in the ventral hippocampus differs greatly in mice that are vulnerable to dietary obesity and that this effect is dependent on biological sex. Overall, these findings point to potential neuronal differences controlling susceptibility to dietary obesity.

DEEP NEURAL NETWORKS CAN BE USED TO TRACK INFANT GAZE

Presenter(s): Emma Niebrzydoski
Neuroscience
Mentor(s): Mark Reimers (College of Natural Science), Michael Moore (College of Natural Science)
Since infants cannot communicate verbally, it can be difficult to determine what they are looking at and attending to at any given moment. Infants lack the fine motor skills

of moving their eyes to attend, rather, they turn their heads in the direction to do so instead. So, we use head direction as a proxy for gaze. We are interested in whether infant facial features can be tracked automatically in order to determine head direction, in order to fit a 3D head model that would determine gaze direction. Our dataset was 75 videos of infants from the University of North Carolina that were used to assess fear reactions to a masked experimenter. Each video contains a few thousand frames. Deep learning software has been used to track different features. DeepLabCut acts as a type of neural network by interpolating the keypoints based on about 30 prelabeled frames per infant. DeepLabCut is a labeling tool used to track different point locations on this video footage of the infants, including the mouth, nose, chin, eyes, and cheek creases. After several iterations of relabeling frames that were mislabeled by the learning network, we were able to make a definite face model that represented the key points at different angles that would help us determine gaze direction. The trained keypoint locations were validated with a testing set of independent, untrained labels and were found to have a median discrepancy of only 1.61 pixels based on 16 sets of x and y coordinates.

THE AFFECTS OF SBI-553 DRUG ON MICE WITH FASTING-INDUCED FEEDING

Presenter(s): Dipankar Roy
Neuroscience
Mentor(s): Jariel Ramirez-Virella (College of Natural Science)

The obesity epidemic currently impacts nearly 40% of the US and is expected to increase. Obesity is a disorder that occurs by excessive food consumption along with a sedentary lifestyle that leads to weight gain. Obesity can lead to other diseases such as heart disease or diabetes, thus it is important to figure out a therapeutic treatment that contributes to weight loss. Unfortunately, available treatments are not effective, but the targeting Neurotensin Receptor-1 (NtsR1) has shown promise for weight loss. Recently, a novel β-arrestin biased positive allosteric modulator called SBI 553 was shown to reduce the self-administration of pharmacologic rewards like cocaine and methamphetamine but its application for reduction of natural rewards like food are yet to be determined. Through a fasting induced refeeding paradigm, lean and obese mice were treated with SBI 553 or saline where only obese males showed reduced feeding after 24h. To examine the potential for weight loss of this compound under the context of obesity, obese mice were treated twice a day with SBI-553 or saline for 3 days, where weight loss was seen exclusively in obese males. Together, SBI-553 shows promise as a safe and novel pharmacologic treatment for weight loss. These findings allow a better understanding on how different metabotropic secondary messengers may mediate distinct physiology, but further research remains to be done to elucidate the sites in the body that NtsR1 induces weight loss.

NUTRITION & FOOD SCIENCE

CAN COLLEGE STUDENTS ACCURATELY INDICATE SODIUM AMOUNTS IN FOOD?

Presenter(s): Blair Hayden, Brennan Spillane
Nutrition & Food Science
Mentor(s): Pallav Deka (College of Nursing)

Significance/purpose: Cardiovascular disease (CVD) is one of the most concerning health issues facing the global population. For many young adults transitioning out of adolescence and going to College, there are consistent challenges in making healthy dietary choices. Many College and University students for the first time in their life are needed to make dietary choices for themselves. Methods: Research staff will approach students on campus and provide information about the study. Informed consent will be implied. The survey, which will take about 5-6 minutes to complete, will be done using Qualtrics which is HIPAA compliant and is secured through MSU's secured server. Results: This is an ongoing project. The mean age of the 52 participants who responded to the survey was 19 ± 0.8 years. 42 participants identified as female, 7 as male, 2 as gender fluid, and 1 as non-binary. 35 participants indicated taking a course in nutrition. With a mean score of 4.0 ± 1.1, participants indicated that they were very surprised about the actual sodium content in the food items (1= not surprised; 5= extremely surprised). Conclusion: College students were not able to accurately predict sodium content in food items and expressed surprise when they came to know of the actual amount of sodium present in the food that college students are likely to consume.

HOW PERCEIVED STRESS WAS RELATED TO DIETARY INTAKE AND EMOTIONAL EATING AMONG LOW-INCOME PARENTS?

Presenter(s): Chante Hardaway
Nutrition & Food Science
Mentor(s): Jiying Ling (College of Nursing), Rebekah Ellsworth (College of Nursing)

Although previous research has been conducted to examine the negative effects of stress on people's dietary intake, limited efforts were focused on low-income families. This study aimed to examine the relationships among dietary intake (fruit/vegetable and fiber intake), perceived stress, and emotional eating among low-income parents. Fifty-three low-income parents of young children were recruited from Head Start organizations across Michigan. Parents completed an online survey via Qualtrics measuring their fruit/vegetable and fiber intake, emotional eating, and perceived stress. The sample included 67.9% white, 18.9% black, and 13.2% other. It contained approximately 94.3% female, 66% had a yearly family income of less than 30,000, and 39.6% had the highest degree of education as a high school diploma. The average fruit/vegetable intake was 2.52 servings per day. Fruit/vegetable intake had a positively small relationship with emotional eating (r=.15) and perceived stress level (r=.13). Similarly, fiber intake was positively related to emotional eating (r=.19) and perceived stress level (r=.11). On the contrary, perceived stress level had a strong correlation with emotional eating (r=.63). This study's results indicate that consumption of fruits/vegetables in low-income parents is only about half of the recommended daily intake of 5 servings. The positive relationship of stress and emotional eating with dietary intake may be because when people are stressed eating, their overall consumption of all food groups including fruits/vegetable increase. The results of this study suggest the need to assist low-income families to effectively manage stress as a way to improve their dietary intake.

PACKAGING AND HOUSEHOLD FOOD WASTE NEXUS

Presenter(s): Muhammad Masood
Nutrition & Food Science
Mentor(s): Monirehalsadat Mahmoudi (College of Agriculture & Natural Resources)

Nearly 30% of the food produced for human consumption is wasted in the United States every year, among which, more than 40% happens in homes. Packaging adjustment/techniques have been recently recognized as among the top 3 solutions for reducing household food waste (HFW). Our research team in the School of Packaging at MSU has initiated a comprehensive study to understand the impact of packaging on HFW. The first phase of this research is to identify food items that could be a good fit for this study. Since consumers' food waste behavior is supposed to be observed for a limited time duration (i.e., one month), it is important to focus on foods that are perished within a month. In addition, to eliminate non-packaging-related factors impacting HFW, we narrow down the list of foods to the ones that are served raw (uncooked) and lose their quality if frozen. To include a packaging-driven factor in our study, we focus on foods that are packaged in different packaging formats (e.g., a flexible plastic bag vs. a rigid plastic container; a semi-transparent plastic jug vs. opaque paper-based cartons). My role in this project was to survey grocery stores' websites (Kroger, Aldi, Walmart, Target, Meijer) online and do some in-field study by taking trips to grocery stores to make a list of foods that meet the aforementioned criteria in Microsoft Excel. I also had an opportunity to analyze and interpret results received from packaging professionals to better understand the adjustment that if implemented could mitigate HFW.

THE EFFECTS OF LOW PH ON THE OF SURVIVAL OF SALMONELLA ENTERICA

Presenter(s): Diane Luong
Nutrition & Food Science
Mentor(s): Teresa Bergholz (College of Agriculture & Natural Resources)

During fermented sausage production, microbes within the sausage are subjected to an acidic environment due to the curing process. The low pH is a stress factor affecting Salmonella survival. The current study aimed to evaluate the survival of five strains of Salmonella enterica with serotype typhimurium, 4,[5],12:i-, and Johannesburg (Table 1) at low pH. The five strains were grown Luria-Bertani (LB) at 37°C for 20 hours. The grown strains were then transferred to pH adjected LB using hydrochloric acid (HCL) to evaluate survival. As a preliminary experiment, the survival of the strains after 2 hours at pH 2.5 and 3.5 was observed. In pH 3.5, strain A indicated a 2.24 log reduction; strain B indicated a 2.67 log reduction; strain C indicated a 1.54 log reduction; strain D indicated less than 1 log reduction; and strain

E indicated a 2.27 log reduction. In pH 2.5, all strains were assumed to have more than 5-log reduction. Only the assumptions were made because detection limit of the current experiment. The preliminary results showed that low-pH environments affect the survival of Salmonella enterica. For future trials, the detection limit will be modified to provide a more accurate result. Also, the survival of the strains in different acid sources (HCl and lactic acid) will be conducted for a more conclusive result. Strain ID Serotype: A = typhimurium B =4,[5],12:i- C=Johannesburg D=typhimurium E=Johannesburg Table 1 Salmonella enterica serotypes used in the current study

CHANGES IN SOIL COMPOSITION, WEATHER, AND FORAGE NUTRIENT PROFILE ACROSS THE GRAZING SEASON IN A SOUTHERN OHIO-BASED PASTURE-RAISING SYSTEM FOR LAYER HENS

Presenter(s): Julianna Adams, Kayla Fenton, Rachel Vanduinen
Nutrition & Food Science
Mentor(s): Jenifer Fenton (College of Agriculture & Natural Resources)

Pasture-raised egg farming promotes a synergistic ecosystem between the chickens and their environment. Layer hen diets have a major impact on the nutritional profile of eggs; however, throughout the foraging period, the quality and composition of the pasture may vary along with soil quality and weather patterns. The objective was to characterize monthly changes in the soil composition, weather, and forage nutrient profile throughout the foraging season. Soil, weather data and forage samples were collected monthly from May to December. Soil composition and forage proximate analysis were assessed commercially. The forage fatty acid profile was assessed by gas-chromatography mass-spectrometry. While soil pH did not change, soil mineral composition and organic matter significantly differed by month ($p<0.01$). The warmest temperatures were recorded in July, and the coldest temperatures were recorded in December. Total precipitation was highest in May and lowest in October. Forage moisture, dry matter, crude protein, lignin, ash, metabolizable energy, and mineral profile differed by month ($p<0.05$). Forage total saturated and monounsaturated fatty acids were lower in early summer and early fall compared to November, while total polyunsaturated fatty acids were higher in May compared to November ($p<0.01$). Alpha-linolenic acid steadily decreased from May to August, increased in the early fall, and decreased again in the late fall ($p<0.001$). The omega-6:omega-3 fatty acid ratio followed the opposite trend ($p=0.002$). These data demonstrate significant seasonal changes in the forage nutrient profile, providing important perspective to understand changes in the pasture-raised egg nutrient profile from the same region.

CHARACTERIZING THE FLAVOR OF BEANS AND BEAN PRODUCTS

Presenter(s): Otto Steinbrecher
Nutrition & Food Science
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources)

There is growing consumer demand for pulse-based products as a nutrient-dense, protein-rich alternative to wheat in foods. Despite their positive qualities, pulses contain flavor compounds often described as "beany" and "musty," which can be off-putting to consumers. This research aims to characterize and identify these off-flavors hindering pulse utilization in food products. We will distinguish the flavor profile of seven bean varieties using three processing methods: boiled, milled, cooked into porridge, roasted, then milled and cooked into porridge. The seven bean varieties were grown and harvested in Macomb County, Michigan. First, they are rinsed in distilled water, sorted, and air-dried overnight. The beans are soaked for twelve hours in distilled water and measured for absorption before and after. To specify cooking times, a Mattson cooker determines when the beans are approximately eighty percent cooked. This cooking step will help deactivate the bean's lectins. Some of the beans are roasted at one hundred and ten degrees Celsius for an hour and ten minutes. Flavors of pulse-based products such as porridges and pasta will be characterized via descriptive analysis. Potential research subjects will be screened for sensory acuity; ten screened subjects will be selected to form a descriptive analysis panel. Panelists will undergo training to develop and define a lexicon for the sensory attributes of reference pulse-based products. Panelists then rate the intensities of the decided attributes for each test product. ANOVA and means separation analysis will also assess differences in off-flavor characteristics and intensities related to bean genotype or processing method.

INSTRUMENTAL AND SENSORY MEASURES OF PULSE COLOR AND THEIR CHANGES CAUSED BY BOILING, MILLING, AND ROASTING: THE POTENTIAL APPLICATION OF PULSES IN NON-TRADITIONAL FOODS

Presenter(s): Winter Graham
Nutrition & Food Science
Mentor(s): Aubrey DuBois (College of Agriculture & Natural Resources), Emily Mayhew (College of Agriculture & Natural Resources), Kaveri Ponkshe (College of Agriculture & Natural Resources)

Pulses, or edible seeds from a legume plant, have increasingly drawn consumer interest for their potential application in nutrient-dense, low-cost products. These renewable, land-efficient resources have begun to show clear potential as traditional resources dwindle worldwide. Many companies have begun utilizing flour created from pulses for gluten-free products that are rich in micronutrients. The global demand for pulse flours is projected to reach $19.3 billion by 2024 according to Future Market Insights' 2023 report, but most pulses have colored seed coats that may impart undesirable color to flour applications. The focus of this project was to determine which pulse(s) hold the most potential for non-traditional applications. Quantitative color data was generated with a CR-400 Chroma Meter to characterize the coordinates of 8 pulses subjected to 3 processing methods (cooked whole, processed into raw flour, or processed into roasted flour) in the Commission Internationale de l'Eclairage (CIE) L*C*h Color Space. Results indicate that the roasting processing method consistently caused an increase in the pulses' chroma, or the intensity of color. The results additionally indicate that both flour preparation methods resulted in a decrease in the pulses' chroma. While these results display a distinct change in chroma when comparing pulse processing methods, they do not illustrate if these changes in intensity are noticeable to potential consumers. To further determine which pulse(s) and processing method(s) hold the greatest potential for non-traditional applications; descriptive analysis (DA) data regarding participants' perceptions of color, specifically chroma, for the described pulses will be collected and analyzed.

EFFECTS OF HOME-COOKING PROCEDURES ON FATTY ACID PROFILES IN MEATS AND SEAFOODS

Presenter(s): Mia Vollkommer
Nutrition & Food Science
Mentor(s): Ilce Medina Meza (College of Agriculture & Natural Resources), Lisaura Maldonado-Pereira (College of Agriculture & Natural Resources)

The Western diet (WD), is characterized by high levels of fat, sugar, and sodium provided by ultra processed foods (UPFs). The effects of cooking/processing used in the WD are a growing concern among the scientific community because of their association with chronic diseases such as obesity, atherosclerosis, and diabetes. In 2018, the USDA reported that 66% of calories were obtained from meals confectioned at home, making it imperative to examine how home-cooking styles affect sensitive molecules, such as lipids, and therefore contribute to WD quality and safety. Five types of meats and seafood (pork loin, bacon, chicken breast, ground beef 80% lean, shrimp, and catfish) were prepared following popular recipes in the USA. Meats were pan-fried at medium-high heat (375F - 425F) and oven roasted at 400F until a safe internal temperature was reached. Additionally, the use of spices was analyzed in this study by comparing the lipid composition of samples cooking with spices to their raw counterpart. Thirty-five fatty acids were identified using a GC-FID and reported as percentages. Results showed higher monounsaturated fatty acid levels (MUFA) ($p<0.05$) in seafood samples cooked with the addition of spices. Results also suggest that spices could play a preventative role in lipid oxidation favoring the formation of more MUFA during cooking, while avoiding further oxidation into SFA. Additionally, the changes demonstrated by the seafood samples were different than the meats, indicating that the matrices of these samples interact differently with the spices and cooking methods.

FIBER INTAKE OF TODDLERS IN A MICHIGAN COHORT

Presenter(s): Kennedy Zarembski
Nutrition & Food Science
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Fiber is an essential nutrient for the body at all stages of life. The nutrient helps to aid in normal bowel movements, lowering cholesterol, and even regulating blood sugar. Although fiber is an essential nutrient, not every toddler consumes an adequate amount. The goal of this study is to determine if the toddlers ages 12 months to 5 years old in a Michigan Cohort are consuming enough fiber to meet recommendations. A questionnaire was collected for each participant that declared how much of each food item the toddler consumes in a week. The PhenX Fiber Intake protocol was used to convert the responses to estimate the daily fiber intake. The serving sizes used in the PhenX protocol will be adjusted to fit those serving sizes typical for the age range of the participants. The daily recommendation and the estimated fiber intake will determine if the toddlers are meeting the adequate amount for their age range. These results will help decide if a toddlers recommended

diet needs to be revisited and revised to include more food products with more fiber to avoid constipation or any chronic diseases.

PHYTOHEMAGGLUTININ IN DIFFERENT LEGUME PULSES

Presenter(s): Tina Choi
Nutrition & Food Science
Mentor(s): Sharon Hooper (College of Agriculture & Natural Resources)

Beans are great sources of nutrients and have readily become a food staple. Consumption of beans has multiple health benefits in which it provides the body with fiber and prevents health risks associated with body weight or gut microbiome. Due to its high nutritional value, an expansion on legume products have become beneficial to the food industry. However, there are health risks that come with legumes and their lectin content, specifically, phytohemagglutinin. Lectin in legumes are proteins that bind to carbohydrates and conduct hemagglutination. Phytohemagglutinin levels are commonly mediated by cooking, boiling, or soaking; however, improper care can lead to traces of active phytohemagglutinin left in the legume. To prevent inadequate processing of legumes, the research project would focus on the regulation of phytohemagglutinin levels in various legume pulses. More specifically, the research will determine the concentration of phytohemagglutinin in different types of legume pulses, observe the effects of different processing methods on legume pulses' lectin activity, and identify what causes the difference in phytohemagglutinin levels among different types of legume pulses.

MODIFYING PSEUDOMONAS SYRINGAE PHAGE FOR PLANT PATHOGEN BIOCONTROL

Presenter(s): Jenna Thibodeau
Nutrition & Food Science
Mentor(s): Daniel Ducat (College of Natural Science), Michaela TerAvest (College of Natural Science)

The United States CDC estimates 2.8 million drug-resistant infections resulting in 35,000 deaths yearly as a result. Importantly, drug-resistant infections are not unique to humans. Pseudomonads are amongst the most antimicrobial-resistant bacteria, in clinical settings, but equally in plant systems like P. syringae. P. syringae is a causative agent for multiple diseases including bacterial cankers and apical plant necrosis affecting nearly all major economical crops worldwide. Despite the yearly rising numbers in drug-resistant infections, common treatments continue to include antimicrobial drugs. Drug-resistant microbes have sparked renewed interest in bacteriophage use in plant infections. Bacteriophages, or phages, are natural predators of bacteria using them as a host to reproduce. Due to phage's high-host specificity and ability to kill microbes efficiently, the use of phages as a plant biocontrol have increasingly been studied with the rise of drug-resistant microbes. Although this is viable in vitro, application of phage on crops results in decreased phage viability as a result of exceedingly variable environmental conditions including UV. The Michigan State iGEM team isolated two novel phages from the Red Cedar River and tomato plants. Methods of characterization and modification of these isolated phage include the addition of spy-tags on the capsid with spy-catcher amino acids to increase capsid protein interactions, increasing protection against variable climates on the plant surface to increase phage viability. This will be the core in creating a phage library for treatment against similar hosts with genes that can be used to for modifications to increase phage-host effectiveness.

CHARACTERIZING THE RELATIVE SWEETNESS AND AROMA OF HONEY

Presenter(s): Anna Wagner
Nutrition & Food Science
Mentor(s): Emily Mayhew (College of Agriculture & Natural Resources), Hannah Mulheron (College of Agriculture & Natural Resources)

Honey is a natural sweetener composed of water, sugars, organic acids, and aroma compounds; the precise composition varies by floral source. The intensity of honey's sweetness relative to sugar and the impact of honey aroma on its sweetness has not been quantified. This project had two aims: to quantify the relative sweetness of honey and to quantify the impact of total aroma on honey sweetness. The end goal of both aims was to create dose-response curves for sugar and honey, that showcase their relative sweetness as a function of sweetener concentration. Five different sweeteners were tested, sucrose and four varieties of honey: Wildflower, Orange Blossom, Clover, and Alfalfa. There were six concentrations of each sweetener diluted in water ranging from 12.5 - 125 g/L. Qualified subjects were presented with each set of diluted sweeteners in a randomized order and asked to rate the sweetness intensity on a Global Sensory Intensity Scale; each set was presented in replicate. The methods for aim 2 were the same as above, except the subjects wore a nose clip while tasting the samples to prevent any of the aromas from impacting the subjects' ratings. The goal was to measure how much of the sweetness came from taste and how much was from the aroma compounds present. There were 7 sessions: 1 for training, 3 for unpinched-nose ratings, and 3 for pinched-nose ratings. Data was analyzed using ANOVA and a post-hoc means separation test dictating if honey was significantly sweeter than sugar and at which concentrations.

EFFECTS OF SLEEP EDUCATION ON COLLEGE STUDENTS

Presenter(s): Suzy Gadd
Nutrition & Food Science
Mentor(s): Robin Tucker (College of Agriculture & Natural Resources)

Background: University students who suffer from sleep difficulties were asked to complete a six-week program delivered by certified peer educators over Zoom. The goal of the program was to improve overall sleep quality and quantity by changing sleep behaviors. Methods: Students currently studying in a university setting were asked to complete the program. Before beginning the program the students completed a survey including 1) sleep quality, measured by the Pittsburgh Sleep Quality Index (PSQI); 2) sleep duration, extracted from the PSQI; and 3) anxiety levels, measured by the Generalized Anxiety Disorder-7. Anxiety was assessed because anxiety is likely to cause sleep issues, and the course covers techniques to manage anxious thoughts before bed. Participants were then asked to complete this survey again upon completion of the six-week program, in order to measure effectiveness. Paired t-tests were used to assess significance. Results: 32 participants

(10 males) completed the course. After completion, the participants experienced significantly improved sleep duration ($p = 0.006$), a reduction in maladaptive sleep hygiene behaviors ($p < 0.001$), an increase in sleep quality ($p<0.001$), and reduced generalized anxiety ($p = 0.020$). Conclusions: This study demonstrates the effectiveness of the six-week virtual sleep program, delivered by peer educators, in improving sleep duration, sleep quality, sleep hygiene behaviors, and generalized anxiety in university students.

THE RELATIONSHIP BETWEEN FIBER INTAKE AND GUT BACTERIAL DIVERSITY AND COMPOSITION DURING THE THIRD TRIMESTER OF PREGNANCY

Presenter(s): Jillian Ladouceur
Nutrition & Food Science
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Based on the Dietary Guidelines for Americans, women in their third trimester of pregnancy should be consuming a minimum of 34 grams of fiber per day. It is known that a high fiber diet during pregnancy is associated with health benefits. It is unknown if a high fiber diet is associated with a specific bacterial composition of the pregnancy gut microbiota. The goal of this research is to determine whether there is a link between a high fiber diet and gut bacteria in pregnant women during their third trimester of pregnancy. Stool samples and fiber surveys were collected from 52 women. These fiber surveys assessed the daily intake for a variety of fiber rich foods. Fiber intake was calculated, based on survey responses, in grams per day. Genomic DNA was extracted from stool samples, and PCR was performed to amplify the V4 region of the 16S rRNA gene. The resulting amplicon libraries were submitted for 16S rRNA gene sequencing. The sequencing data was used to calculate gut bacterial alpha and beta diversity. The calculated levels of fiber intake will be analyzed in association with gut bacterial characteristics to determine how fiber intake is associated with bacteria in the gut. These results will allow us to determine if there are benefits of consuming a high fiber diet on the pregnancy gut microbiota.

THE RELATIONSHIP BETWEEN BACTERIAL BUTYRATE PRODUCING GENES AND DIETARY FIBER INTAKE DURING THE THIRD TRIMESTER OF PREGNANCY

Presenter(s): Lindsay Schwartz
Nutrition & Food Science
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

The Dietary Guidelines for Americans recommend that women in their third trimester of pregnancy consume a high fiber diet ranging from 34-36 grams of fiber per day. High fiber intake is encouraged among pregnant women due to the benefits that fiber has during pregnancy such as decreasing the risks of constipation and preeclampsia. Increased fiber also promotes an increase in butyrate production. Increased butyrate production leads to a higher concentration of short chain fatty acids which has an overall positive effect on the gut. The objective of this research is to determine whether women in a Michigan cohort are meeting the recommendations for dietary fiber in their third trimester of pregnancy and to assess whether there is an association between dietary fiber intake and the Faecalibacterium prausnitzii and Roseburia sp. genes for butyrate production. 52 pregnant women submitted dietary fiber surveys using the National Cancer Institute 5 factor screener. Fiber intake was calculated based on survey responses. We observed the fiber intake of participants in this cohort to be below the recommendations. To quantify the amount of Faecalibacterium prausnitzii and Roseburia sp. genes for butyrate production, qRT-PCR was performed. A test of normality, correlation tests, and a test to compare between those meeting versus those failing to meet the recommendation will be performed with this data to determine if there is an association between fiber intake and genes for butyrate production. These tests will determine whether there is an association between fiber intake and butyrate production in pregnant women.

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): Rachel Vanduinen
Nutrition & Food Science
Mentor(s): Jenifer Fenton (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. 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. Total fatty acids were highest in May (20.1 ± 3.9 g per 100 g fresh yolk) and decreased over the year ($p<0.001$). Total saturated, monounsaturated, and polyunsaturated fatty acids were significantly different by month ($p<0.001$). Total omega-3 fatty acids were higher in May compared to the mid-summer and late fall months, and the n-6:n-3 ratio was lower in the early summer and fall compared to July ($p<0.001$). Oleic acid content was highest in the month of May (8.1 ± 1.7 g per 100 g fresh yolk; $p<0.001$). Finally, ALA and DHA content were higher in the early summer, decreased over the summer months, increased again in the late fall, and then decreased in December ($p<0.001$). This study demonstrates significant changes in the fatty acid profile of pasture-raised eggs across the growing season relevant to consumers purchasing pasture-raised eggs in this region.

PEAPOD-2: A PREGNANCY DIET INTERVENTION FOR WOMEN WITH CLASS III OBESITY

Presenter(s): Yash Khiraya
Nutrition & Food Science
Mentor(s): Sarah Comstock (College of Agriculture & Natural Resources)

Dietary intervention during pregnancy potentially positively influences the development of the pregnancy gut microbiome. Our objective is to build upon the results of the PEAPOD Feasibility study by assessing the impact of a food intervention, designed to elevate vegetable and fiber intake, on pregnant, women with Class III obesity (BMI > 40). Participants will be enrolled (N ~30) from a prenatal care clinic located in rural Michigan during mid-pregnancy. The food-based intervention will focus on providing vegetables and high fiber foods. Stool samples, surveys, and dietary assessments will be collected from each participant at baseline (around 22 weeks gestation) and again 1 and 2 weeks after initiation of the dietary intervention. The aim of this study is to contribute to the existing body of knowledge on the impact of a diet intervention during the second half of pregnancy on maternal gut microbiomes and assess whether women with Class III obesity in the second half of pregnancy follow through with a dietary intervention by comparing the baseline and post-intervention data.

PHARMACOLOGY & TOXICOLOGY

PER AND POLYFLUORINATED SUBSTANCES DYSREGULATE GAP JUNCTIONAL INTERCELLULAR COMMUNICATION

Presenter(s): Jamie Liebold
Pharmacology & Toxicology
Mentor(s): Brad Upham (College of Human Medicine)

The selection of gap junctional intercellular communication (GJIC) as an endpoint is a significant step in developing a systems-based in vitro model to assess the toxic potential of environmental contaminants, as this biological phenomenon is crucial for integrating signaling mechanisms within cells with that of neighboring cells in a tissue and is an important early-stage event in abnormal cell proliferation. Thus, we are determining the effects of per and polyfluorinated substances (PFAS) on GJIC, which are major environmental contaminants. I am using the well-established "scalpel load - dye transfer" assay to assess GJIC as a function of dose and time and comparing the dose response results with the lab's newly established high throughput screening (HTS) assay. Both assays used an in vitro cell model of liver oval cells, a bipotent stem/progenitor cell that give rise to hepatocytes and hepatic biliary duct cells and self-renew. The new HTS depends on a subset of donor and subset of receptor cells where the donor cells are stably transfected with the iodide transporter gene and the acceptor cells with the yellow fluorescent protein (YFP) gene. The addition of iodide initiates the bioassay by entering the donor cells via the iodide transporter, and then transfers through gap junctions to the receptor cells, in which iodide quenches the YFP-fluorescence. Closed or partially closed gap junction channels prevents or partially prevents quenching in the receptor cells from iodide. My results will help validate the new HTS assay system and provide crucial data for assessing the toxicity of PFAS.

SEM IMAGING OF FIBRIN(OGEN)

Presenter(s): Evan Madden
Pharmacology & Toxicology
Mentor(s): Carl Boehlert (College of Engineering), James Luyendyk (College of Veterinary Medicine), Per Askeland (College of Engineering)

ibrinogen is a soluble protein found in blood plasma and produced in the liver. When injury occurs, fibrinogen is converted to its insoluble form, fibrin, by thrombin to form clots. The structures of these clots are impacted by a number of proteins. However, in this experiment, basic clots were produced. Human fibrinogen was clotted with bovine thrombin to establish a baseline for protocol and a reference for fibrin clot scanning electron microscopy (SEM) imaging. The clots were studied in vitro via SEM. Clots are expected to include fibrinogen polymerization and cross linking by the protein Factor XIII (FXIII). Future directions for this project include incorporating other proteins anticipated to affect clot structure. Transglutaminase (TG2), predicted to increase cross linkage, will be prioritized for future studies.

PROGRESSION AND PERSISTENCE OF LUNG INJURY IN DIABETIC MICE REPEATEDLY EXPOSED TO OZONE

Presenter(s): Anna Skedel
Pharmacology & Toxicology
Mentor(s): Jack Harkema (College of Veterinary Medicine)

Epidemiological studies suggest that people with metabolic diseases are particularly prone to adverse health effects of air pollution. We recently reported that diabetic KKAy mice have more severe lung injury than nondiabetic C57BL/6 mice after repeated exposures to ozone, a common gaseous air pollutant. In the present study we further elucidated the progression of ozone-induced lung injury and resolution in KKAy mice as compared to C57BL/6 mice. Male mice of both strains were exposed to 0 or 1 ppm ozone for 4, 8 or 12 consecutive weekdays, 4 h/day, and euthanized 1-day postexposure (PE). Another group of these mouse strains were exposed for 12 weekdays but sacrificed 26 d PE (recovery group). Lung tissue was prepared for light microscopic, immunohistochemical and morphometric analysis. Minimal lung lesions were present in ozone exposed C57BL/6 mice. Lesions were restricted to centriacinar regions and resolved by 26 d PE. In contrast, ozone exposed KKAy mice had multifocal, necrotizing alveolitis that expanded beyond centriacini to more distal alveolar parenchyma. There was a time dependent increase in severity of alveolar histopathology that included necrosis and loss of alveolar type I epithelial cells, influx of eosinophils, fibrin accumulation, hemorrhage, proliferation of alveolar type II epithelial cells and alveolar transitional epithelial cells, and interstitial fibrosis. KKAy recovery mice had resolving yet persistent epithelial, inflammatory, and interstitial lung lesions. These findings give biological plausibility to the epidemiologic suggestion that people with diabetes are particularly susceptible to health effects of air pollution.

DOSE-DEPENDENT LUNG INJURY IN DIABETIC, COMPARED TO NONDIABETIC MICE, EXPOSED TO OZONE

Presenter(s): Jenan Shareef
Pharmacology & Toxicology
Mentor(s): Jack Harkema (College of Veterinary Medicine)

People with metabolic diseases are particularly prone to adverse health effects of air pollution. We recently reported that diabetic KKAy mice have more severe lung injury than nondiabetic C57BL/6 mice after repeated inhalation exposures to 0.5 ppm ozone, a common encountered gaseous air pollutant. In the present study we determined dose-dependent sensitivity of KKAy and C57BL/6 mice to repeated inhalation exposures to ozone. Male mice of both strains were exposed to 0, 0.25, 0.5 or 1 ppm ozone for 4 consecutive weekdays, 4 h/day, and euthanized 1-day postexposure (PE). At necropsy, bronchoalveolar lung lavage fluid was collected for inflammatory cell counts, and lung tissue was prepared for light microscopic, immunohistochemical and morphometric assessment of ozone-induced histopathology. Minimal ozone-induced inflammation and tissue injury were present in the lungs of the nondiabetic C57Bl/6 mice at all exposure doses. In contrast, dose-dependent increases in the severity of cellular inflammation and tissue injury (mild, moderate to marked lesions with increased ozone concentrations) were present in the lungs of diabetic KKAy mice. These findings give biological plausibility to the epidemiologic suggestion that people with diabetes are particularly susceptible to health effects of air pollution. Biologic mechanisms responsible for greater sensitivity to ozone toxicity in the lungs of diabetics are yet to be determined.

THE ROLE OF ARYL HYDROCARBON RECEPTOR IN MODULATING STATIN SENSITIVITY IN AHR-NULL HEPATOMA CELLS

Presenter(s): Zach Dhaem
Pharmacology & Toxicology
Mentor(s): John LaPres (College of Natural Science)

Hypercholesterolemia, obesity, and non-alcoholic fatty liver disease (NAFLD) have increased in the US population to epidemic proportions. NAFLD increases the risk for cardiovascular disease, type II diabetes, and hepatocellular carcinoma. Epidemiological and rodent studies have linked NAFLD progression and cholesterol dysregulation with exposure to environmental pollutants such as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). TCDD is the most potent ligand for the aryl hydrocarbon receptor (AHR). The AHR is a ligand-activated transcription factor that regulates many genes including 3-hydroxy-3-methlglutaryl coenzyme A reductase (HMGCR), which encodes the rate-limiting enzyme of cholesterol synthesis and may be important for TCDD-induced liver injury. HMGCR is a therapeutic target of statins, a class of drugs that are used to treat NAFLD. Previous experiments found that Hepa1c1c7 AHR-null cells died faster after statin treatment. We hypothesize that the AHR-mediates the effects of statins on the mitochondria because statins impact the production of farnesyl pyrophosphate and coenzyme Q, an important intermediate in ATP production in the mitochondria. The goal of this experiment is to elucidate the relationship between the AHR, the mitochondria, and statin sensitivity. To test this, we treated a mouse hepatoma cell line with TCDD and statins, and performed a staining assay using a panel of stains related to membrane potential. Results suggest that statins might be impacting the number of mitochondria in each cell. This study will have to be repeated to confirm these results but suggest that statins may be impacting mitochondrial viability. Future experiments will include stain panel optimization and assessing ATP production in treated cells.

BEHAVIORAL PHENOTYPE OF A MOUSE MODEL OF THE VOLTAGE-GATED SODIUM CHANNEL PATIENT VARIANT SCN1B-P.R89C

Presenter(s): Bryana Sandy
Pharmacology & Toxicology
Mentor(s): Samantha Hodges (University of Michigan)

Developmental and Epileptic Encephalopathies (DEEs) are a class of severe pediatric epilepsies with a broad range of severities. In addition to epileptic seizures that onset in early childhood, patients with DEEs clinically present with developmental delays and cognitive and behavioral impairments. Individuals with DEEs are also at an increased risk of Sudden Unexpected Death in Epilepsy (SUDEP.) In patients, variants in the scn1b gene, which encodes for the β1 subunit of the voltage-gated sodium channel, have been linked to several DEEs, including the scn1b-p.R89C variant. The scn1b-p.R89C variant arises from an arginine to cysteine missense mutation located on the immunoglobulin loop of β1 at the 89th amino acid position. The Scn1b-p.R89C mouse model is the first mouse model of this exact patient variant. As this is a non-fatal mutation, Scn1b-p.R89C mice are able to live normal lifespans allowing us to characterize their behavior. Just as in patients, Scn1b-p.R89C mice present with spontaneous seizures, which is characteristic of epilepsy. Our goal is to characterize the behavioral phenotype of these mice to identify additional behavioral and cognitive deficits that would be indicative of a DEE. Characterizing the Scn1b-p.R89C mouse model will help in better understanding the clinical presentations of patients with this exact variant, and ultimately aid in the discovery of future therapeutic drug targets for patients with DEEs.

ACUTE AND LONG-TERM HEMATOLOGICAL CHANGES FROM DERMAL EXPOSURE TO MUSTARD VESICATING AGENT IN MURINE MODELS

Presenter(s): Ellen Kim
Pharmacology & Toxicology
Mentor(s): Neera Tewari-Singh (College of Osteopathic Medicine)

Sulfur mustard (SM) and nitrogen mustard (NM) are vesicating agents that cause severe toxic effects, inflammation to the skin, and systemic toxicity when absorbed through the skin for which there are no approved therapies. Previous studies from acute exposures have shown that SM and NM cause toxic effects to the hematological cells and the bone marrow; specifically, it has been reported that victims of SM-exposure show initial leukocytosis, and later develop leukopenia. However, the long-term hematologic effects of skin vesicant exposure have not been fully characterized and investigating these effects can further our understanding of the mechanisms of mustard vesicant induced long-term toxicity related to systemic effects. Male C57BL/6 mice were topically exposed to 0.5 mg or 1.0 mg of NM in 100 μL of acetone or acetone alone (control). NM-exposure resulted in skin injury with significant increases in the skin bi-fold thickness, edema, necrosis, erythema, and long-term wounds. The mice were sacrificed at day 1, 7, 14, and 28 post NM-exposure. Blood was collected and analyzed using the IDEXX ProCyte Dx Hematology Analyzer. Our results indicate that NM exposure caused transient toxic effects to the bone marrow which recovered over the subsequent days/weeks. 0.5 mg NM caused lymphopenia, and decreases in eosinophils, RBCs, hemoglobin, and reticulocytes 1-day post-exposure. Lymphocytes and eosinophils recovered at 28-day post NM-exposure. 1.0 mg NM-exposure also caused similar decreases in blood cells with an additional decrease in monocytes; however, recovery was not observed with the higher NM dose. Increase in neutrophils was observed post 0.5 mg and 1.0 mg NM-exposures. Our results indicate that cutaneous NM induces hematologic toxicity which could be involved in NM-induced inflammatory responses and long-term illnesses. Furthermore, our results through mouse models support findings of bone marrow depression, immune suppression, infection, and toxicity reported in war victims of real-world SM exposures. Further investigations are being carried out in these murine models to fully characterize the hematologic toxicity and related mechanisms for identifying effective countermeasures against toxic effects from mustard vesicant skin exposures.

ENGINEERING A SOLUTION TO SEX DIFFERENCES IN DISEASE: USING DATA TO UNMASK FUTURE NEEDS

Presenter(s): Sophie VanderWeele
Pharmacology & Toxicology
Mentor(s): Jeremy Prokop (College of Human Medicine)

Sex differences in diseases in an emerging field and scientific discoveries are made daily, forcing scientists to reevaluate our understanding of female physiology. These discoveries are impacting areas such as immunology, epigenetics, and more. However, we continue to see discrepancies in public databases that limit researchers. An analysis of clinical trials reveals the difference in active studies between male and female-centric studies. Data reveals the staggering differences between the sex of samples for one of the most widely used public genomic insight platform. Although the samples from male to female differ significantly, current findings only reveal the possibilities that a less skewed database could provide. Findings focused on showing that X-chromosome inactivation (XCI) and more specifically, X-inactive specific transcript (XIST) has high variability between tissue types and samples. This indicates that the cellular function and regulation between sexes might be more complicated than previously thought.

PHYSICAL SCIENCES

PETROGENETIC CHARACTERIZATION OF VOLCANIC ROCKS IN THE SOUTHERN MAIN ETHIOPIAN RIFT AT THE NORTHERN ABAYA AND CHAMO LAKES REGION

Presenter(s): Julia Rudlaff
Physical Sciences
Mentor(s): Tyrone Rooney (College of Natural Science)

The Main Ethiopian Rift (MER) is a portion of the East African Rift System (EARS) that connects the Afar depression to the Turkana depression. The MER is an ideal study area within the EARS because of the rich volcanic record that can be used to study the relationship between the breakup of a continent and magmatism. Here we explore on the most recent phase of rift development (less than 1 million years), where discrete zones of focused magmatic and tectonic activity are forming on the rift floor. For this study, eighteen basalts were collected in a region of the MER at the southern limit of one of these zones of focused magmatism. Whole rock geochemical analyses were performed on these samples using X-Ray Fluorescence. The data revealed two groups of basalts distinguished by contrasting behavior in TiO2 when compared with an index of magma differentiation. The high TiO2 group showed lower concentrations of Al, K and Nb, and higher concentrations of Fe, Mn, and P. The low TiO2 group showed Nb and Rb enrichment. The high TiO2 group consisted of samples that were from the northern portion of the sample region, along Lake Abaya, and the low TiO2 group consisted of samples collected from the southern portion of the sample region, along Lake Chamo. We examine the hypothesis that contrasting behavior of magma evolution in the crust in these two regions creates the observed heterogeneity: crystal fractionation in the north, and magma mixing in the south.

QUANTITATIVE IDENTIFICATION OF NONPOLAR PERFLUOROALKYL SUBSTANCES BY MASS SPECTROMETRY

Presenter(s): Lindsey Dejesus
Physical Sciences
Mentor(s): Marcos Dantus (College of Natural Science)

Per- and poly-fluoroalkyl substances (PFAS) comprise a group of thousands of compounds that undergo little or no degradation in the environment, hence the "forever chemicals" designation. The widespread use of these compounds and their longevity lead to bioaccumulation, presenting a hazard to humans and entire ecosystems. Among the characteristics that make PFAS identification difficult by standard electron-ionization mass spectrometry (EI-MS) are the strength of C-F bonds compared to C-C bonds. Identifying the >10,000 different man-made PFAS estimated to be present in the environment, in our food, and in our bodies, extremely challenging because the molecular ion is absent. Instead, we identify and quantify n-C5F12 and n-C6F14 in binary mixtures by analyzing small changes in abundances of the main fragment ions following femtosecond tunnel laser ionization, without the need of chromatographic separation. Additional time-resolved femtosecond ionization mass spectrometry reveals additional dissociation dynamics. These include coherent oscillations associated with the predissociation dynamics of the metastable molecular ion. Our findings indicate that femtosecond laser ionization may be a useful tool for identifying and quantifying mixtures of PFAS without the need of chromatography or high-resolution mass spectrometry.

LASER SPOT POSITION STABILIZING SYSTEM FOR LASER SPECTROSCOPY EXPERIMENTS

Presenter(s): Michael LeTarte
Physical Sciences
Mentor(s): Kei Minamisono (Facility for Rare Isotope Beams)

The BECOLA lab specializes in measuring the radius of short-lived isotopes using laser spectroscopy. Isotope beam and laser light are overlapped over a distance of a few meters to excite an atomic transition and measure fluorescence, from which information about the radius is deduced. Here, one of the difficulties is having a good overlap in such a precise way so that the atomic transition can be efficiently probed. Due to the small vibration and movement of mirrors used to transport the laser light, the laser light has a tendency to waver and fluctuate, which leads to imperfect alignment with the isotope beam. This causes inefficient excitation and inaccurate fluorescence detection as a function of the laser frequency. To counteract the fluctuation, a stabilizing system was installed. This stabilizing system is capable of correcting the displacement of the laser light position, and further counterbalancing it to keep it at a given position. In this poster I will discuss the effectiveness of the laser spot position stabilizing system.

CCD IMAGING OF A CRYOGENICALLY FROZEN KRYPTON FILM

Presenter(s): David Benkes-Toth
Physical Sciences
Mentor(s): Erin White (Facility for Rare Isotope Beams), Jaideep Singh (Facility for Rare Isotope Beams)

At the Facility for Rare Isotope Beams (FRIB), the Single Atom Microscope (SAM) project aims to investigate low-yield nuclear reactions relevant to nuclear astrophysics using an optical imaging technique. The prototype apparatus (pSAM) uses a cryogenically frozen noble gas film to capture product atoms and then uses a laser to induce fluorescence. Krypton and Rubidium will be used, due to their compatibility with the laser, to study the reaction Kr84(p,?)Rb85. Calibration measurements of the fluorescence will be conducted using a charged coupled device (CCD) camera to image Krypton and Rubidium codeposited on a sapphire substrate. The purpose of this project is to integrate a new, higher resolution CCD camera into the existing pSAM set up and achieve focused imaging of a Krypton film. A unique optical layout is required to capture clear and correctly framed images. Implementation of the new camera enables increased sensitivity needed to study the reactions of interest.

ELECTRON DETECTING AND SCINTILLATING DEVICE

Presenter(s): Claire Ardelean
Physical Sciences
Mentor(s): Wolfgang Mittig (Facility for Rare Isotope Beams)

My research project has been to design an electron detector.The electrons are produced by particles traversing thin foils. They are called secondary electrons; they can be used to localize the traversing particle in time and space. The electrons are accelerated and focused on the detector. The detector is composed of a scintillator that produces light flashes. The scintillator is optically coupled to a silicon photomultiplier. For the test, an alpha particles are sent through a foil into a silicon detector. The signal from the silicon detector will be used to observe the response of the silicon photomultiplier.

A NUMERICAL ANALYSIS OF THE MAXI J0556-332 NEUTRON STAR: IS A "HYPERBURST" PHYSICAL?

Presenter(s): Jonathan Kho
Physical Sciences

Mentor(s): Edward Brown (College of Natural Science)

Neutron stars, formed when a massive star's core implodes, are the densest observable objects in the universe. Many neutron stars accrete matter from a binary companion. The neutron star MAXI J0556-332 accretes intermittently; when accretion turns off the surface temperature of the neutron star can be measured. Following a period of accretion in 2011-2012, the surface temperatures were anomalously high. It was proposed that the neutron star experienced a new kind of thermonuclear explosion deep in its crust: a "hyperburst", caused by the unstable fusion of oxygen or neon at densities over 10 billion times that of water. Here I numerically model the outer layers of the neutron star and simulate the hyperburst by injecting heat at the expected location, computing the resulting effects, and comparing the predicted signatures of such a hyperburst with observations.

STUDYING THE DECAY OF EXOTIC COBALT NUCLEI

Presenter(s): Kyle Taft
Physical Sciences
Mentor(s): Artemisia Spyrou (Facility for Rare Isotope Beams)

In the field of nuclear physics, we study the behaviors of nuclei and how they are created. Nuclei are the tiny centers of atoms that define the elements on the periodic table. However, unlike how elements are defined only by the amounts of protons in the nucleus, we prefer to look at isotopes which are defined by both the amount of protons and neutrons. These isotopes are of particular interest when the combination of protons and neutrons is not stable, as they undergo processes to change their combination to become more stable. This process is the radioactive decay and it releases different types of radiation and different amounts of energy. Currently, our understanding of these unstable isotopes is incomplete, so experiments are crucial for building higher quality models. Michigan State University's Facility for Rare Isotope Beams (FRIB) is one such nuclear facility that conducts experiments to better understand these nuclei. In my project, I analyzed the energy of the gamma-rays emitted by the decay of 74Co through beta-decay, using experimental data to study the de-excitation.

UNRAVELLING THE MYSTERIES OF THE MOON'S FORMATION USING N-BODY SIMULATIONS

Presenter(s): Collin Dobson
Physical Sciences
Mentor(s): Seth Jacobson (College of Natural Science)

In this presentation, I will explore the methods through which I simulated the formation of Earth's moon. The moon has been the subject of fascination for much of human history. In general, It is generally accepted that the moon formed later in the formation of the Earth, around 140 Myr after the formation of the solar system, as the result of a singular large impact. This impact would have been off center, throwing a large amount of mass into a disc wrapping around the Earth. This cloud then accreted into the moon we know today. However, there is still debate as to when this impact would have happened, and many methods have been used to attempt to answer it, from element composition to n-body simulations. The method used in our research was the latter. High particle count simulations have been used to simulate the formation of the solar system to some success. This has given much insight into the early solar system, especially with the positions of the planets and what conditions would have had to be met in order for the current solar system to have formed. In our research, we assumed that the Earth-moon system was fully formed, and kept track of any and all close encounters with large bodies. Then, using another program determined if the encounter would have caused the Earth-moon system to be disrupted. This will give us a good estimate as to when the moon would have formed.

SEARCH FOR LOW-ENERGY PROTONS FOLLOWING THE BETA DECAY OF 32AR

Presenter(s): Logan Schaedig
Physical Sciences
Mentor(s): Christopher Wrede (College of Natural Science)

The decay of 32Ar is already one of the most thoroughly measured beta delayed proton emitters. We have acquired additional data on this decay using the Gaseous Detector with Germanium Tagging (GADGET) at the National Superconducting Cyclotron Laboratory (NSCL). The unprecedented sensitivity to low energy protons provided by GADGET's Proton Detector enables us to set upper limits on the intensities of unobserved protons between 200 and 600 keV. The limits can be used to improve nuclear structure models and precision constraints on fundamental symmetries in the weak interaction. The final results of the proton data analysis will be presented.

HOW INITIAL DUST CLOUD PROPERTIES TRANSLATE INTO THE FINAL COLLAPSED PLANETESIMAL SYSTEM

Presenter(s): Sanskriti Verma
Physical Sciences
Mentor(s): Seth Jacobson (College of Natural Science)

Investigating the formation of the first large objects called planetesimals, in the Solar System by studying properties within the protoplanetary disk and their effects on on the formation of said planetesimals. This will be done by simulating the gravtiational collapse of large dust clouds brought to a critical density via a hydrodynamical effect called, "streaming instability".

CONSTRAINING CHEMICAL TRENDS THROUGH EARLY RIFT DEVELOPMENT USING 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 System is the archetypal example of a plume-influenced continental breakup. The Turkana Depression (Kenya) provides an important window into how magmatism and rifting interact. In this investigation, we examined the

Kalakol basalts, a stratigraphically well-constrained magmatic sequence extending from 28 to 18 Ma. Specifically, we explored how the magmatic system responded to extension as the rift developed over this period using stratigraphically constrained observations on the geochemistry, rock textures, and mineralogy of the lavas. Mineral geochemical data was gathered from 8 samples throughout the sequence using a laser ablation inductively coupled plasma mass spectrometer. Pyroxene analyses revealed four unique chemical trends as time progresses in this magmatic system from the bottom, 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 suggest these observations reflect an initial magma chamber under equilibrium conditions that was followed by a period of crustal contamination within the chamber. The subsequent nickel enrichment occurs in samples with large and abundant olivine crystals, which we hypothesize were the initial stages of a new pulse of magmatism that then was followed by a period of magmatic resurgence, reducing incompatible trace element concentrations. We will test this model against the geochemical characteristics of olivine crystals from the same sequence of flows using similar methods.

NUCLEAR VIBRATIONS OF CADMIUM ISOTOPES

Presenter(s): Elijah Cole
Physical Sciences
Mentor(s): Vladimir Zelevinsky (College of Natural Science)

A nucleus is a quantum system made up of neutrons and protons. These neutrons and protons interact to create a force needed to keep the particles together. In the ground state, the nucleus will be spherical in shape, while low energy oscillations such as "quadrupole" and "octuple" can be egg shaped and pear shaped respectively. By tracking these oscillations, a correlation can be modeled and tracked down the periodic table or isotopes of a specific element. First, the energy levels of multiple cadmium isotopes will be plotted by using experimental data from the Brookhaven ENDSF database. These graphs will be compared to determine if there is a significant relationship between the different isotopes. Lastly, a ratio between the quantum levels will be analyzed to predict energy levels for each isotope. Final predicted value will be plotted as error alongside the gathered value.

OBSERVING GEOCHEMICAL TRENDS OF A CONTINENTAL FLOOD BASALT IN THE PELEKETCH REGION OF THE EAST AFRICAN RIFT SYSTEM

Presenter(s): Jessica Ruhukya
Physical Sciences
Mentor(s): Tyrone Rooney (College of Natural Science)

The Peleketch section is a series of continental flood basalt flows within the Turkana Depression (northern Kenya), and are an archetype of continental rifting (the East African Rift System). Continental flood basalts represent the precursor magmatic episode to the development of the EARS and provide evidence of initial destabilization of the continent. We collected bulk rock major element geochemical data on the flows using X-Ray Fluorescence and compared these data to a petrographic analysis of the flows to create a combined geochemical and petrographic stratigraphic column. We then created conceptual models explaining the temporal variance of data based upon magma chamber dynamics. The stratigraphic column was sub-divided into three pulses based on distinctive patterns: a gradual decrease in magmatic activity that ends in a silicic break within the first and second pulses, and a resurgent pulse of mafic magma within the third and youngest pulse. We reveal that the third pulse is a distinct magma type that is characterized by high concentrations of Sr and TiO_2. We explore the crystals contained within these flows for additional insights into the evolution of the system. Preliminary SEM imagery of selected olivine and plagioclase crystals within the flows shows potential zonation suggesting the temporal variation of the magma chamber dynamics may be preserved within the crystals. We will analyze the crystal zonation by laser ablation ICPMS to broaden our understanding of the magma chamber evolution within the Peleketch section and constrain the composition of magmas generated early in the rifting process.

ION SURFING AT THE FRIB: INVESTIGATING WIRE-CARPET PERFORMANCE IN THE ACGS

Presenter(s): Jose Moraes de Albuquerque Neto
Physical Sciences
Mentor(s): Antonio Camargo Villari (Facility for Rare Isotope Beams)

This poster displays the findings of an undergraduate research project ongoing at the Facility for Rare Isotope Beams (FRIB). The subject of this research is the wire-carpet apparatus currently utilized in the Advanced Cryogenic Gas Stopper (ACGS) to increase particle accelerator perfomance through quicker transport times and greater space charge mitigation. The stability of the ion paths in the ACGS was investigated using SIMION simulations as a function of buffer gas pressure, RF wave amplitude and frequency, and push field. The findings of this research contribute to the current efforts in improving ion transporting technologies.

INFLUENCES OF BACKGROUND ULTRAVIOLET RADIATION ON ION DENSITIES WITHIN THE CIRCUMGALACTIC MEDIUM

Presenter(s): Elias Taira
Physical Sciences
Mentor(s): Brian OShea (College of Natural Science)

The Circumgalactic Medium (CGM) is a large mass of gas that exists in the region just outside the disk of a galaxy. While they are not the most visible feature of a galaxy, they make up almost half of its baryonic mass (the parts of the galaxy that aren't dark matter) and play a vital role in the galaxy's evolution. Currently, in this field we often attempt to study this feature of galaxies via the use of simulations. As a part of this work, we take into account how the intensity of Ultraviolet Background (UVB) Radiation influences the observed ionization states. However, as the true nature of the UVB has yet to be fully characterized, we are often made to make a series of assumptions about the UVB. As these assumptions vary from author-to-author, this introduces a degree of uncertainty to the distribution of ionization states within the CGM. To estimate these uncertainties, we generate a series of ion densities under different assumptions about the UVB and quantify UVB-induced uncertainties based on the variation in the derived densities.

CHARACTERIZING CONTAMINANTS IN SNOW

Presenter(s): Ian Wettlaufer, Zackary Zeller
Physical Sciences
Mentor(s): Steven Safferman (College of Agriculture & Natural Resources)

This research project focuses on pollution caused by the accumulation of various contaminants found specifically in snow piles. It is well established that runoff from parking lots contains many often-toxic chemicals; meanwhile snow has an aptitude for 'sponging' up various atmospheric contaminants. The research done in this project will test snow piles for contaminants such as hydrocarbons, suspended solids, and other trace contaminants that are suspected to be present in snow based on existing research on snow's interaction with pollutants. This research is motivated by concerns for the potential rush of contaminants entering the river every snowmelt, and aims to discern if this is happening, and to what extent/ impact it may have. The information obtained will be used to improve locations and techniques for snow management, in order to minimize runoff that reaches the Red Cedar River.

EXAMINING EXOTIC NICKEL NUCLEI

Presenter(s): Owen James
Physical Sciences
Mentor(s): Artemisia Spyrou (Facility for Rare Isotope Beams)

One of the most important questions nuclear astrophysicists seek to answer is how the elements were created. An important part of answering this question is understanding the behavior of exotic radioactive isotopes that are synthesized in astrophysical environments. Nuclear physics concerns itself with the study of nuclei, the central component of atoms made up of protons and neutrons. We can study the decay of radioactive nuclei by observing the discrete units of energy, called gamma rays, that they release when they undergo radioactive decay. In this presentation, I will review my findings in my study of the decays of a radioactive neutron-rich isotope, nickel-75, and explain how I used data from a detector of the gamma rays emitted in the radioactive decay of this isotope to create a preliminary energy level scheme, which gives us insight into the internal structure of this exotic and poorly characterized nucleus.

AT THE MICROSCOPIC LEVEL: THE COMPOSITION OF SOLDER

Presenter(s): Geoffrey Rajesh
Physical Sciences
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)
The modern world runs on electronics. From a person's pocket to the International Space Station, electronics can be found just about anywhere and doing just about anything. These electronics are made up of circuit boards, wires, capacitors, resistors, and many more items, but without a metal alloy known as solder, things would fall apart. Solder is used in many different electronics to attach components to one

another. At room temperature solder is traditionally found as a thin metal wire, but when heated up using a soldering iron at temperatures such as 700 degrees Fahrenheit, the alloy melts and adheres to electrical components as it cools. But as the solder cools, it does not return to its original structure and rather becomes a globule of melted alloy. So what differences (if any) are present in unmelted solder versus melted solder? The purpose of this study is to determine at the microscopic level, using an SEM, to see if there are any physical differences at the microscopic level between melted and unmelted solder.

STUDY OF THE KEY RESONANCE FOR THERMONUCLEAR RUNAWAYS ON NEUTRON STARS

Presenter(s): Arian Andalib
Physical Sciences
Mentor(s): Christopher Wrede (College of Natural Science)

When a neutron star accretes hydrogen from a binary companion, a thermonuclear runaway may occur, producing X-ray bursts that can be observed with space-based X-ray telescopes. When temperatures of approximately 0.4 GK are reached, the 15O(α, γ)19Ne(p, γ) reaction sequence is predicted to be the initial pathway for breaking out from the Hot CNO hydrogen burning nucleosynthesis cycles. Then nuclei up to approximately mass 100 may be produced via the rapid proton capture process. The 15O(α, γ) 19Ne reaction is considered the critical bottleneck in X-ray burst nucleosynthesis. This presentation will focus on the GADGET II(Gaseous Detector with Germanium Tagging) detector which is comprises two main sub-systems: The GADGET TPC (Time Projection Chamber) and DeGAi (DEcay Germanium Array initiator). The GADGET TPC is a gaseous radiation detector that detects charged particles such as Alpha particles and protons. It also can distinguish multiple particle emissions and allow for 3D reconstructions of events in the detector. When the charged particle traverses the gas-filled TPC, the charge spreads as it drifts in an electric field and during amplification in the Micromegas readout. Successfully modeling the charge dispersion is essential for producing accurate simulations of the charged-particle decay tracks. Moreover, these simulations are needed to train convolutional neural networks that can be used for particle identification in rare event searches. DeGAi is an array of clover-shaped gamma-ray detectors surrounding the GADGET TPC in a 2 Pi array. The purpose of DeGAi is to assist us in clarifying the decay scheme and can be used as a diagnostic tool.

GRAIN SHAPE ANALYSIS OF MARS REGOLITH SIMULANT MGS-1 AND LUNAR REGOLITH SIMULANT LHS-1

Presenter(s): Brenna Bischer, Elisha Alemao, Shubh Gorantla
Physical Sciences
Mentor(s): Michael Velbel (College of Natural Science)

Martian Global Simulant (MGS-1) and Lunar Highlands Simulant (LHS-1) replicates regolith from Mars and the moon's highlands. Both were produced by Exolith Labs using crushed terrestrial rocks and minerals including anorthosite, glass-rich basalt, pyroxene, and olivine. By studying sand-size grains of the simulants and running tests on them, scientists can learn necessary information about the lunar and Martian surfaces before planning future missions. The information ensures that scientists can create a safe and successful mission plan and rover/equipment. To assist in collecting this information, we have analyzed Scanning Electron Microscope (SEM) images by looking for specific surface features and grain shapes that are prevalent among the grains. Information about common grain features of LHS-1 and Martian Global Simulant (MGS-1) SEM images and grain features are compared in order to get a more in-depth understanding of the lunar and Martian surfaces.

GRAIN SHAPE ANALYSIS OF MARS REGOLITH SIMULANTS MGS-1, MGS-1C, AND MMS

Presenter(s): Bryce Wert, Karthick Prem Satheesh Kumar, Rahul Vallurupalli
Physical Sciences
Mentor(s): Michael Velbel (College of Natural Science)

Simulants of Martian "soil" are used in a variety of ways to assist the research and development of future Mars exploration endeavors. Numerous simulants have been produced, each hoping to properly emulate the physical characteristics found in particular regions of interest in which current and future missions take place. The purpose of this research is to classify and analyze grain shape and other associated properties by measuring the dimensions of individual grains of Mars Global Simulant 1 (MGS-1), MGS-1C (clay mineral-bearing variant), and Mojave Mars Simulant (MMS). Each of these simulants was created using various methods that leave seemingly minor differences between them, which in reality can have large implications for the In Situ Resource Utilization (ISRU) methods of future missions. Forty to fifty images of these samples have been obtained by a JEOL 6610LV scanning electron microscope with measurements of each acquired manually to characterize shape, roundness-angularity (based on the Powers, 1953 criteria), and surface textures. Applications of this work, as well as ongoing research, will include examining the characteristics of simulants when mixed with cement for production of concrete for ISRU, with special consideration of the reactivity of each simulant during cement production. ISRU is an imperative aspect of future manned missions to Mars for extended periods of time. We are working to further classify the characteristics of each sample for before-and-after comparisons when used for producing cement.

MOLECULAR LEVEL UNDERSTANDING OF PFAS INTERACTIONS WITH SOILS

Presenter(s): James Hager, Libby Ashby
Physical Sciences
Mentor(s): Angela Wilson (College of Natural Science), Narasimhan Loganathan (College of Natural Science)

Per- and polyfluoroalkyl substances (PFAS) are a group of emerging contaminants of concern that have been detected in the environment due to their widespread use in various industrial and household products over the last six decades. The unique physical and chemical nature of PFAS provides them extreme stability towards degradation. Unfortunately, there is increasing evidence that exposure to PFAS can result in detrimental health impacts to human and animals. PFAS exposure can occur through air, water, soil, and sediments. In the present research, the behavior of PFAS molecules in surface soils and sediments has been investigated. Classical molecular dynamics simulations were performed to simulate the presence of PFAS in clay minerals, representing natural pH conditions. Our studies clearly indicate that the adsorption behavior of PFAS varies significantly between different clay minerals and is strongly dependent on the mineralogical composition and their structure. In addition, the magnitude and the location of the surface charge are critical in dictating the adsorption and transport of PFAS in soil environments. This insight about the behavior of PFAS molecules in soil environments will help to understand the extent of the spread of these molecules throughout the environment and enable suitable clean-up of PFAS contaminated sites.

CATALOGING ENGAGEMENT IN COMPUTATIONAL PRACTICES IN A HIGH SCHOOL PHYSICS CLASSROOM

Presenter(s): Jake Rodgers
Physical Sciences
Mentor(s): Danny Caballero (College of Natural Science), Laura Wood (College of Natural Science), Patti Hamerski (College of Natural Science)

Computing is becoming more present in physics classrooms but how teachers and students engage in computing is not well understood. To characterize ways of engaging in computation in a classroom, we focused on practices, the activities involved in doing physics, that students use while working on computing problems in high school physics classes. We examined student interviews that focused on normative and individual practices within high schools physics courses. The interviews had participants rank practices using paper note cards. Students were asked: 1) about their perspectives on the practices and important values of their classroom and 2) to identify what it means to be a good physics student and what an ideal physics classroom looks like. We coded the four interviews with students identifying where normative and individual practices were mentioned, and extrapolated overall classroom expectations based on what each student said. Then we analyzed the interviews to build an understanding of the harmonies and tensions between how students were expected to learn physics and how they actually engaged with the classroom activities. We also turned to an interview with the teacher to compare the students' perception of the classroom with the teacher's desired classroom environment. In this presentation, we will discuss similarities and differences in the practices students emphasized in their interviews, and compare those student perceptions with the classroom expectations as described by the teacher. We will discuss strategies based on this analysis to better implement computation-integrated physics into high school classrooms, without hampering student engagement and learning.

REMOVING DETECTOR RESPONSE FROM HIGH-RESOLUTION PHOTON DATA USING ML METHODS

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 determine gamma ray energies. Concretely, we run a Geant4 simulation to model a 36-clover Germanium detector. A 2D histogram consisting of energies deposited into all 36 clovers across many events is used as input for the machine learning model. The desired output is a plot with points indicating excitation and gamma ray energy. Ultimately, the ability to predict the energies of gamma rays from detector data offers new insights into how radioactive isotopes decay.

TRAINING A NEURAL NETWORK FOR TPC PARTICLE IDENTIFICATION

Presenter(s): Adam Jaros
Physical Sciences
Mentor(s): Christopher Wrede (College of Natural Science)

Neural networks can be used to automate the identification of rare events quickly and efficiently from a dataset, but they require a large, labeled training dataset beforehand. In this research project, simulations were tuned to assist in training a convolutional neural network (CNN) to be used for identifying the rare, theorized Magnesium-20 proton-alpha decay branch from data collected by the Gaseous Detector with Germanium Tagging (GADGET-II) detector at the Facility for Rare Isotope Beams (FRIB). The simulations were done with the ATTPCROOT framework, designed to simulate particle tracks in time projection chambers. The simulation parameters were adjusted to generate tracks that closely match the tracks seen in experimental data, and the impacts of parameter fluctuations on the CNN's performance was measured to determine its sensitivity and robustness. Using a CNN has shown promising results for accurately detecting these rare events. This research could enhance our understanding of the underlying physics of stellar x-ray bursts by allowing rapid quantification of rare nuclear decay branching ratios.

DESIGNING A SOURCE OF RADIOACTIVE MOLECULES FOR TESTS OF FUNDAMENTAL SYMMETRIES

Presenter(s): Joseph Noonan
Physical Sciences
Mentor(s): Jaideep Singh (Facility for Rare Isotope Beams), Jochen Ballof (Facility for Rare Isotope Beams)

A permanent electric dipole moment (EDM), a quantity which has never been observed, could help distinguish between different new models of particle physics and probe physics beyond the Standard Model. Heavy, highly deformed "pear-shaped" nuclei are expected to have large and potentially observable EDMs. These isotopes, which are typically radioactive, will be produced in abundance at MSU's Facility for Rare Isotope Beams (FRIB). The EDM3 experiment at FRIB intends to use Radium-225, which is known to have a pear-shaped nucleus. The experiment will embed RaF molecules into a frozen noble gas matrix, which will lock the orientation of the molecules, allowing us to search for the electric dipole moment with very high sensitivity. I am working on the design of the apparatus that will ionize and mass-separate an aqueous sample containing 225RaF. The apparatus will use octupole ion guides, an electrostatic deflector, and a quadrupole mass filter. I developed simulations in SIMION to determine the configuration that will guide the desired ions with minimal losses into a charge-exchange cell where they are neutralized and subsequently embedded into a cryogenic target.

DUNE: PROJECT SAYCHEESE

Presenter(s): Aditya Kalakuntla
Physical Sciences
Mentor(s): Kendall Mahn (College of Natural Science)

My research entails working on installing a camera system for object detection and tracking for the Deep Underground Neutrino Experiment (DUNE). As the name suggests, DUNE is an experiment designed to study neutrino oscillations with the help of two detectors, one being a Liquid Argon detector (ND-LAr) used for the detection of neutrinos and the production of light and charge data that it to be observed, and the Gaseous Argon Detector (ND-GAr), that helps constrain uncertainties and has a higher sensitivity to lower-energy particles. In order to measure the changes in flux of the neutrino beam, these detectors are placed on a set of Hillman rollers, but due to this there must be a system in place to alert the detector operators in case of an obstruction, for both the safety of personnel operating the detector and the detector itself. In order to enable this, I've working on a set of camera mounts which, when operational, can identify the type of object blocking the path of the detector and stop the movement of the detector accordingly.

ML DIMENSIONALITY REDUCTION APPLIED TO EMULATING NUCLEAR SYSTEMS

Presenter(s): Aaron Philip
Physical Sciences
Mentor(s): Kyle Godbey (Facility for Rare Isotope Beams), Pablo Giuliani (College of Natural Science), Witold Nazarewicz (Facility for Rare Isotope Beams)

A major challenge in computational science today is the poor scaling of computational time and resources in modeling complex phenomena with many degrees of freedom. One approach seeking to address this problem is called dimensionality reduction. The central principle is that of taking a system described by many degrees of freedom and finding a reduced number of parameters that can adequately describe the system. Techniques such as Principal Component Analysis, Dynamic Mode Decomposition, and Reduced Order Methods to name a few have been applied to great effect. With the advent of machine learning (ML), autoencoder ML models can learn to map high dimensional data to a lower dimensional manifold, capturing the most "descriptive" features. In this study, we utilize the Neural Implicit Flow ML structure recently designed to learn spatio-temporal dynamics by mapping high dimensional data to a lower dimensional latent space. We present the model's efficacy in learning the periodic dynamics of nuclei under a quadrupole moment. One major advantage of our approach is the mesh-agnostic nature of the network, allowing extremely efficient evaluation of spatial data at any required resolution at every snapshot. The model can learn from sparse data to learn the full-field evolution of the nuclear system at a significantly reduced computational cost. The model uses sparse measurements of the field to predict time derivatives and integrate the mesh forward in time. Not only is emulation computationally cheaper, but the model can interpolate in space and extrapolate in time from sparse data it was trained on.

UNDERSTANDING THE FORMATION OF TERRESTRIAL PLANETS

Presenter(s): Bernard Monteiro de Barros Leal
Physical Sciences
Mentor(s): Seth Jacobson (College of Natural Science)

There are various scenarios that describe planet formation, each predicting different levels of impact violence. One such scenario, called the Grand Tack, hypothesize that the giant planets, like Jupiter and Saturn, have a direct influence on shaping the inner part of the Solar System, exciting the orbits of protoplanets, which causes dramatic high-speed collisions between them. Other models lean towards a much milder growth process called pebble accretion, which is dominated by multiple small collisions between objects in the early Solar System, ranging from centimeters to meters of diameter. All these scenarios can reproduce what is observed in today's Solar System such as the orbits and masses of the planets and small body populations, like the asteroid belt. Our research's interest in on the formation of the atmospheres of those early planets since they are heavily influenced by the impacts that happen during the planets' growth. Therefore, the atmospheres' compositions work as a reflection of the different projectile environments for the growing terrestrial planets, allowing us to determine which formation model created a specific atmosphere. In this research, we analyzed the evolution of major atmospheric gases such as nitrogen, water vapor, and carbon dioxide, as planets grow in the different scenarios. The findings of this research contribute to the current efforts to improve our understanding of how Earth-like planets evolve, what their initial conditions looked like, and how the terrestrial planets of our Solar System may have formed.

IMPERFECT ACCRETION IN AN ASTROPHYSICAL SIMULATOR

Presenter(s): Ryan Copeland
Physical Sciences
Mentor(s): Seth Jacobson (College of Natural Science)

Accretion during the late stage of terrestrial planet formation is dominated by collisions between Moon-size to nearly Earth-size bodies. These collisions are not always perfect mergers because they often eject material from the colliding bodies. The projectile may even survive after an off-center impact. Impact outcomes are sorted into several different regimes by the relative impact velocity, the angle of impact, and the ratio of masses between the colliding objects. Depending on the type of collision, the post-impact mass of the target and the amount of material ejected can vary widely. Accounting for the large amount of debris generated in some impacts places a significant strain on CPU-only astrophysical simulators, so neglecting the debris is standard practice; however this may lead to inaccurate results. Here, we show an implementation of imperfect accretion in a GPU-enhanced astrophysical simulator and how different initial parameters result in different collision types. We expect an increase in the computation time as the simulation progresses due to debris generation. It may be that the inclusion of imperfect accretion into the simulator could have a negligible effect on the outcome if most of the debris is recombined soon after each impact, or this could be a significant way of depleting planetary mass and distributing it throughout the Solar System in a new population of smaller objects.

COUPLING SPH GIANT IMPACT MODELS WITH A MODIFIED SYMBA CODE TO SIMULATE LUNAR FORMATION

Presenter(s): Brenna Chetan
Physical Sciences
Mentor(s): Seth Jacobson (College of Natural Science)

The prevailing theory regarding the creation of our Moon is the giant impact hypothesis, which states that the Moon formed from a collision between early Earth and a Mars-sized planetary embryo. This impact led to the formation of a circumplanetary disk about the Earth consisting of ejected impact debris, and the Moon eventually accreted out of this disk. One current model of lunar formation is HydroSyMBA, a code that utilizes an N-body integrator for the outer accretion disk of a lunar forming region and a 1D hydrocode for the conditions of the inner disk. Although many strides have been made in numerically modeling lunar formation, one area that remains to be explored in detail is the coupling of actual simulated giant impact data with these numerical integrators. Recent smoothed particle hydrodynamics (SPH) models have been able to model the impact process itself at high resolutions, but they can only be run for a few hours of computational time due to the cost. However, the accretion of the Moon takes centuries to millennia. Thus,here we have utilized SPH giant impact models to receive input parameters needed for running the HydroSyMBA code. Our results will have applications beyond just replicating the Earth-Moon system, and by running this astrophysical N-body code on multiple kinds of impact SPH models we will gain a more extensive understanding of how specific impact models correspond to the final accreted Moons.

DATA ACQUISITION FOR THE CATHODE STALK TEST PLATFORM

Presenter(s): Darayus Daboo
Physical Sciences
Mentor(s): Sanghoon Kim (Facility for Rare Isotope Beams), Taro Konomi (Facility for Rare Isotope Beams), Ting Xu (Facility for Rare Isotope Beams), Walter Hartung (Facility for Rare Isotope Beams), Wei Chang (Facility for Rare Isotope Beams)

The superconducting radio-frequency (SRF) electron gun is attractive for the delivery of beams at a high bunch repetition rate with a high accelerating field. An SRF gun is the most appropriate injector for the high-energy upgrade of the Linac Coherent Light Source (LCLS II-HE), which will produce high-energy X-rays at a high repetition rate. An SRF electron gun is currently being developed for LCLS-II HE at MSU's Facility for Rare Isotope Beams. The radio-frequency cavity, which has the aim of accelerating charged particles, has an operating frequency of 185.7 MHz. The target accelerating field for the photocathode, which is located inside the cavity, is 30 MV/m. The photocathode is held by a fixture known as the cathode stalk which is designed for thermal isolation. The stalk must allow for cryogenic or room-temperature cathode operating temperature and direct current (DC) bias to inhibit multipacting. We prepared a test platform for the cathode stalk called "RF/DC Test Stand". The program is developed with the visual programming language LabVIEW. In this presentation, a four-steps cathode stalk test plan and corresponding features of the software will be presented.

A NEW APPROACH TO SYNTHETIC STELLAR SPECTRA: THE STARDIS RADIATIVE TRANSFER CODE

Presenter(s): Isaac Smith
Physical Sciences
Mentor(s): Wolfgang Kerzendorf (College of Natural Science)

Stars are one of our most important tools for studying the structure and history of the universe, and studying the light they produce allows us to learn crucial information about them. We introduce a new, open-source radiative transfer code, STARDIS, for the generation of synthetic stellar spectra. The code employs a comprehensive treatment of line broadening, continuum opacity, and raytracing, to accurately model the physics of stellar atmospheres. We provide an overview of the code, the physics behind it, and plots of the solar spectrum generated by STARDIS. Comparing output spectra with well-established codes allows us to identify where STARDIS is successful and where improvement is needed. Being an open-source code, STARDIS has the potential of being a powerful tool used across the astrophysics community.

COMPARISON OF SUPERNOVAE "BUBBLES" IN SIMULATED GALAXY TO OBSERVATIONS

Presenter(s): Brock Wallin
Physical Sciences
Mentor(s): Benjamin Wibking (College of Natural Science), Gerard Voit (College of Natural Science)

Supernovae are intense endings to the lives of large mass stars that eject a vast amount of matter and energy into the surrounding interstellar medium. The shockwave from these supernovae push back gas in the surrounding interstellar medium to form a "bubble" of space that has very little gas left inside. The way these bubbles affect the evolution and structure of galaxies is a point of interest, leading to the use of simulations to try to better understand the long-term effects the bubbles have on the galaxy. To better simulate these types of galaxies, we thus want to compare simulated results with actual observations of similar galaxies to see if long term evolutions match between the two. In this project, we look at a simulated spiral galaxy that has been ran for a simulated time of 1 billion years and measure and compare the size and frequency of supernovae bubbles to that of similar observed galaxies. We hope to use our results to better fine tune our simulations and to better understand galaxy evolution and structure as a whole.

IDENTIFYING BCGS IN ACCEPT 2.0 CLUSTERS

Presenter(s): Agrim Gupta
Physical Sciences

Mentor(s): Megan Donahue (College of Natural Science)

Brightest Cluster Galaxies (or BCG) include the most massive galaxies in the universe and usually lie in the geometric center of a galaxy cluster. The central galaxy of a cluster or group plays a very special role in how the cluster evolves and in how the most massive black holes in the universe grow and evolve. This project aims to identify the BCGs of over 600 clusters in the ACCEPT (Archive of Chandra Cluster Entropy Prole Tables) 2.0 database using various sky surveys such as DSS, SDSS, XMM etc. and verify their redshifts using NED and SIMBAD or published research papers. I also kept a journal where I recorded my notes for each cluster I analyzed and this proved to be useful if I wanted to ever revisit that cluster and would also be helpful to others reviewing my work or undertaking a similar project. Over 50% of the BCGs are unambiguous, meaning that the cluster has only one candidate galaxy to be a BCG, while others are ambiguous. These ambiguous BCGs include clusters with 2 or more candidates and even merging clusters. The results from this project will be used to study X-ray properties of a galaxy cluster, for example - identifying how many BCGs are coincident with the peak of the cluster X-ray emission. In a broader sense, the data collected from the manual identification of these BCGs can be used in Machine Learning to train AI, so that it would be possible to identify and rate the likelihood of many thousands to even millions of BCGs rather than hundreds.

A BEAM MONITORING SYSTEM FOR THE S2 VAULT USING THE RUTHERFORD SCATTERING PROCESS AND VALIDATION WITH GOLD FOIL

Presenter(s): Ebony Kaczander
Physical Sciences
Mentor(s): Paul Gueye (Facility for Rare Isotope Beams)

In the early 1900's, a scientist named Ernest Rutherford conducted an experiment that changed the very foundations of our understanding of the atom. He shot a beam of alpha particles toward a thin sheet of gold foil and recorded the scattering angle. During Rutherford's time, the atom was believed to have its components equally distributed. However, Rutherford's results showed that there was deflection mainly in the center. This led to the idea that atoms contain most of their mass in their centers, which are now called nuclei. Although this experiment was done over a hundred years ago, it can still help us understand the structure of various atoms, which in turn, helps us better understand the properties of those atoms. This is directly linked to our research conducted at the Facility for Rare Isotope Beams (FRIB). We will first carry out two sets of experiments each with a different foil, gold and aluminum. This presentation will provide an overview of the former, including comparison with a python prediction. In a second phase, we will design a detector to obtain information about incident ion beams on the target that undergo a Rutherford-scattering (elastic) process. These events will allow us to monitor the beam and normalize various experiments held in the S2 vault against each other. Additionally, we will provide an update about the status of this project.

MONA SWEEPER OPTIMIZATION

Presenter(s): Jared Bloch
Physical Sciences

Mentor(s): Paul Gueye (Facility for Rare Isotope Beams)

The MoNA Collaboration has been conducting experiments over the past two decades at the then National Superconducting Cyclotron Laboratory (NSCL) and is poised to expand its scientific program with the upcoming Facility for Rare Isotopes (FRIB), both located in East Lansing, MI. The Collaboration primarily focuses on the study of unbound isotopes along the neutron drip line using the invariant mass technique that requires measuring the momenta and kinetic energies of the decay products (e.g., neutrons and fragments). For the fragments, the process requires to measure their (X,Y) positions and (QX,QY) angles after passing through a large gap dipole magnet. This information is obtained from two cathode readout drift chambers (CRDCs). The magnetic field is modeled with a matrix that permits to reconstruct the position, angle and energy of each event back to the production target. An effort has recently been made to optimize the matrix elements of this optical matrix to improve the reconstructed kinematics (position, angle, energy) using a dedicated data set acquired with a mask housing a specific hole pattern at the target location. Two approaches are being conducted in parallel for this project: one uses an iterative minimization technique using the ROOT data analysis framework and the other a machine learning algorithm using the NumPy python libraries. This presentation will provide a status report on the latter.

DEPENDENCE OF THE TOP-QUARK MASS MEASURED IN TOP-QUARK PAIR PRODUCTION ON THE PARTON DISTRIBUTION FUNCTIONS AT THE LHC AND FUTURE COLLIDERS

Presenter(s): Jarrett Fein
Physical Sciences
Mentor(s): Reinhard Schwienhorst (College of Natural Science)

The dependence of the top-quark mass measurement in top-quark production on the parton distribution functions is explored through differential distributions in tt and ttj production at hadron colliders. Several different proton-proton collider options are considered: 8 TeV, 13 TeV, 13.6 TeV, 14 TeV, and 100 TeV. The top-quark mass is obtained from a chi-squared fit to the invariant mass of the top-antitop-quark pair. Parton distribution function uncertainties are used in the chi-square evaluation, and these uncertainties are reduced through a fit to rapidity and longitudinal momentum distributions.

A NEW METHOD TO SOLVE QUANTUM BOUND STATE PROBLEMS BY EXTRAPOLATING FROM LOW-RANK SOLUTIONS

Presenter(s): Kenneth Sun
Physical Sciences
Mentor(s): Xilin Zhang (Facility for Rare Isotope Beams)

In quantum physics, interactions between particles can be modeled with matrices, and solving a bound state problem reduces to a linear algebra problem. Under realistic conditions for a large nucleus, the size of the matrix far exceeds computational capacity, so new methods are needed to make this calculation feasible. In our approach, we first obtain approximate, low-rank models of the real model using singular value decomposition, then use solutions of the low-rank models as a basis set to construct the solution of the actual model. Amazingly, the results from this procedure are far more accurate than each of the individual approximate solutions, and is less computationally intense than solving the original problem directly.

PLANT SCIENCES

PRELIMINARY ANALYSIS OF ROOT TRAITS IN ERAGROSTIS TEF GROWTH IN A MICHIGAN CLIMATE

Presenter(s): Dilyn Heslinga
Plant Sciences
Mentor(s): Miranda Haus (College of Agriculture & Natural Resources)

Eragrostis tef, commonly referred to as teff, is an under-researched crop primarily grown in Ethiopia as a staple grain. Teff is often grown in marginal soils with little fertilization, yet it has exceptional iron, calcium, and fiber content; as well as being a great gluten-free option. It has recently seen exponential growth in production in the United States as an alternative grain and forage crop due to its superior nutritional quality, cultural significance, and climate resilience. A teff diversity panel was grown at the Michigan State University Horticulture Teaching and Research Farm in summer of 2021 and 2022. Each genotype was grown in three separate plots and three plants within each plot were collected at the flowering stage. Roots were imaged during sampling and root architecture was evaluated using Digital Imaging of Root Traits (DIRT). Root, shoot, and panicle dry biomass were also collected. Data were analyzed in R. A wide range of variation in root tip diameter, root tip paths, and root mass was found among subpopulations indicating genetic diversity within the data set. We found environmental factors have a large effect on root architecture. Using these data, along with field data from successive plantings will provide useful information that fuels detailed research for use in crop development and breeding. Further research is being done on the early root growth of various lines for developmental comparison.

STICKY SITUATIONS: ASSESSING SEED MUCILAGE OF AIZOACEAE

Presenter(s): Olivia Beebe
Plant Sciences
Mentor(s): Vincent Pan (College of Natural Science)

Seed mucilage is an extremely common trait in angiosperms, including members of the Aizoaceae family. When wetted, mucilage is released from seeds and binds them strongly to substrates. We hypothesize that this trait helps many members of the Aizoaceae family to establish on cliff-sides as has been often observed in their native range of South African and Namibian deserts. We characterized the stickiness of the seed mucilage of 76 accessions of 27 Aizoaceae species and related their stickiness to the climate conditions of their home range. We also examined how well the seeds withstood 13 days of periodic misting without dislodgement from a vertical surface. Upon examination, we discovered the seed mucilage of Aizoaceae has an unusual appearance that resembles small knobby projections, different from the mucilage of other plant families. Results from two stickiness assays indicate that seeds from windier and wetter areas were significantly less sticky and were more likely to dislodge from a vertical surface. Since seeds from dryer areas were stickier, it is possible that the mucilage could be an adaptation for something other than allowing the seeds to attach themselves on rough terrains. Based on the experimental outcome, our hypothesis was most likely incorrect. These results help bring a greater understanding of Aizoaceae members and their mucilage and may aid in the conservation of these plants by identifying what seeds are vulnerable to which climatic characteristics.

SALINITY STRESS IMPACTS SWEET PRODUCTION AND CONCENTRATION IN KITAAKE RICE

Presenter(s): Charlotte Anker
Plant Sciences
Mentor(s): Eva Farre Prokosch (College of Natural Science), Tammy Long (College of Natural Science)

The bacteria Xanthomonas oryzae pv. oryzae (Xoo) is responsible for infecting and killing rice, a significant food crop, around the globe. It does this by hijacking the plants' sucrose transporters, SWEETs, to force the plant to export sugars to the extracellular space where the bacteria can access it. To combat this, resistant strains of rice have been engineered by removing the coding regions for different SWEET proteins (called a knock-out mutant) so the bacteria cannot successfully infect the rice. These alterations don't impact the function and health of the plant under normal conditions, but it is unclear how these mutants will behave in stress conditions. Salinity stress, or stress a plant experiences due to high salt levels in its surroundings, is a common issue in areas of rice production and so it is important to consider how these mutant rice strains will respond. To learn the effect that SWEETs have on the response to salinity stress, we observed how the movement of sucrose via SWEET proteins changes in response to salinity stress in both wild type and mutant strains of Kitaake rice. This was done through monitoring concentration of SWEETs by tagging the proteins with another protein for dyeing (GUS) and by measuring phenotypic changes in the knock-out mutants. Results show that only one of the six SWEETs, SWEET12, might serve an important role in salinity stress response and so might not be a good candidate for removal to create Xoo resistance.

FUNCTIONAL CHARACTERIZATION OF GENES ASSOCIATED WITH SPORE GERMINATION IN FUSARIUM GRAMINEARUM

Presenter(s): Zoe Zeluff
Plant Sciences
Mentor(s): Frances Trail (College of Natural Science), Soumya Moonjely (College of Natural Science)

Fusarium graminearum is a pathogenic fungal species that occurs in cereal crops like wheat and barley, causing Fusarium Head Blight (FHB), that negatively affects these crops. To do this, the fungi germinate asexually (conidial germination) on the host surface- a critical life stage for the survival of the fungi. This project focuses on the disruption of targeted genes- suspected genes were selected through the examination of phenotypic expression in ancestral lineages. Genes that were suspected to play a role in germination in these ancestral lines are being examined in Fusarium graminearum. By disrupting the targeted genes through the insertion of Hygromycin B- an antibiotic - we can examine if there are differences in phenotypic expression related to conidial germination in Fusarium graminearum. The main questions of this experiment are (1) does the deletion of the targeted genes alter the germination rate and pathogenicity of F. graminearum? and (2) does the deletion of selected genes affect other features such as growth rate and conidiation? The answers to these questions could help us to further understand how spores are able to survive in harsh conditions and still be able to germinate.

PHOTOSYNTHETIC SCREEN OF COWPEAS UNDER PHOTORESPIRATORY CONDITIONS

Presenter(s): Joy Li
Plant Sciences
Mentor(s): Jianping Hu (College of Natural Science)

Photosynthesis is a critical pathway for plants to generate their own food source. However, photorespiration (PR) is another metabolic pathway that occupies the key enzyme RuBisCO, whereby energy is traditionally thought to be "wasted" as photorespiration in a biochemical sense appears to run photosynthesis in reverse. It is now understood that photorespiration is not necessarily a useless evolutionary vestige and does provide functional photoprotection (and immune response!). However, there is a tradeoff between the photoprotection provided by photorespiration and plant growth from photosynthesis as plants have to dynamically decide how to allocate their energy and metabolic resources. Cowpeas as a major agronomical crop, under conditions where photoprotection from PR is necessary (such as high light and high temperature) may trade off their photosynthetic capability in order to sustain natural growing conditions. This alone makes it important to better characterize the genetic bases of how PR and PS work in conjunction for these critical agronomic crops. Here, I characterize some of the natural variations in photosynthesis efficiency in cowpea germplasms under photorespiratory conditions, with hopes of better elucidating the genetic and biochemical interactions of these two key pathways.

GENE EDITING IN CRISPR-CAS9 EXPRESSING TRANSGENIC TOBACCO REVEALS HIGH FREQUENCIES OF CHIMERIC EDITING

Presenter(s): Grace Urban
Plant Sciences
Mentor(s): Guo-Qing Song (College of Agriculture & Natural Resources)

Chimeric editing is often reported in gene editing. To assess the extent of chimeric editing, we created a transgenic tobacco line carrying a marker, beta-glucuronidase gene (gusA), introduced a CRISPR-Cas9 editing vector into the transgenic tobacco line to knock out gusA, and then investigated the gusA editing efficiencies in T0 and subsequent generations. The editing vector contained a Cas9gene, two guide RNAs, gRNA1 and gRNA2. The two gRNAs were designed to knock out a 42-nucleotide fragment of the coding region of gusA. The editing vector was transformed into the tobacco using Agrobacterium tumefaciens-mediated transformation and hygromycin selection. T0 transgenic lines were used to evaluate gusA-editing efficiencies through histochemical GUS assays, polymerase chain reactions (PCR), and next-generation sequencing of PCR amplicons. Profiles of targeted sequences of 94 T0 transgenic lines revealed that these lines were regenerated from non-edited cells where editing occurred and created chimeric cells in these lines during or after regeneration. Detailed analysis showed that on-target mutations at the AtU6-gRNA1 site and the AtU3-gRNA2 site were found in 4.3% and 77.7% of T0 transgenic lines, respectively. To overcome the issue of extremely low editing efficiencies in T0 lines, we conducted a second round of shoot induction from the chimeric line(s) to enhance the success of obtaining lines with all or most cells edited. The mutation profiles in T0 transgenic lines provide valuable information to understand gene editing in plant cells with constitutively expressed CRISPR-Cas9 and gRNAs.

GENOTYPE EFFECTS DEPEND ON TEMPERATURE IN ARABIDOPSIS

Presenter(s): Elijah Persson-Gordon
Plant Sciences
Mentor(s): Melissa Lehti-Shiu (College of Natural Science)

To predict how plants may respond to climate change, we need information about how they survive and reproduce under a variety of temperatures, which is influenced in large part by their genes. There are many currently known heat response genes that allow a plant to respond to increasing temperature. Yet, a gene's influence on fitness is rarely tested, and its fitness effects are likely dependent on certain environmental conditions. To find additional genes that may be involved in the response to increases in temperature, I searched for ones that were upregulated in response to heat or whose corresponding proteins interacted with known proteins in heat-response pathways. To evaluate three putative heat-response genes, including one previously known to function in heat response, I grew different Arabidopsis loss-of-function mutants in two different temperatures (18°C and 27°C) and measured traits important for fitness, namely flowering time and total number of fruits and seeds produced. Although I expected to find that most of the mutants would perform more poorly than wild type, only 3 of 6 sets of plants in either condition had a lower mean fitness than the wild type. These results provide data about the fitness impacts of genes in different temperatures, which can be used to build models that predict how plants will respond to rising temperatures.

NATURAL VARIATION WITHIN AND AMONG SHINNERY OAK (QUERCUS HAVARDII) CLONES IN A TEXAS HYBRID POPULATION

Presenter(s): Claire Henley
Plant Sciences
Mentor(s): Charles Cannon (The Morton Aboretum), Samantha Panock (The Morton Aboretum)

Quercus havardii or the Shinnery Oak is a shrub oak endemic o the American Southwest. Shinnery Oaks grow in clonal groves and have high hybridization capabilities and are extremely varied in morphology and genetics. The Shinnery oak population in this region is putatively mixed with Post oak (Q. stellata) and Mohr's oak (Q. mohriana) and a wide variety of growth forms are found sympatrically. The goal of this research is to better understand the morphological variations within an individual clone and the variations between the different clones. Leaf shape analysis and data on the above-ground growth is used to compare the individual clones to themselves and each other.

THE ROLE OF THE CIRCADIAN PERIOD IN ADAPTATION TO ENVIRONMENTAL CYCLES

Presenter(s): Marisa Digiuseppe
Plant Sciences
Mentor(s): Ann Feke (College of Natural Science), Eva Farre Prokosch (College of Natural Science)

The circadian clock allows plants to respond to daily and seasonal environmental changes and is entrained by light and temperature signals. As clocks are self-sustaining, when under constant environmental conditions the plant lacks external time cues and the free-running period of about 24-hours is observed. By coordinating biological processes throughout the day, the clock plays a large role during the entire plant life cycle by regulation of developmental processes, such as photosynthesis and reproduction, and responses to stress. Therefore, understanding the relationship between environmental cycles and clock mechanisms may improve yield production. Previous studies observed a large array of circadian periods in wild potato species, showcasing the prevalence of natural variation in the circadian clock. In other plants, a correlation between latitude and period has been observed, as plants with a geographic origin of higher latitudes tend to have longer periods than plants from a lower latitude. This observation could be due to the high seasonal variability in day length seen at higher latitudes. I hypothesize that natural variation in circadian period has an effect on potato growth and biomass accumulation under different day lengths. The goal of this study is to assess the role of the circadian rhythm in response to adaptation to different day lengths. Height, width, leaf number, branch number measurements, photosynthetic parameters, and hyperspectral data will be used to evaluate the health of the plant. I expect to observe that plants with longer periods will grow better under the long-day conditions than plants with shorter periods.

HONEYSUCKLE INVASION REMOVAL

Presenter(s): Vincent Lipari
Plant Sciences
Mentor(s): Eva Farre Prokosch (College of Natural Science), Tammy Long (College of Natural Science)

Invasive plant species pose a big threat to our natural ecosystems and affect the surrounding biodiversity that they invade. My research project focused on removing an invasive plant species called Honeysuckle. Honeysuckle is classified as an invasive species because it competes with the native plants for nutrients, pollinators, light, and soil moisture. Baker Woodlot, which is located on MSU campus, is a forest that has been heavily invaded by Honeysuckle. Removing Honeysuckle from Baker Woodlot is important for the native plant species so they do not get out competed. If native plants were to be destroyed from their natural environments and overrun by invasive plants, it can cause multiple environmental problems. Such as loss of habitat, and reduction of native biodiversity. Within my internship, we traveled to Baker Woodlot, and started to manage Honeysuckle using a herbicide.

EVALUATING DRONE MEASUREMENTS OF AN AGRICULTURAL MAIZE FIELD

Presenter(s): Lucas Townsend
Plant Sciences
Mentor(s): Addie Thompson (College of Agriculture & Natural Resources)

An automated processing pipeline for drone image analysis for the Michigan location of the Genomes 2 Fields project was explored as a way to make data collection more efficient and accurate. By comparing a) data that was hand collected at ground level, b) data collected from drones that was processed in-house, and c) data that was processed using automated pipelines, I was able to assess the accuracy of the different drone-based approaches relative to the ground-level data that is the baseline collection method. By using Python, I compared stand count, vegetation coverage, and plant height data collected by drones versus the data collected by lab members, visualizing them in separate figures. From the results, it seems that the automated processing pipeline is not sufficiently accurate to replace any of our current data collection or processing methods.

MORPHOLOGY BEYOND THE LIGHT MICROSCOPE: MARRYING THE SCANNING ELECTRON MICROSCOPE WITH DIATOM RESEARCH

Presenter(s): Julia Walton
Plant Sciences
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering), R. Jan Stevenson (College of Natural Science)

Harsh effluents are released into the environment every day as a result of human and industrial activity. These waste products range from small amounts of nitrogen to large amounts of heavy metals-this runoff poses a great threat to aquatic ecosystems, agricultural products, and human health. Considering the magnitude of these risks, it's important to have reliable techniques to survey marine environments around us. It has come to light that observation of diatom algae is a natural and extremely sustainable way to profile aquatic environments. Being a substantial and diverse class, diatoms are very informative when it comes to the marine environments they inhabit. They act as natural indicators of pH levels, phosphorus levels, turbidity, etc.; and different species of these diatoms have unique water quality parameters that suit their needs. Being such a diverse class of algae, diatoms become increasingly difficult to distinguish under the light microscope, because of this, the scanning electron microscope is becoming an integral piece of diatom research. In this study, the scanning electron microscope was used to determine distinct differences between taxon within the Encyonema species. The information gathered from this study will be used to supplement research of marine habitats in the western Everglades.

CHARACTERIZING FERTILITY AND GENETIC TRANSFORMATION CAPABILITIES OF DIPLOID POTATO CLONE, 1S1

Presenter(s): Samantha Sikora

Plant Sciences

Mentor(s): David Douches (College of Agriculture & Natural Resources), Thilani Jayakody (College of Agriculture & Natural Resources)

Potato breeders and researchers have been looking to diploid potato (2n=2x=24) as a source of progress in overcoming barriers associated with cultivated potato (2n=4x=48) to gain access to modern genetic engineering and breeding approaches. A limitation to transitioning potato to a diploid inbred crop is the common presence of self-incompatibility mechanisms that prevent the production of viable fruit after self-pollination. Employing modern genetic engineering techniques on these lines is also limited by recalcitrance to tissue culture regeneration and Agrobacterium-mediated transformations. A promising diploid potato clone, 1S1, is amenable to regeneration, Agrobacterium-mediated transformation, and is self-fertile, although these qualities could be improved. In this study, conditions to optimize transformation efficiency and self-fertility response in 1S1 were explored. Transformation efficiencies were characterized using the alternative markers RUBY or hygR during an application of genome editing using CRISPR-Cas9. Flowering stages for self-pollination were explored to identify conditions that would increase fruit set. Specifically, fruitset counts following self-pollinations from open and closed flowers were collected. The results displayed that self-pollinating unopened flowers led to more viable fruit set than selfs using open flowers. This indicates that self-pollination using unopened flowers is more viable for overcoming self-incompatibility barriers in 1S1. By finding ways to overcome self-incompatibility and increasing transformation efficiency in diploid potato, lines like 1S1 can be better utilized for genetic engineering and breeding applications.

RAIN EXCLUSION SHELTERS DECREASE AVAILABLE PHOTOSYNTHETIC LIGHT

Presenter(s): Maggie Jones

Plant Sciences

Mentor(s): GPhilip Robertson (College of Agriculture & Natural Resources), Kevin Kahmark (College of Agriculture & Natural Resources)

Rain Exclusion shelters are widely used at the W.K. Kellogg Biological Station (KBS) in LTER and GLBRC projects to allow more control over water received by the plants underneath. Based on visible shadows underneath the shelters, we decided to compare light levels under the shelters to ambient field conditions. Light was measured in photosynthetically active radiation (PAR) wavelengths in terms of photosynthetic photon flux density (umol photons/m2/s) using an AccuPAR LP-80 ceptomter. The manufacturers suggest an 85% average PAR light transmission through the clear corrugated polycarbonate shelter roofing material when new. At maximum solar radiation around midday, shelters allow 71.4% ± 1.58 of PAR through on average. Throughout a full day, shelters allow 67.17% ± 2.38 of PAR through on average. As shelters age, the percentage of light allowed to pass through the shelter decreases, based on 0, 1, 2, and 6-year-old shelter PAR data. Therefore, the shelter roofing may need to be periodically replaced. We also compared the iPhone application "Photone- Grow Light Meter" to the LP-80 ceptometer and found they differ by 5.04% on average. We concluded that Photone may be used as an accessible alternative to a ceptometer in ambient conditions with low accuracy requirements. Overall, plants underneath shelters receive less light than plants in ambient conditions. This could be a confounding factor in the various projects using Rain Exclusion shelters at KBS.

BREAKING THE CYCLE: HARNESSING SOYBEAN RESISTANCE TO COMBAT SOYBEAN CYST NEMATODE

Presenter(s): Navid Ali
Plant Sciences
Mentor(s): Marisol Quintanilla Tornel (College of Agriculture & Natural Resources)

Soybean is an important agricultural commodity and source of revenue worldwide. There are several soybean pathogens causing soybean yield loss. Among these, soybean Cyst Nematode is the most economically devastating pathogen with an economic impact of more than $1 billion. Some of the promising management options include planting of resistant cultivars, crop rotation, and nematicides. However, due to high prevalence and constant use of cultivars derived from a single line of resistance, SCN still accounts for significant soybean yield loss. A greenhouse study was conducted to evaluate different sources of resistance (Peking, SCN susceptible, PI88788, and PI437654) utilized as a trap crop. Four treatments with a fallow control were replicated ten times under a randomized complete block design. Treatments' efficacies were determined at four- and eight-week post treatment inoculation. There was a significant decrease in population levels of SCN cyst and SCN egg+J2 in the eight-week experiment while the population levels in the four-week experiment were not significantly reduced. The eight-week study was most effective in inducing hatching and preventing further feeding of SCN on the plant roots for the PI437654 and Pecking varieties. The goal of this study was to use different sources of resistant soybean varieties as a trap crop for SCN management. Further field studies are necessary for approval of our results and to share the proposed strategy with the farmers.

POTENTIAL DROUGHT INDUCED IMMUNE RESPONSE IN ARABIDOPSIS THALIANA

Presenter(s): Madison Putmon
Plant Sciences
Mentor(s): Pai Li (College of Agriculture & Natural Resources)

Plant immunity is triggered by pathogen invasion and aims to counteract pathogens, and in some cases, abiotic stresses can also trigger an immune response. This was demonstrated in other studies, where a cold treatment was observed to trigger salicylic acid (SA)-mediated immune response which was accomplished by deactivating calmodulin-binding transcription activator (CAMTA) transcription factors. CAMTA transcription factors repress immune genes so by deactivating them, an immune response can be produced and regulated. Although a cold-induced immune response was observed, it is undetermined if other abiotic stresses can produce an immune response and if they can produce an SA-mediated immune response. I will be investigating a possible drought-induced immune response by Arabidopsis which was suggested by other studies. I will accomplish this by performing RT-qPCR to measure SA signaling marker genes PR1 and CBP60g on a variety of drought-treated plants. By studying this transcriptional regulation, we can obtain a better understanding of the relationship between drought and immunity response. In the future, this research could be expanded by studying other abiotic stresses such as osmotic pressure to determine if there is an immune response triggered.

SPORE-MATES: THE SYMBIOTIC RELATIONSHIP OF FUNGI AND FERNS

Presenter(s): Amanda Saad
Plant Sciences
Mentor(s): Maria Magallanes-Lundback (College of Agriculture & Natural Resources), Patrick Edger (College of Agriculture & Natural Resources)

Numerous species of fungi form symbiotic relationships with plant roots. Some fungal species have been shown to promote root development and nutrient absorption. Previous research on plant-fungal interactions have largely focused on a few select fungal and plant species. The goal of this experiment focuses on expanding our knowledge of a less studied lineage of fungi, from the subphylum Mucoromycota, and its symbiotic relationship with diverse plant lineages. Mucoromycota is a lineage that consists of thousands of species and have long been hypothesized to be associated with facilitating plant terrestrialization. As part of a larger study examining the symbiosis of these fungi with various phylogenetic lineages of plants, we analyzed the impact that seven species of Mucoromycota have on growth rates for the fern species (Ceratopteris richardii). We compared plant growth rates, as well as examined the presence of hyphae associated with roots, of this fern species when grown with different fungal species. The results of this experiment will further our understanding of the potential benefits that these understudied fungal species may provide for terrestrial plants.

THE IMPACT OF A PETAL'S STRUCTURE

Presenter(s): Lauren Murray
Plant Sciences
Mentor(s): Carl Boehlert (College of Engineering), Per Askeland (College of Engineering)

The purpose of the unique structure of a flower's petal has been studied and questioned for decades. The patterns, ridges, and shape of the internal structure of a flower petal vary significantly for each flower. This project examined the structure of four different flower petals through a scanning electron microscope (SEM). Through analysis of the petals and past research, it was determined that each petal had unique traits that allowed bees and other pollinating insects to choose a flower purely by structure. The results of this examination explain how some flowers are not as pollinated as others due to structural factors, such as conical-celled flowers versus flat-celled flowers, and will be backed by previous literature findings.

PSYCHOLOGY

PUPILLOMETRY AND VISUAL PERCEPTION

Presenter(s): Simon Lafleur
Psychology
Mentor(s): Jan Brascamp (College of Social Science)

It is well known that pupils dilate and constrict in response to changes in light, but there are many other events that can trigger changes in pupil size. For example, natural eye events such as blinks, cognitive tasks such as doing math, and motor events such as pressing a spacebar can all influence pupil size in different ways. Pupillometry, the measurement of such changes in pupil size, is a promising new nonintrusive method to indirectly investigate the activity of the brain. However, it can be difficult to understand a pupil signal because it reflects one measurement influenced by dozens of factors. The goal of this study is to investigate the similarities and differences in pupil responses between different types of stimuli. To achieve this, we exposed participants to seven different stimuli that likely lead to different pupil responses. After preliminary analysis, we have determined that there are ways to group together certain tasks. For example, our visual and auditory cognitive tasks both give similarly sharp pupil dilations, while exposing participants to changes in light gives a response more similar to a standard blink response. With a factor analysis, we can begin to draw conclusions about the driving mechanisms behind these pupil responses. Eventually, we hope to utilize this information in order to tackle the inverse problem and determine whether we can measure brain activity from the single pupil size measurement.

DOES THE PERCEIVED SIMILARITY TO THE FUTURE SELF PREDICT GREATER WELL-BEING? DIRECT REPLICATION AND METHODOLOGICAL EXTENSION OF REIFF ET AL. (2019)

Presenter(s): Alisar Alabdullah, Megan Denehy, Siya Vesikar
Psychology
Mentor(s): Andrew Rakhshani (College of Social Science), Brent Donnellan (College of Social Science), Hyewon Yang (College of Social Science), Jenny Warkentien (College of Social Science), Rebekka Weidmann (College of Social Science), Richard Lucas (College of Social Science)

Perceived similarity with the future self may reflect general satisfaction with one's identity, which could be indicative of future well-being. Longitudinal research by Reiff et al. (2019) demonstrated a linear association between greater perceived similarity with the future self and higher life satisfaction 10 years later in a sample of 4,963 participants. However, a methodological concern related to these results is that they used difference scores as a measure of personality similarity. Although difference scores provide an intuitive way to assess similarity, they can provide misleading results. Therefore, in study 1, we conducted a direct replication using the original data (MIDUS waves 1 and 2) and code from the study by Reiff et al. (2019). First, we were able to directly replicate the effect of perceived personality similarity on later life satisfaction. However, when applying polynomial regression and response surface analyses, we were not able to obtain a significant similarity effect. Hence, in study 2, we attempted to replicate the results with a different sample of MSU students (N = 1,250). When using difference scores like the original authors, higher perceived similarity with the future self significantly predicted higher current life satisfaction. However, similar to the findings from study 1 with MIDUS data, we could not obtain a significant similarity effect when computing polynomial regression and response surface analyses. We discuss the findings in light of the possible theoretical explanations for how perceived personality dis/similarity to future self are associated with future life satisfaction.

DYADIC EFFECTS OF PERSONALITY AND SEXUAL ACTIVITY AND PERCEPTIONS

Presenter(s): Anna Parcells, Hannah Bechinski, Jessica Skaff, Kaitlyn Sims, Siying Rao, Zoe Dunnum
Psychology
Mentor(s): William Chopik (College of Social Science)

There are individual difference characteristics associated with whether or not people engage in sexual activity and the benefits they derive from it. However, to date, few studies have taken a dyadic approach--one that looks at the psychological characteristics of both members of a monogamous couple. This study examines the effects of personality on sexual activity among 953 opposite-sex married couples (Mage = 70.60; 80.5% White) from the National Social Life, Health, and Aging Project (NSHAP). Conscientious people reported having more sex, and people with conscientious partners reported less frequent masturbation. People high in extraversion and openness to experience rated sex as more important. Sex was most physically pleasurable and emotionally satisfying among those with partners high in agreeableness, conscientiousness, and emotional stability. People high in conscientiousness and emotional stability reported having more emotionally satisfying sex. The current study provides useful descriptive information for characterizing the individual and dyadic contributors to sexual behavior and who benefits most from this behavior.

ANDROGEN EFFECTS ON RISK FOR BINGE EATING IN MALES DURING PUBERTY: PROJECT OVERVIEW AND CURRENT STATUS

Presenter(s): Leo Pereira Sanabria
Psychology
Mentor(s): Kristen Culbert (College of Social Science)

Boys account for one third of binge eating (BE) cases during/after puberty, yet studies exploring BE in males are rare and have yet to identify biological factors that may contribute to pubertal increases in BE risk. Adrenal and gonadal androgens are one set of male-specific biological factors that may play a critical role because they drive pubertal maturation, influence the consumption of high-fat/high-sweet food, and regulate gene transcription in neurobiological systems relevant to BE. Indeed, preliminary animal and human data have shown that lower levels of androgens (e.g., testosterone) are predictive of higher levels of BE and that genetic influences on BE become prominent during early pubertal stages (i.e., mid-adrenarche to early gonadarche) in boys when androgens begin to increase. However, no large-scale study has examined the role of adrenal and gonadal androgens on risk for BE in boys across the full range of puberty. Thus, this on-going study aims to test these hormone-behavior effects using a large, population-based sample of 1,000 same-sex male twins (ages 7-17) from the Michigan State University Twin Registry. BE symptoms and the physical changes of puberty are assessed with well-validated measures questionnaires. Saliva samples are tested for adrenal and gonadal androgen levels using enzyme immunoassays. Data collection and analysis is on-going, but we expect to find that lower levels of androgens are associated with higher levels of BE, and that genetic factors drive the emergence of these effects in boys during puberty.

DELIVERY OF HEALTHY EATING AND PHYSICAL ACTIVITY INTERVENTIONS INVOLVING ADOLESCENTS AND PARENTS: A SYSTEMATIC REVIEW

Presenter(s): Medha Manepalli, Ryan Hertz
Psychology
Mentor(s): Lorraine Robbins (College of Nursing)

Approximately 19.3% of adolescents in the US are obese and 16.1% are overweight, placing them at high risk for various health conditions. Although research suggests that support from parents/family members is essential for interventions to promote physical activity (PA) and healthy eating among adolescents, no comprehensive literature review about the most effective ways to deliver these interventions was found. This systematic review was conducted to examine whether intervention delivery affects these behaviors and adolescents' anthropometrics, focusing on different face-to-face and non-face-to-face interventions. Following PRISMA statement guidelines, CINAHL, Cochrane, ERIC, Grey Literature, PubMed, ERIC and Sociological Abstracts, SportDiscus, and Web of Science databases were searched for relevant intervention studies (RCT and quasi-experimental) that actively involved parents. The quality of each study was evaluated by using RoB 2 and ROBINS-I tools. Of the 59 studies included, the results from the analysis are as follows: of the 49 face-to-face interventions, 32 (65.3%) had significant effects on anthropometrics (n=21), PA (n=13), and nutrition (n=15); 16 interventions (32.7%) had no significant effects on any variables. Of the 10 interventions that were not conducted face-to-face, 6 (60%) had significant effects on anthropometrics (n=4), PA (n=2), and nutrition (n=2); 4 (40%) had no significant effects on any variables. Face-to-face delivery of interventions involving parents and adolescents was a better approach than non-face-to-face delivery for achieving positive health-promoting outcomes. Although continued research is necessary, the information in this review could guide future interventions to promote healthy habits.

MATERNAL INVOLVEMENT FROM CHILDHOOD INTO EARLY ADULTHOOD: POTENTIAL VARIATION ACROSS SEX

Presenter(s): Eva Petroff, Sanjanasri Pothuraju, Sarah Stewart, Veronica Van Rossen
Psychology
Mentor(s): Alex Burt (College of Social Science), Sarah Carroll (College of Social Science)

Parent perceptions of the parent-child relationship have been observed to change throughout development, albeit with different findings across studies. Specifically, while some studies report a decrease in parent-child conflict and/or an increase in closeness as children get older, others report the opposite. Associations between child sex and the parent-child relationship have also been inconsistent across studies, with some reporting negligible sex differences and others reporting parents to have more positive relationships with their daughters than with their sons. The purpose of our study is to examine child age and sex as predictors of maternal nurturance in a population-based adolescent twin sample (N = 706). Participants were drawn from the Michigan State University Twin Registry (mean age = 14.6 years, 49% female). Parent-child nurturance was assessed via a maternal report on the Parent Environment Questionnaire (PEQ). Multilevel regression analyses, conducted separately for males and females, will evaluate the sex-specific contribution of child age to maternal nurturance. Based on previous studies in adolescent samples, we hypothesize that maternal nurturance will be greater for younger participants and that this association will be consistent across sex.

DETERMINING WHICH PROTECTIVE FACTORS ARE MOST LIKELY TO BE RELATED TO CRIMES COMMITED BY THE JUVENILE

Presenter(s): Samantha Bowers
Psychology
Mentor(s): Ashtaan Rapanos (College of Social Science), Caitlin Cavanagh (College of Social Science)

Within the last century, juvenile crime peaked without understanding why and why those crimes. Yet recently it became a research priority to discover the cause and correlation, which we can theorize is directed by protective factors. Protective factors are "characteristics associated with a lower likelihood of negative outcomes or that reduce a risk factor's impact. Protective factors may be seen as positive countering events." (SAMHSA). We will examine patterns to determine if violent homes result in assault and battery as "Assaults of all types of vandalism are often associated with physical abuse at home." (JDWCA)

THE PUPIL LIGHT REFLEX IN INDIVIDUALS WITH VARYING LEVELS OF SCHIZOTYPAL TRAITS: A FAILED REPLICATION STUDY

Presenter(s): Amanda Williamson, Pelli Mechnikov
Psychology
Mentor(s): Erika Shiino (College of Social Science), Katharine Thakkar (College of Social Science)

The pupil light reflex refers to the change in pupil size in response to light. The autonomic nervous system controls this process, where sympathetic acitivty is responsible for pupil dilation and parasympathetic activity is responsible for pupil constriction. Abnormal pupil responsivity in schizophrenia has been documented in a growing body of psychophysiological work dating back to the early 1900's. More recently, a connection between abnormal pupil dynamics and symptom severity has been demonstrated. These findings have been interepreted as reflecting an imbalance in the autonomic nervous system. Thus, the pupil light reflex has the potential to provide insight into the brain processes in schizophrenia using a simple and non-invasive measurement, which may have implications for understanding illness mechanisms and may even be useful in clinical settings. Investigating this reflex as a function of schizotypal traits in healthy individuals avoids certain confounding factors, while also exploring the connection between schiztoypy and schizophrenia. In a previous study, we found that amplitude and constriction velocity of the pupil were correlated negatively with unusual perceptual experiences in healthy individuals. In the current study, we sought to replicate these findings. College undergraduates completed the Schizotypal Personality Questionnaire. Additionaly, dark-adapted pupil diameter, as well as the velocity and magnitude of pupil constriction and dilation were measured using a hand-held Pupillometer. Analyses were done in Matlab.This is a direct replication of our previous study. Results from the previous study were not replicated. These results and their implications for interpreting altered pupil dynamics in schizophrenia will be discussed.

CHILD SEX MODERATES THE ASSOCIATION BETWEEN INTIMATE PARTNER VIOLENCE EXPOSURE AND MOTHER-CHILD REMINISCING

Presenter(s): Jennie Lynch-Boulus
Psychology
Mentor(s): Amy Nuttall (College of Social Science)

Maternal guidance during discussions of past conflicts with children scaffolds children's responses - termed "mother-child reminiscing" (Valentino et al., 2015). Intimate partner violence (IPV) perpetrated by male partners is a risk factor for poor maternal reminiscing (Visser et al., 2016): mothers of sons may have more difficulty due to the gendered nature of IPV (Smagur et al., 2004). Using data from a longitudinal IPV study of mothers and children (N=206), we hypothesized that IPV would predict lower quality of mother and child reminiscing and child sex would moderate this relationship such that IPV be more negatively associated with reminiscing for mother-son dyads than for mother-daughter dyads. Prenatal IPV was assessed during pregnancy. Cumulative IPV was summed across child ages 1-7. The Autobiographical Emotional Events Dialogue was used to code mother-child reminiscing. Multi-group models were conducted in Mplus to test sex as a moderator of the relationship between IPV exposure and reminiscing quality. An unconstrained two-group model was compared to a model with pathways constrained to be equal. A $\chi 2$ difference test revealed that the unconstrained two-group model fit significantly better than the constrained model for maternal contributions and child contributions. Cumulative IPV significantly predicted: 1) lower quality of maternal contributions in mother-son dyads, not mother-daughter dyads; 2) lower quality of acceptance and tolerance and decreased child elaboration of the story among boys, not girls. Mothers may associate the challenging nature of conflicts with sons similarly as with a male partner. IPV exposure negatively impacts sons' reminiscing perhaps because of IPV's gendered-nature.

PREDICTORS OF LEADER EMERGENCE IN TEAMS WITH INEFFECTIVE FORMAL LEADERS

Presenter(s): Alek Roehl

Psychology
Mentor(s): Dorothy Carter (College of Social Science), Emily Gerkin (College of Social Science), Josh Pearman (College of Social Science)

Many organizations allocate important tasks to teams that are led by formal managers or supervisors. Unfortunately, team managers are not always effective team leaders and instead, often exhibit a laissez-faire (hands-off) leadership style that creates a leadership 'void' in teams. In order to succeed, teams led by ineffective team managers need other team members to assume informal positions of leadership effectively. My project considers the individual characteristics associated with the emergence of informal leaders when team managers are ineffective team leaders. I am leveraging prior research on leaderless group discussions to identify individual characteristics, such as self-efficacy, personality, adaptability, resilience, and team role experience and orientation, that are likely to be associated with informal leader emergence in teams led by ineffective formal leaders. I plan to test my hypotheses using data collected as part of a large-scale teamwork experiment involving undergraduate participants assembled into five-person teams. In each experimental session, five undergraduate students were randomly assigned to unique roles on the team, including the team leader role. The teams completed a three-hour military-oriented team simulation requiring that they address a series of challenges and solve problems. Participants completed self-report measures of individual differences and sociometric (network) measures assessing leader emergence at multiple points in time. Results of this project may help organizations better understand how to manage leadership 'voids' and enable team success.

ESTROGEN MEDIATES MELANIN CONCENTRATING HORMONE EXPRESSING CELLS TO CONTROL TIME-DEPENDENT MOTIVATED FOOD-SEEKING

Presenter(s): Kate Sapkowski
Psychology
Mentor(s): Alexander Johnson (College of Social Science), Lauren Raycraft (College of Social Science)

Decisions on when to search out and eat food are mediated by timing mechanisms in the brain. However, little is known about how mechanisms controlling the perception of time (in the seconds to minutes range) interact with biological systems controlling food intake. Our laboratory was the first to demonstrate that stimulation of the lateral hypothalamic area (LHA) expressing feeding signal, Melanin Concentrating Hormone (MCH), enhanced temporally dependent food-seeking in female rats. Strikingly, this effect was dependent on the estrus cycle stage. In female rats, estrogen levels fluctuate across four phases: estrogen is relatively low in metestrus and diestrus (M/D) and higher during proestrus and estrus (P/E). Only when rats were in M/D (i.e., low levels of gonadal hormones) did stimulation of MCH expressing cells enhance temporally dependent food-seeking. In the current study, we isolated the effects of estrogen in time-dependent motivated food-seeking by removing the ovaries through ovariectomy (OVX) before testing the effects of excitation of LHA MCH expressing cells. Moreover, we examined a specific circuit by targeting only LHA MCH cells that project to the nucleus accumbens (NAc), an area of the brain thought to be critically important for time-dependent motivated food-seeking. Overall, our findings reveal the neural and hormonal mechanisms controlling time-dependent food-seeking including independent functions of estrogen and complex interactions of this gonadal hormone on functionality of LHA MCH cells that project to the NAc. Thus, we have elucidated a potential cellular mechanism of differences in food-seeking behaviors in female rats that are controlled by gonadal hormones.

TIME-DEPENDENT RELAPSE IN ADOLESCENT VS ADULT COCAINE-EXPOSED RATS: ROLE OF DORSAL HIPPOCAMPAL NEUROPLASTICITY

Presenter(s): Shambhvi Ojha
Psychology
Mentor(s): Amy Arguello (College of Social Science)

Substance use disorders are characterized by repeated episodes of relapse which can be triggered by drug-associated stimuli. In adults, craving to take drug can increase even after a year of drug-free abstinence. Much less is known about craving during the critical period of adolescence. Using an adolescent rat model of cocaine self-administration (Coc-SA) and relapse, we found that cocaine exposure during adolescence led to higher relapse-like behavior in a cocaine-paired context during late abstinence, compared to adult rats. The goal of the current research is to examine whether synaptic plasticity related proteins contribute to the age-dependent difference observed in relapse. We focused on examining plasticity-related proteins within the dorsal hippocampus, a region known to facilitate contextual relapse. Adult and adolescent rats went through a Coc-SA-relapse procedure. During Coc-SA, all rats pressed a lever for cocaine infusions in a unique context (2 hr, 2x/day over 5 days). Then the rats underwent EXT training in a second context, where lever presses were not rewarded (2 hr, 2x/day over 4 days). Adult and adolescent-exposed rats were tested in the cocaine-paired context after 1 day or 15 days of abstinence. Thirty minutes after the relapse test, rats were sacrificed via live decapitation, brain punches were obtained from the dorsal hippocampus and western blotting conducted to examine markers of synaptic plasticity (i.e., phosphorylated NR2b and NR2a). Based on preliminary data from the prefrontal cortex, we hypothesize that levels of pNR2b within the dorsal hippocampus will be associated with the time-dependent relapse effects in adolescent-exposed rats.

GOAL ORIENTED EYE MOVEMENT IN SCHIZOPHRENIA

Presenter(s): Zeeba Ali
Psychology
Mentor(s): Katharine Thakkar (College of Social Science)

Schizophrenia is a debilitating psychiatric disorder associated with hallucinations, delusions, and chronically diminished motivation and pleasure. Motivational symptoms are persistent disturbances in experiencing pleasure and engaging in goal-directed behavior and, thus, are predictive of social dysfunction, unemployment, and overall lower quality of life. Such symptoms are markedly treatment resistant and stem from unknown causes, which emphasizes the need to investigate their underlying mechanisms. A promising theory is that motivational symptoms reflect a failure in allocating effort to obtain rewards. This effort can be represented by simple, quantifiable movements: for example, we walk more quickly to the people we love, or more broadly, we move more vigorously the more we want something. Rapid shifts of gaze (saccades) to rewarding stimuli are more vigorous and are associated with more dopaminergic activity- a neuromodulator associated with reward. Thus, saccade vigor provides a quantitative measure of motivated behavior. Here, we investigate saccade vigor as an indicator of effort allocation and relate it to motivational deficits in schizophrenia. Across two behavioral tasks, we quantified saccade vigor using the distance traveled (amplitude) and the time to complete the saccade. Using linear mixed effects modeling, we compared saccade vigor between healthy controls and individuals with schizophrenia. We found significant interactions that showed vigor differentially related to amplitude across groups. Most interestingly, we found significant correlations between vigor and negative symptoms. These results suggest that saccade vigor analysis may offer a valuable tool for monitoring and predicting outcomes related to negative symptoms in schizophrenia.

LIFE SATISFACTION AND THE NEIGHBORHOOD: THE ROLE OF INFORMAL SOCIAL CONTROL AND FEAR OF CRIME

Presenter(s): Alexis Mashni, Atef Choudhury, Hibah Siddiqui, Naim Mashni
Psychology
Mentor(s): Alex Burt (College of Social Science), Elizabeth Shewark (College of Social Science)

Disadvantaged neighborhoods predict many deleterious physical and mental health outcomes. We sought to understand the neighborhood features that influence general life satisfaction. Informal social control in the neighborhood, defined as the extent to which residents collectively maintain social order, is related to self-reported life satisfaction. Conversely, fear of crime in the neighborhood is negatively related to life satisfaction. We aimed to test and replicate these associations in a sample experiencing modest-to-severe levels of neighborhood disadvantage. We hypothesized that higher informal social control and lower fear of crime would be associated with higher levels of life satisfaction. Also, there is evidence to suggest that as informal social control increases, residents' fear of crime decreases. Thus, we examined the potential joint influences of informal social control and fear of crime on life satisfaction. Our sample included 1880 participants (majority white, with a $40,000 median household income). Informal social control and fear of crime were assessed via The Neighborhood Matters Questionnaire. Participants also completed the Satisfaction with Life Scale. We used a linear regression model to examine associations between informal social control, fear of crime, and life satisfaction, while controlling for sex, ethnicity, and income. The results partially supported our hypotheses and showed that higher levels of informal social control and lower levels of fear of crime were associated with higher levels of life satisfaction. However, informal social control did not moderate the association between fear of crime and life satisfaction. This investigation provides insights into factors that affect neighborhood resident life satisfaction.

RELATIONSHIP BETWEEN SPEECH AND NON-SPEECH SYNCHRONIZATION

Presenter(s): Bailey Rann, Frank Dolecki, Kyle Oliver

Psychology
Mentor(s): J McAuley (College of Social Science), Toni Smith (College of Social Science)

Assaneo et al. (2019, 2020) found that when individuals are asked to whisper the syllable "tah" for one minute while monitoring a synthesized stream of syllables, some listeners spontaneously align their speech with the heard syllables while others do not. Although this research shows that listeners vary in their tendency to spontaneously synchronize produced speech with heard speech, there is little research on whether spontaneous speech synchronization (SSS) performance engages speech-specific timing mechanisms or more general timing mechanisms associated with non-speech motor activities such as tapping to a beat. If speech and non-speech synchronization performance engage a shared general timing mechanism, then SSS performance should be correlated with non-speech synchronization. If not, then this would suggest that speech-to-speech synchronization engages speech-specific timing mechanisms. To test these hypotheses, participants completed implicit and explicit versions of the SSS task of Assaneo and colleagues and a synchronize-continue tapping task. In the SSS task, participants whispered the syllable "tah" for one minute while monitoring a synthesized stream of syllables. For the synchronization-continuation tapping task, participants tap their index finger in synchrony to isochronous sequences of tones presented at different fixed tempos ranging from 506 milliseconds to 1,709 milliseconds. Results will be discussed with respect to the question of whether speech-to-speech synchronization engaged a speech-specific or a general timing mechanism shared with non-speech motor synchronization tasks.

EMPATHY AS PREDICTOR OF WELL-BEING AND HEALTH DEVELOPMENTS IN ADULTHOOD

Presenter(s): Brooke Soulliere, Christie Perez, Jillian Lange, Joseph Romanelli
Psychology
Mentor(s): Rebekka Weidmann (College of Social Science), William Chopik (College of Social Science)

Empathy promotes feelings of compassion and reduces feelings of isolation, which can contribute to better mood, boosts in self-esteem, and increases in sense of purpose. Further, empathy can improve physical health by reducing stress and promoting relaxation. In contrast, empathy can allow for an overexposure to the negative emotions of others, which can lead to feelings of burnout and increased stress, anxiety, and depression. Individuals may internalize the emotions of others and struggle with boundaries, which can negatively impact mental and physical health. The goal of this project is to determine if empathy predicts the mental and physical health and well-being trajectories of adults (i.e., if empathy is protective or a risk factor for one's health). We examined longitudinal data from over 4,000 individuals who participated in a representative panel study in the Netherlands (M = 50 years old, 53% female) across nine years. Empathy was not associated with initial levels or changes of life satisfaction. However, empathy predicted higher levels of and decreases in depressive symptoms and lower initial levels in self-rated health and health conditions. We will discuss these findings, contextualizing them in previous research, while providing practical implications and future directions regarding how empathy might impact physical and mental health and well-being.

CAREGIVER PERSPECTIVES OF A PARENT-MEDIATED INTERVENTION AIMED AT IMPROVING SOCIAL-COMMUNICATION SKILLS IN AUTISTIC CHILDREN: A MIXED METHODS STUDY

Presenter(s): Jessie Greatorex
Psychology
Mentor(s): Brooke Ingersoll (College of Social Science)

Parent-mediated intervention is a recommended best practice for young children with autism, yet it is underutilized in community settings. Caregiver perspectives are especially important when assessing the feasibility and effectiveness of parent-mediated interventions as they are highly involved in the implementation of the intervention. It is therefore crucial to investigate how to efficiently implement these best practices in the homes of families, while also supporting their individual family needs. This mixed-methods study examines parent perspectives on the process and outcomes following participation in the parent-mediated intervention, Project ImPACT, for six parents of young children with ASD. This qualitative analysis utilized the framework method and thematic analysis. Results complement and expand previously reported quantitative data that demonstrated an improvement in child social-communication skills following the intervention. Results also indicate themes related to improved overall family functioning and parent-child interactions following participation in the intervention. Parents additionally reported appreciating the consistency of sessions and accessibility of a manualized intervention.

INTERPARENTAL CONFLICT AND YOUTH ANTISOCIAL BEHAVIOR: EXPLORING THE MODERATING ROLE OF DELINQUENT PEER AFFILIATION

Presenter(s): Ashlyn Tait, Avani Vinod, Leya Chambo, Nithya Gogineni
Psychology
Mentor(s): Alex Burt (College of Social Science), Alexandra Vazquez (College of Social Science)

Witnessing interparental conflict (including physical and/or verbal conflict) has been shown to negatively impact adolescent mental health. Indeed, exposed youth are at higher risk of engaging in a range of aggressive and non-aggressive antisocial behaviors (e.g., vandalism, stealing, threatening others, fighting). Delinquent peer affiliation has also been linked to increases in youth antisocial behavior. Surprisingly however, scholars have yet to examine whether or how delinquent peer affiliation might modulate the effect of interparental conflict on antisocial behavior. The present study will therefore employ a sample of 774 adolescents (mean age = 14.25; 52% male) from the Michigan Twin Neurogenetics Study (MTwiNS) to assess whether deviant peer affiliation moderates the relationship between interparental conflict (specifically conflict that places blame on the child) and youth social aggression, physical aggression, and rule-breaking, respectively. Preliminary analyses were performed in SPSS version 27 and path analyses will be conducted using Mplus version 8. We expect to find that interparental conflict and delinquent peer affiliation each significantly predict all three forms of youth antisocial behavior. We also expect to find that delinquent peer affiliation significantly moderates the relationship between interparental conflict and antisocial behavior such that exposure to higher interparental conflict is potentiated in the face of higher delinquent peer affiliation. The present study thus stands to inform our understanding of the way interparental conflict and deviant peer affiliation shape antisocial youth behavior.

HEY, LOOK AT ME! INVESTIGATING IF THE QUITTING THRESHOLD EFFECT FROM A SALIENT DISTRACTOR IS ACTUALLY A RESPONSE BIAS EFFECT

Presenter(s): Al Rajala, Caleb Bonno, Derrek Montalvo, Megan Swan
Psychology
Mentor(s): Mark Becker (College of Social Science)

Recent research has shown that adding a highly salient distractor to a visual search display results in more missed targets and faster target-absent reaction times (RTs). This pattern (known as quitting threshold effect or QTE) was therefore interpreted as evidence that the salient distractor was responsible for the reduction in the participant's quitting threshold - participants searched less of the display before responding that the target was absent. A shift in quitting threshold could have significant implications for real world searches, such as radiology and baggage screenings. However, this finding may also have another possible explanation based on response conflict. In those experiments the salient distractor contained visual features that were associated with the target-absent response, if the salient distractor activated that response that activation may have resulted in more misses and faster target absent responses. In order to distinguish between these two explanations, the current experiment varied whether the salient distractor shared visual features with the target or non-salient distractors. If the salient distractor lowers the quitting thresholds, increased misses and faster target-absent RTs should be observed with both types of salient distractors. However, if the original findings were due to activation of the response associated with the salient distractor, the observed pattern should reverse as a function of the salient distractor type. More specifically, when the target-absent response is activated, misses should increase and target absent RTs should decrease. Similarly, if it activates the target-present response, misses should decrease, and target-absent RTs should increase.

ACES AND THEIR AFFECT IN UNDERGRADUATE STUDENTS

Presenter(s): Autumn David
Psychology
Mentor(s): Arianna Pikus (College of Social Science)

This project highlights the effects of ACES and their effects on undergraduate students such as gpa and mental health.

A LONGITUDINAL LOOK AT LYRICS: A TEXT ANALYSIS OF POP MUSIC

Presenter(s): Abby Roberts, Antoinette Wingo, Kenneth Sun, Urvi Joshi
Psychology
Mentor(s): Hyewon Yang (College of Social Science)

Popular music artists' lyrics have been found to change throughout the years in response to changes in both internal (e.g, personality changes) and external environments (e.g., societal shifts). In order to explore the nature of this change, we will use text analysis (Linguistic Inquiry and Word Count; LIWC) and growth curve models to examine changes in the lyrics of 230 popular artists (e.g., those included in "best of" lists, such as Billboards' Top 100). By analyzing lyrical themes and lyrical-emotional associations, we can gauge how an artist's lyrics change over time. Specifically, we will test whether lyrics change in accordance to theories of aging (e.g., perhaps valuing relationships more, as predicted by socioemotional selectivity theory, or becoming more conscientious, as predicted by personality maturation). Moreover, we will test if artists' gender or geographic origins creates a significant difference in the evolution of their lyrics. Lastly, we will test whether lyrics change with shifts in psychological traits. Results will be discussed in the context of theories of aging and personality development. Keywords: lyrics, artists, change, compare

A ONE-YEAR FOLLOW-UP OF CHILDREN SCREENING FOR BEHAVIORAL HEALTH SYMPTOMS DURING A 2020 PEDIATRIC WELL-CHILD VISIT: DOES FUNCTIONAL IMPAIRMENT PREDICT POORER OUTCOMES?

Presenter(s): Hady Omar, Harsna Chahal, Rana Omar, Sanjanasri Pothuraju
Psychology
Mentor(s): Melissa Benbow (College of Osteopathic Medicine), Rachel Christensen (College of Osteopathic Medicine), Susan Frank (College of Human Medicine)

Over the course of 2020, there was a noticeable increase in behavioral health symptoms among children and adolescents. This increase has been largely attributed to school closures, increased anxiety among children's caregivers, and social isolation from peers that occurred in response to the Covid-19 pandemic. This study assesses the persistence over a one-year period of clinically significant behavioral health symptoms observed among a large sample of children and adolescents during routine well-child visits at two MSU Pediatrics clinics. Behavioral health symptoms were measured by parents' (and, for children ages 11 to 18, adolescents') responses to a standardized screening instrument assessing internalizing, externalizing, and inattention symptoms. Additional items measured functional impairment at school, home, and with peers. Close to 30% of parents and/or adolescents screened in 2020 reported clinically significant symptoms in one or more areas assessed by the screening instrument. The study assesses whether clinically significant behavioral health symptoms identified in 2020 would be more likely to persist one year later among children who, in 2020, also initially presented with functional impairment than among children who presented with clinically significant symptoms.

WRITING AND MENTAL HEALTH

Presenter(s): Haley Christopher
Psychology
Mentor(s): David Biedenbender (College of Music), David McCarthy (Residential College in the Arts & Humanities)

Writing is not an uncommon way to deal with emotions. People keep diaries and journals and it isn't uncommon for psychologists or counselors to recommend that their patient write letters or stories. There has been research on the benefits of writing and mental health, though it is often seen as only a supplementary tool, even if a useful one. After researching some of the benefits, I got in contact with NAMI Lansing to host and plan a few workshops leading up to an event. The community would be able to work on their writing projects and share them in a safe space. Though I will not be collecting research on my own event, I think that simply providing people with a safe place to express themselves is inherently good for a community.

EXPLORING THE EFFECTS OF A SCALABLE PSYCHOLOGICAL DISTANCING TECHNIQUE FOR MEDICAL PROFESSIONALS EXPERIENCING COVID-19-RELATED STRESS AND ANXIETY

Presenter(s): Jason Kazmierczak, Jillian Lange
Psychology
Mentor(s): Ania Pathak (College of Osteopathic Medicine), Jason Moser (College of Social Science)

Since the emergence of COVID-19, stress management has become increasingly necessary in the medical field. Excessive stress both lowers quality of life for medical professionals and diminishes their ability to serve their communities at their full capacity. The widespread nature of this issue demands a scalable, cost-effective intervention for managing stress. Our study asks medical professionals across Michigan to engage in a writing practice of third person self-talk/future perspective (TPST/FP), a psychological distancing technique where one uses third-person language from a future perspective to reflect on stressful events and experiences. In past work, third person self-talk has been shown to effectively decrease measures of stress, while requiring less cognitive effort than alternative emotion regulation methods. The study is currently ongoing. Sixty medical professionals are being recruited for this study. Participants are divided evenly between a control group and a TPST/FP intervention group. Stress and anxiety are measured with questionnaires throughout the study across 3 sessions over the course of 10 days. Based on past evidence using TPST/FP, we predict that participants in the intervention group will report a greater reduction in stress and anxiety compared to participants in the control group.

EFFECTS OF OVARIAN HORMONES ON SLEEP AND ACTIVITY PATTERNS IN FEMALE DIURNAL RODENTS

Presenter(s): Jamie Shi
Psychology
Mentor(s): Lili Yan (College of Social Science)
Women often experience sleep disturbances throughout pregnancy and postpartum period, which can have negative implications for overall maternal health and well-being. Circadian rhythmicity during pregnancy is strongly influenced by ovarian hormones, which has been primarily studied in nocturnal rodent models, i.e. laboratory mice or rats that sleep mostly during daytime. Thus, there is a need to study these effects in diurnal ones that show similar sleep/wake rhythms, i.e. sleep at night as humans. The current study aims to determine the impact of ovarian hormones on daily activity and sleep in female diurnal Nile grass rats (Arvicanthis

niloticus) throughout reproductive stages. Nile grass rats have a circadian timekeeping system organized in a way similar to that in humans, therefore will offer a translatable model to humans to study how circadian rhythms change from pregnancy throughout the postpartum period. Female and male grass rats were cohoused, vaginal cytology was conducted to determine estrous stage and cervical plugs were checked to determine the date of copulation. Above-cage sensors monitored in-cage locomotor activities and tracked mating and parturition behavior. These data will allow us to monitor circadian timing during late gestation and labor onset. We hypothesize that ovarian hormone changes will influence the circadian rhythmicity and sleep behaviors of female grass rats particularly at late gestation in preparation for labor. The results of this study will help elucidate the relationship between reproductive stages and associated changes in sleep and activity in female diurnal grass rats.

ANALYZING THE MEASUREMENT OF AWE

Presenter(s): Alisar Alabdullah, Megan Denehy, Sam Barans
Psychology
Mentor(s): Andrew Rakhshani (College of Social Science), Richard Lucas (College of Social Science)

Awe is an emotional experience that is thought to result from two main eliciting features: exposure to a stimulus that is vast in nature and a need for accommodation. Although many studies have assessed awe, the use of different measures across these studies leaves open psychometric questions and complicates cross-study comparisons. The primary goal of the present study is to evaluate the psychometric properties of four different measures of awe. To address these goals, two samples of participants will be randomly assigned to one of three conditions: (1) recall a time when they experienced positive awe; (2) recall a time when they experienced negative awe; or (3) a control condition where they recall completing a neutral task. Subsequently, all participants will complete multiple measures of awe. Responsiveness to the manipulation, along with internal consistency, convergent validity, and criterion validity of each measure will be evaluated. These findings will help to clarify issues about the assessment of awe and will help integrate results across existing studies.

NARRATIVE PROCESSING OF MUSIC: HOW CULTURE INFLUENCES OUR PERCEPTION OF MUSIC

Presenter(s): Grace Bonnema, Quynh Tong, Tushya Mehta
Psychology
Mentor(s): Jennifer Mojica Santana (College of Arts & Letters), Natalie Phillips (College of Arts & Letters)

This presentation explores parts of a larger NSF-funded interdisciplinary study conducted at Michigan State (McAuley, TAP Lab; Phillips, DHLC lab), Princeton University (Lisa Margulis), and the Chinese University of Hong Kong (Patrick Wong). The study investigated if and when people imagine and/or hear stories when they listen to musical stimuli. One of the experiments had participants from across the US and Dimen, China listen to instrumental music and asked them to give a narrative to their story, if they heard one; a surprising number of people did. Many of the narratives had incredible similarities, such as the same topics, themes, and even specific words. The similarities in participant answers were often startling, and so were the cultural perceptions of different themes, like war. In many narratives, we observed that Western and Chinese listeners have contrasting stories around these themes and also reveal powerfully different moods while writing their narratives. For example, in two excerpts, western listeners wrote narratives that portray wars in the name of remorse (Keywords: battle, violence, sadness, fear) while Chinese listeners portrayed wars in the name of national pride (Keywords: Excitement; Nationalism; victories). As we investigate these moments of cultural alignment and divergence in music inspired stories, we point toward an innovative model for linking specific structures and time-points in music to the kinds of stories people hear. Through this presentation, moreover, we aim to provide an understanding of when and why instrumental music yields culture-influenced narrative listening.

RETHINKING HOW TO MEASURE MOOD USING DAY RECONSTRUCTION METHOD

Presenter(s): Hyewon Yang, Jas Banks, Sam Barans, Sneha Challa
Psychology
Mentor(s): Brent Donnellan (College of Social Science), Hyewon Yang (College of Social Science), Richard Lucas (College of Social Science)

The Day Reconstruction Method (DRM) is a research method that can be used to measure daily emotional experiences by collecting information about one's activities and emotions on a given day. Many studies have used the DRM, but questions about its validity remain. This study examines if the use of the DRM affected participants' scores on the BFI Extraversion and Neuroticism, Self-Esteem, and the Satisfaction with Life Scale. One concern is that by asking the same questions about one's emotions repeatedly for each episode a person experienced, investigators subtly signal to participants that they should focus on the changes that occur across these episodes. To address this goal, we collected data via self-report in a study of 900 participants to investigate if asking about multiple episodes leads participants to emphasize the effects of the situational factors on their mood compared to participants who were asked about a single episode (who might evaluate their mood based more on their trait levels). The study included two conditions with 450 participants per condition: In the first condition, participants reported on their personality and then complete a standard DRM. In the second condition, participants completed a measure of personality and then detailed how they were feeling at a single moment in time on the previous day. Afterward, they completed the full DRM. Simple regression analysis was used to test whether features of the situation each interact with the condition to predict the mood reported during the episode. These results will help clarify whether the DRM causes people to emphasize situational factors when reporting their mood.

THE CHANGE OF A NARRATIVE PLOT BASED ON ACOUSTIC CUES

Presenter(s): Marine Avequin, Paige Seidell
Psychology

Mentor(s): Jennifer Mojica Santana (College of Arts & Letters), Natalie Phillips (College of Arts & Letters)

This presentation discusses parts of an NSF-funded interdisciplinary study conducted at the Digital Humanities and Literary Cognition Lab and Timing, Attention, and Perception Lab at MSU called "The Role of Narrative Listening in Music Perception." The study explored if and when participants imagine or hear stories and the similarities in narrative themes when exposed to musical stimuli. Our focus is on a narrative event tagging experiment that looks at narrative convergence in music processing. The precise moments when participants perceived an "event", or a change in narrative flow, were recorded with a button press. The experiment instructed participants to press a button when they observed a change of event in their imagined narrative while processing the musical stimuli. Many of the participants pressed the button near or at exactly the same time during each music piece. This was specifically an occurrence when they heard an acoustic cue change in the music such as tempo, dynamic, rhythm and/or tonality. This suggests that musical cues give rise to emotions and narratives in the mind. The similarities of pressing the button seen with almost all participants link the connection of narrative convergence to the music in our study. People are able to generate similar events at the same time across geographic locations that share cultures, like our participants who are from the University of Arkansas and Michigan State University. This connection of culture has created narrative convergence, bridging the similar events played through the participant's mind to forming similar button press times.

EFFECTS OF PERCEIVED STRESS AND ANXIOUS AROUSAL ON MEASURES OF EXECUTIVE FUNCTION IN FEMALES

Presenter(s): Kristie Boynton, Natalie Magid
Psychology
Mentor(s): Ania Pathak (College of Osteopathic Medicine)

Previous research has indicated that anxiety and stress are associated with worse cognitive performance and may be detrimental to executive functioning across severity levels. With these associations noted, this study investigated the relationships that tie stress and anxiety to executive function as measured by three markers across three levels of cognitive load in a community sample. This study measured perceived stress and anxious arousal in approximately 140 women aged 18-25. Participants completed N-back working memory tasks (0, 2, and 3-back) in four sessions across 35 days to obtain EEG data of the P300 wave and behavioral data of their reaction time and accuracy in each task. A multi-level modeling analysis on the resulting data showed no significant correlations with the P300 wave or accuracy across all tasks. However, increased perceived stress was significantly correlated to slower reaction times on the 0-back ($B = +3.817$ ms, $n = 111$, $p = 0.021$) and 3-back tasks ($B = +8.275$ ms, $n = 111$, $p = 0.036$) with no significant relationship in the 2-back, while anxious arousal was significantly related to faster reaction times on the 2-back ($B = -2.051$ ms, $n = 142$, $p = 0.005$) with no significant relationships found in the 0- or 3-back tasks. These findings go against the notion that stress and anxiety work similarly regarding their effect on executive functioning and indicate a possible difference in pathways or mechanisms across levels of cognitive load; further research should investigate the consistency and causes of these differences.

THE ROLE OF RHYTHMIC EXPECTATIONS IN UNDERSTANDING SPEECH IN DIFFICULT LISTENING CONDITIONS

Presenter(s): Cynthia Sridhar, Kyle Oliver
Psychology
Mentor(s): J McAuley (College of Social Science), Toni Smith (College of Social Science)

Understanding speech in difficult listening environments is a critical skill for effective communication in the social world. Studies have shown that speech rhythm is important for speech perception with competing sounds (Aubanel et al., 2016; McAuley et al., 2020; Wang et al., 2018). One hypothesis for why that may be is a Selective Entrainment Hypothesis (SEH) which proposes that attentional entrainment (synchronization) to the natural rhythm of target speech helps listeners track the target speech while ignoring competing background sounds. Supporting SEH, McAuley and colleagues found that disrupting the speech rhythm of to-be-attended target speech worsens recognition in noise (2020, 2021). The present study extends this work by considering how manipulating the temporal onset of target words relative to listeners' rhythmic expectations affects their recognition. Participants heard target sentences of the form, "Ready Baron go to [Color] [Number] now," and identified the color-number pair in the sentence amidst a speech-shaped noise background. Experiment 1 removed the phrase "go to" from a subset of trials to establish that performance does not worsen when "go to" is removed. Experiment 2 used a similar paradigm, but also manipulated the onset of the target color-number pairing so that it occurred 'early', 'on-time', or 'late' with respect to the context speech rhythm. Based on the SEH, recognition of the target color and number is predicted to worsen when it is 'early' or 'late' compared to when the onset of the color-number pair is 'on-time.' Results will be discussed in the context of the SEH.

INDIVIDUAL DIFFERENCES IN SONAR MONITORING AND THE VIGILANCE DECREMENT

Presenter(s): Adhi Sureshkumar, Tim Odaniel
Psychology
Mentor(s): Kimberly Fenn (College of Social Science)

Sonar operators fulfill a crucial role on submarines - they detect, locate, and track other ships using sensitive audio equipment. The crew's safety depends on operators' ability to quickly detect and identify these signals. Sonar operators typically work long shifts requiring sustained focus on a sonar monitor throughout - an ability known as vigilant attention. Previous studies on vigilant attention have demonstrated that lapses in attention increase in frequency over time. Individual differences in this vigilance decrement are important in sonar monitoring because they determine how effective a sonar operator is. This study investigates how individual differences in cognitive ability relate to this vigilance decrement. Participants first complete a series of cognitive assessments designed to measure cognition and placekeeping. Placekeeping is the ability to perform a sequence of steps in order, without omissions or repetitions, even in the face of interruptions. Following the cognitive assessments, participants complete two sonar monitoring tests. In each one-hour test, participants select and identify incoming signals on a simulated sonar monitoring screen. Error rate and response time are recorded over the duration of the shift. We expect that cognitive ability will be negatively correlated with the decrement in vigilant attention over time. Increasing the understanding of individual differences in the vigilance decrement has important implications for theories of attention and will inform selection criteria for sonar operators. Selecting sonar operators that miss fewer signals and more accurately identify incoming signals will allow the Navy to operate more effectively and increase the safety of submarine crewmembers.

MITIGATING THE LOW-PREVALENCE EFFECT USING PROBES ON A PHOTOREALISTIC VISUAL SEARCH TASK

Presenter(s): Derrek Montalvo, Devashree Patel, Kiki Xiang, Nicole Grace
Psychology
Mentor(s): Mark Becker (College of Social Science)

Previous visual search research has found that target detection rates dramatically decrease when targets become rare - a phenomenon known as the low-prevalence effect (LPE). This effect has potential negative implications for important real-world searches, such as radiology and baggage screening, in which targets are rare and misses are costly. Our lab previously found that inserting "probe trials"- trials that provide feedback regarding the presence of the target after the participant has responded- in a set of low-prevalence trials can increase rare target detection rates. However, these experiments utilized very simple stimuli (letters) and a single target, and thus, the probed target always perfectly matched targets in the real trials. For this technique to be beneficial to real-world searches - searches in which targets vary and their features are unknown- this benefit must generalize to targets that are not identical to probed items. To investigate this issue, the current experiment utilized more complex stimuli (photorealistic images) to examine if probes from a superordinate category (musical instruments) can increase target detection for targets that are from the same superordinate category, but a different basic level category. For example, if one is given probes from two basic level categories (trumpets and guitars) of the superordinate category musical instruments, will the probe benefit generalize to non-probed targets of the same superordinate category (e.g., bongos). Determining whether the probe benefit generalizes should provide important information about the potential benefit of this probe technique in real-world search scenarios where targets are rare.

PERSONALITY AND PARTISAN NEWS CONSUMPTION DURING COVID-19

Presenter(s): Zoe Dunnum
Psychology
Mentor(s): Jennifer Neal (College of Social Science)

During the COVID-19 pandemic, many individuals relied on varying news sources to receive information. However, news sources are often skewed toward a liberal or conservative point of view. A phenomenon known as media crosscutting can occur when an individual uses a source that presents attitude-challenging news media, such that a Democrat uses conservative media, or a Republican uses liberal media. Previous research has found support that individuals high in the Openness personality trait are more likely to use "liberal" media sources regardless of the political party with which they identify. In other words, Republicans high in Openness are more likely to crosscut in their media usage than Democrats high in the same personality trait. Using 778 representative Michigan adults from the 2020 State of the State Survey, this pre-registered study aimed to investigate this in addition to understanding the role Conscientiousness plays in media crosscutting and the level of crosscutting in Democrats and Republicans. An exploratory analysis is also conducted to examine the use of neutral news sources. Using negative binomial regression analyses, a significant association was not found between openness and liberal media use; however, openness did predict less conservative media use. Additionally, although conscientiousness predicted less liberal media use in the reduced model, this was not the case when political party was controlled in the full model. Lastly, our results show higher levels of media crosscutting in Republicans than Democrats.

EVALUATING A COMPUTATIONAL MODEL OF RHYTHM PERCEPTION

Presenter(s): Sanaye Lewis
Psychology
Mentor(s): J McAuley (College of Social Science)

Whenever you are tapping your foot to a beat of a song your mind develops a representation of the song's rhythm. There have been a number of studies that have investigated how listeners represent musical rhythm or more generally temporal patterns (Collard & Povel, 1982; Deutsch & Feroe, 1981; Leeuwenberg, 1969; Simon, 1972). One computational model is the Povel and Essens (1985) model, which assumes that listeners structure the representation of a rhythm using an internal clock. The internal clock is similar to a periodic beat. For a given rhythmic pattern, the model determines how well a periodic beat can align with the rhythm. To do this, the model calculates a counterevidence score for each possible clock (periodic beat) alignment. Counterevidence refers to the extent to a particular clock (beat alignment) does not line up with sounds in the sequence (i.e., the beats fall on silence). The best clock (predicted beat alignment) is the clock with the lowest counterevidence score. To evaluate the model, the lowest counter-evidence scores were calculated for a set of short rhythmic patterns. These scores were then correlated with behavioral data from adults who completed a rhythm discrimination task. For this task, listeners heard two presentations of a rhythm and then had to judge whether a third presentation was the same or different from the first two. Supporting the model, lowest counter-evidence scores for each rhythm predicted rhythm discrimination scores. That is, listeners had a harder time discriminating rhythms that had more counter-evidence.

TO WHAT EXTENT IS AN AGENCYS IMPLEMENTATION CLIMATE ASSOCIATED WITH IMPROVED SOCIAL COMMUNICATION OUTCOMES OVER THE COURSE OF A PARENT-MEDIATED INTERVENTION TRIAL FOR AUTISTIC CHILDREN IN THE MEDICAID SYSTEM?

Presenter(s): Helena Corda, Katie Bullock

Psychology
Mentor(s): Brooke Ingersoll (College of Social Science), Diondra Straiton (College of Social Science)

Parent-mediated intervention is an evidence-based practice for this population, and the implementation of this intervention is hardly seen in the community mental health system. The Michigan Medicaid Autism Benefit primarily uses Applied Behavioral Analysis (ABA) clinical centers and their providers for ABA services but has been starting to provide parent-mediated intervention to families in the Medicaid system. ABA providers can utilize this training along with their employment at an ABA agency. In this analysis, we examined social communication outcomes for autistic children 6 and under whose caregiver received Project ImPACT from ABA clinicians learning to use the intervention for the first time with consultation support from a trainer. Project ImPACT is a parent-mediated intervention that improves social communication skills in children diagnosed with Autism Spectrum Disorder (ASD). Our aim was to determine whether there was a relationship between agencies' implementation climate and child social communication outcomes using caregiver reports on the Autism Impact Measure (AIM) (Kanne et al. 2014). This study included 21 providers from six agencies working with 22 families. We used a subscale of the Implementation Climate Scale (Ehrhart et al. 2014) called Focus on Evidence-Based Practice, which describes the extent to which an agency prioritizes evidence-based practices in clinical care. This scale ranges from 0-4 with 0 representing "Not at all" and 4 representing "Very great extent". We anticipate that children at agencies with higher scores for Focus on Evidence-Based Practice will have greater gains in social communication than those at agencies with lower scores.

THE EFFECTS OF BLUE LIGHT EXPOSURE ON COGNITION AFTER A NIGHT OF SLEEP DEPRIVATION

Presenter(s): Manvir Bamrah
Psychology
Mentor(s): Kimberly Fenn (College of Social Science)

Sleep is vital for optimal cognitive performance, but instances arise where sleep-deprivation is inevitable. One night of deprivation hinders cognition, particularly, vigilant-attention and placekeeping, or the ability to follow a sequence of steps without skipping or repeating steps. Placekeeping facilitates performance in daily tasks, from making coffee to performing surgery. Thus, strategies that support cognitive performance following sleep-deprivation are necessary. Blue spectrum light is shown to increase alertness and brain activation, hence we assess the ability of blue-light to reduce cognitive deficits from sleep-deprivation. In the evening, participants completed two tasks in our lab: a vigilant-attention task (Psychomotor Vigilance Task [PVT]) and a placekeeping task (UNRAVEL). They then randomly drew conditions to determine whether they remain awake, Deprivation group, or sleep for the night, Sleep group. The Deprivation group remained in the laboratory, monitored by research assistants, only prohibited from activities activating the autonomic nervous system. The Sleep group slept in their habitual sleeping environment and returned in the morning. Only half of the participants received 30-minutes of blue-light exposure. Two factors were present in our design, sleep

(Deprivation, Sleep) and blue-light exposure (Present, Absent). After light exposure, all participants again completed UNRAVEL and PVT. Data collection is ongoing but sleep-deprived participants are expected to perform worse on both tasks with blue-light exposure improving performance across both groups. As sleep-deprivation becomes increasingly prevalent, blue-light therapy may show efficacy in reducing associated negative cognitive effects. Although results may show interventional promise, performance deficits are expected, suggesting no replacement for adequate sleep.

EFFECTS OF VIRUS-LIKE PARTICLE-BASED TAU VACCINE ON HIPPOCAMPAL PRO-INFLAMMATORY RESPONSE IN A MOUSE MODEL OF ALZHEIMER'S DISEASE

Presenter(s): Meena Kannan
Psychology
Mentor(s): Lili Yan (College of Social Science)

Alzheimer's disease (AD) is the most common type of dementia characterized by amyloid plaques and neurofibrillary tangles formed by pTau, which are the major therapeutic targets. Neuroinflammation plays an important role in the progression and severity of AD. Proinflammatory response is activated by microglia upregulating cytokines that are involved in apoptosis and necrosis. This study tests the efficacy of a virus-like particle-based Tau vaccine on inflammatory responses within the hippocampus of a mouse AD model. This study focused on females because they have higher susceptibility to neurodegenerative disease, due to increased estrogen levels compared to males. 30 transgenic female mice were treated by the vaccine conjugate, Admix, or a PBS control over 4 weeks. Brains were collected following the treatment, and qPCR was performed to measure the expression of microglia marker CD11b and pro-inflammatory cytokines IL-1beta, IL-6, and TNFa through the dorsal hippocampus. Dorsal hippocampus subregion CA1 was specifically looked at for learning and memory, and have been implicated in relation to Alzheimer's. We expect that the vaccine will decrease proinflammatory markers in the dorsal hippocampus, while the untreated animals in the PBS group will have the highest pro-inflammatory expression.

WAS ATTENDING INTRODUCTION TO ENGINEERING (EGR-100) VIRTUALLY DURING COVID-19 ASSOCIATED WITH GREATER STRESS AMONG FEMALE UNDERGRADUATE STUDENTS?

Presenter(s): Catie Glascott, Dorothy Zhao, Lina Berman, Nina Kozik, Ryan Sauter
Psychology
Mentor(s): Lisa Linnenbrink-Garcia (College of Education), Sharlyn Ferguson-Johnson (College of Education)

In the post-pandemic era, universities resumed face-to-face (FTF) learning, which led to higher stress levels in FTF students compared to online learners (Lazarevic & Bentz, 2020). Female engineering students experienced more stress than males (Wang et al., 2022). Gender stereotype threat, the fear of confirming negative stereotypes about female engineers (Steele & Aronson, 1995), may explain the increased stress of female students (Silverman & Cohen, 2014). Increased FTF class meetings can heighten gender stereotype threat and stress for females due to the presence of male students (Inzlicht et al., 2000). The present study assessed whether post-pandemic stress levels were linked to more time spent in FTF entry-level engineering courses and whether gender and perceived gender stereotype threat played a role in the association. The sample included 645 MSU undergraduates enrolled in an introductory engineering course (EGR-100) during Spring 2021 (18-23 years old, 39% female, 10% ethnic/racial minority). Stress was measured through 10 statements, and predictors included gender, FTF attendance, and perceived gender stereotype threat. T-tests compared the perceived stress level and gender stereotype threat means for females and males. Moderation analyses assessed the 2- and 3-way interactions. Results showed females reported significantly higher stress and gender stereotype threat in EGR-100. The relationship between gender and stress did not vary by FTF frequency ($F(3, 610) = .367$, $p = .392$), and gender stereotype threat did not play a role in this association ($F(1, 614) = .733$, $p = .392$).

THE EFFECTS OF TRAINING ON POLICE RECRUITS' DECISIONS TO SHOOT

Presenter(s): Ryan Clare, Srihita Veeramachaneni
Psychology
Mentor(s): Joseph Cesario (College of Social Science)

Police recruits from a large Midwestern Police Department completed a shooting simulator to test for racial bias in the decision to use deadly force. All recruits from a single incoming class completed the shooting scenario both before academy training and again after completion of use of force/arrest tactics training. At each time point, recruits completed 40 shooting scenarios requiring the decision to shoot or not to shoot using a modified handgun. Citizens in the videos were either Black or White males, and in half the videos the citizen was armed and fired a gun. If the citizen was unarmed, the correct decision was always to not shoot; if the citizen was armed, recruits were instructed to fire their own gun before the citizen fired. Results revealed that training reduced error rates overall. Additionally, before training recruits showed racial bias in being more likely to shoot unarmed Black citizens; after training, recruits showed no racial bias in error rates.

HOW CHILDREN USE PLAY AS A FORM OF COMMUNICATION: AN ETHNOGRAPHIC STUDY ON PLAY THERAPISTS

Presenter(s): Ella Sturtz
Psychology
Mentor(s): Steven Fraiberg (College of Arts & Letters)

In psychological care, children are often treated like young adults, when in reality they are not. This can be difficult when trying to treat them psychologically. Play therapy is a form of counseling, often used with young children, that utilizes a child's natural instinct to play in order to help them work through their thoughts and emotions. This is one method used to address mental health in children. This ethnographically informed research project looks into the way that children use play as a form of language through the perspective of play therapists. I developed this research question because I wanted to better understand what interventions are in place to help children who are struggling with their mental health, behavioral issues, and developmental disorders. While play therapy helps children who are struggling psychologically, it also allows all kids to become more aware of their thoughts and feelings and develop healthy ways to communicate them. To explore this question, I conducted semi-structured interviews with licensed play therapists and reviewed social media groups and forums. The purpose of this research is to better understand play therapists and what they do. From this, we can learn the different ways children communicate and express themselves. This opens the door to support kids that are suffering, and teach them how to convey what is going on in their inner world.

DOES MOVING TO SOUND HELP IMPROVE JUDGMENTS ABOUT TIMING?

Presenter(s): Meghana Gogineni, Tanmay Shekhar
Psychology
Mentor(s): J McAuley (College of Social Science)

Manning and Schutz (2013) found that tapping to the beat of auditory sequences improved listeners' judgments about sequence timing. In this study, participants either listened only to isochronous tone sequences (no move condition) or listened plus tapped along with these sequences (move condition) and then made 'on-time' vs. 'off-time' judgments about the timing of the final tone that occurred after a three-beat silent interval. The move condition produced better judgments about sequence timing than no move, with the authors concluding that movement through the engagement of the motor system 'objectively improves timing perception.' An alternative explanation is that tapping along with the sequences encourages mental subdivision of the to-be-judged time intervals, thus improving timing judgments due to a shorter referent interval. To address this, we ran two experiments using an adapted version of the Manning and Schutz paradigm where participants made "early" vs. "late" judgments instead of "on time" vs "not on time" judgments. In Experiment 1, the same stimuli with a silent interval before the final tone were used. In Experiment 2, the silent interval was filled with three missing tones and the tone sequences either had a high-low-low-low pattern (as in Manning & Schutz, 2013) or contained only high tones. The proportion of correct responses will be compared between move and no-move conditions for both experiments. Overall performance and effect of movement will also be compared between same- and different-pitch conditions in Experiment 2. Results will be discussed in terms of a motor engagement hypothesis and a subdivision hypothesis.

SOCIAL SCIENCE GENERAL

APPLYING ECOLOGICAL PRINCIPLES OF DESIGN FOR THE RESTORATION OF BROWNFIELDS: A CASE STUDY IN RIVER ROUGE, MI

Presenter(s): Andreea Bodea
Social Science General
Mentor(s): Jun Hyun Kim (College of Agriculture & Natural Resources)

Failing industrial cities have left behind a legacy of social, economic, and environmental deterioration, the aftermath includes cities experiencing departing residents, decaying infrastructure, and urban blight. There are many contributing factors to degradation, for cities such as Detroit, MI, the predominant reason was the departure of the automotive industry along with a failing economy, racial affairs, and a decline in employment. Much of Detroit's infrastructure has become vacant, and due to previous heavy industrial use, lots have turned into brownfields. Additionally, there is a lack of comprehension of the terms "vacant land" and "brownfield", and within academic literature, there is no definition or difference. Within the realms of this research, brownfields are considered a type of vacant land; posing more severe stressors to adjacent neighborhoods. The following research adopts a case study approach, where it reconstructs the economic, social, and environmental health by creating an ecological design matrix based on landscape ecology principles of design; and applying those elements to the 80" Hot Mill company, located in River Rouge, MI, United States. This site offers an opportunity for ecological re-design through applying landscape performance research. The post-design metrics show the environmental outputs such as the reduction of carbon sequestration, air pollution, waste, and increased stormwater retention. The social impacts measured include visual quality, safety features, recreation/gathering spaces, and bike lanes. Economically, improvements have been seen in stormwater maintenance costs and energy savings. The findings from this research help future designers and planners in implementing ecological principles within their designs.

THE EFFECTS OF BEHAVIORAL SKILLS TRAINING ON RESEARCH ASSISTANT ADMINISTRATION OF LITERACY ASSESSMENTS

Presenter(s): Ashley Riggs
Social Science General
Mentor(s): Sarah Dunkel-Jackson (College of Social Science)

Training is incredibly important for research assistants to help collect, organize, and store crucial data necessary to conduct research studies. Specifically, behavioral skills training (BST) methods (Parsons, Marsha B,) can contribute to efficient and effective data collection, which provides valid and reliable data. BST can be broken down into four different components: instructions, modeling, rehearsal, and feedback. There is also additional training that can be implemented if needed, for example coaching and prompts. The current study examined the effect of BST on research assistants' administration of the cWRITE literacy assessment 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 assessment comfortably, and accurately to preschoolers. These results can be extremely useful in all areas of training for research assistants, as well as training for other roles outside of the research community. Overall leading to efficient and effective work being completed, as well as individuals feeling more confident in their skills and performance.

YOUTH ENGAGEMENT WITH COMMUNITY RESOURCES BY ZIP CODE

Presenter(s): Sophy Smithson
Social Science General
Mentor(s): Ashtaan Rapanos (College of Social Science), Caitlin Cavanagh (College of Social Science)

Access and availability to free, safe, and high-quality community resources is a useful factor in analyzing juvenile crime rates. With YLS data collected from 2015-2019, my research will organize offenses by zip code, offense type, and available resources within that zip code. Comparing different zip codes in Ingham County, each with different available access to resources will analytically demonstrate disparities in community resources between zip codes, the influence of community safe-spaces on decreasing juvenile delinquency, and severity of juvenile offenses. This research can be extrapolated to examine disparities in community resources between communities, cities, states, and nations.

STUDENT LEARNING GAINS AND ATTITUDES IN A CRITICAL MAKING CLASS

Presenter(s): Amyra Walker, Jimin Son, Kaitlyn Hartl, Manvir Bamrah, Sasha Palmkoeck
Social Science General
Mentor(s): Isaac Record (Lyman Briggs College)

This project presents the methodology and preliminary results of interviews conducted with students taking a course employing a "critical making" pedagogy. Critical making combines traditional "critical thinking" research techniques within the humanities and social sciences with creative and constructive making. This interdisciplinary approach is intended to teach students a framework for solving "wicked problems"- problems without a straightforward definition or easy resolution. The interviews ask questions relating to critical making with students rating their value of the critical making process and framework, as well as giving room for critique. Also present were questions relating to teamwork, class structure, information retention, and overall enjoyment of the course. The main goal is to develop the critical making framework and give recommendations for future research based on the findings of student survey responses and direct student evaluations.

DEATH IN FAIRFAX COUNTY, VIRGINIA, IN THE MID-19TH CENTURY: MORBIDITY AND MORTALITY AMONG ENSLAVED AND FREE POPULATIONS

Presenter(s): Bailey Griffin, Lorenzo Duran Charris
Social Science General
Mentor(s): Walter Hawthorne III (College of Social Science)

This undergraduate research adds to the rich open-source database entitled Enslaved.org (https://www.enslaved.org). We obtained scans of death records from the Fairfax County, Virginia, courthouse for 1854-1869, extracted data from them, and organized it in a Google Sheet. These records were available to us because, in the mid-nineteenth century, the state of Virginia mandated that county courts were to collect detailed information about their inhabitants for census and taxation purposes. Across the state, records of this nature are difficult to come by because many county clerks shipped theirs to Richmond, which Union soldiers burned in 1865. Because Fairfax did not ship their records to the capital, the collection we had access to is unusual. Our approach seeks humanization as a guiding principle-a commitment that informs our decision-making. To the extent our sources allow, we include information about the names, ages, and personal experiences of those included in the database. The presentation of this data at UURAF has two main goals; first, we will apply modern statistical analyses to the data to measure morbidity and mortality disparities among racial groups, statuses (enslaved and free), genders, and age categories. Second, we seek feedback since we will submit our dataset and findings for consideration for publication in the Journal of Slavery and Data Preservation.

MUSLIMS IN AMERICA

Presenter(s): Shahad Nasir
Social Science General
Mentor(s): Steven Fraiberg (College of Arts & Letters)

My research is focused on the Muslim community in Michigan and the struggles they go through to be able to stay connected to their religion. It is really hard to practice your religion when you live in a different environment where your beliefs and practices are not common. There are a lot of misconceptions about the life of Muslims living in America and through my research, I highlighted common misconceptions and stories of Muslims living here. I conducted multiple interviews with Muslims born here, those who converted recently to Islam, and people who came from Muslim countries. A common theme I found is that what makes Muslims connected to their religion is the community they are part of which supports them and builds a stage where they feel welcomed and represented.

GREEN URBANISM: AN ANALYSIS OF THE DUTCH APPROACH TO SUSTAINABLE CITIES AND COMMUNITIES

Presenter(s): Miki Deliyski
Social Science General
Mentor(s): Elizabeth Perry (College of Agriculture & Natural Resources)

The rapid urbanization of humankind presents challenges within the sustainability and social welfare of world cities and communities. Nations worldwide have agreed to address these challenges through collective international goals and actions. The UN's creation of 17 Sustainable Development Goals (2015) established a sense of direction for sustainable action by the year 2030. Amsterdam, the capital of the Netherlands is a city aiming to address these goals proactively; Well-known for their environmental technologies and sustainable urban social design, Amsterdam is paving the way for what future cities may look like. A look into how this international aim has been applied in a more localized context is warranted. A unique culture, history, and take on environmentalism make Amsterdam is an intriguing case study candidate. UN Goal number eleven emphasizes making our cities resilient, secure, inclusive, and sustainable. We argue that incorporating sustainable practices in tandem with a strengths-based approach to community engagement will promote the functional integrity of these communities and provide long-term, sustainable opportunities to interact and connect with the cityscape. This case study will evaluate and compare official city documents, academic papers, and journalistic articles to gain a deeper understanding about Amsterdam's sustainability initiatives and draw meaningful conclusions regarding their most successful sustainability practices and how they may benefit other urban areas around the world.

FOOD INSECURITY WAS POSITIVELY RELATED TO PERCEIVED PARENTAL STRESS

Presenter(s): Laika Tanveer
Social Science General
Mentor(s): Jiying Ling (College of Nursing)

Although the relationship between food insecurity and stress was studied in previous literature, limited research focuses on low-income families. Therefore, this study aimed to examine the relationship between food insecurity and perceived stress among low-income families. Data was collected through an online survey. Food insecurity status was assessed by the U.S. Household Food Security Survey Module, and parental perceived stress was assessed by the 10-item Perceived Stress Scale. A total of 53 families (34 rural and 19 urban) participated. About 18.9% parents were black, 39.6% made less than $20,000 a year, and 37.7% were single. Among the 53 families, 64.2% were food secure and 35.8% were food insecure, 66.1% of parents were food secure and 34% were food insecure, and 75.5% of children were food secure and 24.5% were food insecure. About perceived stress, 23.6% had low stress, 54.7% had moderate stress, and 22.6 had high stress level. Parental perceived stress was significantly and positively correlated with food insecurity status among parents ($r=.43$, $p=.001$), children ($r=.39$, $p=.003$), and) families ($r=.43$, $p=.014$). Even though there are food assistance programs such as the Emergency Food Assistance Program and the Commodity Supplemental Food Program offered by USDA, the level of food insecurity among low-income families is still high. Given the positive relationship between stress and food insecurity status identified in this study, equipping these low-income parents effective stress coping strategies such as cognitive behavior therapy or mind-body program may help buffer the negative effects of food insecurity on these families' mental well-being

COMING FROM A SMALL TOWN

Presenter(s): Cynthia Solis-Davila
Social Science General
Mentor(s): Steven Fraiberg (College of Arts & Letters)

Down the road, in Pontiac, Michigan, you will find a community of people who would describe their hometown as "un rancho chiquito de Zacatecas." These ranches are small towns with 100 houses in Noria de Angeles, Zacatecas, Mexico. The life paths have to lead them to Pontiac, leaving everything behind and trying to get by in a language different from their native home. In this research project, I examine this process and the ways families have adapted to their new way of living in another country while maintaining their roots. I will interview children and parents of immigrant families to share their stories within this society and the relationships among individuals in the city of Pontiac. Many parents identify this change as an opportunity for future generations. Children express an investment and desire to pay it forward.

CONNECTION BETWEEN THE LOCATION OF MANUFACTURED HOMES AND CLIMATE RISK

Presenter(s): Shae Burnham, Vivian Morales
Social Science General
Mentor(s): Noah Durst (College of Social Science)

The people that live in manufactured housing (mobile homes) are often disadvantaged and at risk. This project focuses on Brownsville, Texas, a city on the Mexican border close to the Rio Grande. By utilizing big data and machine learning techniques, we aim to predict with a high level of accuracy the location of manufactured homes and their exposure to climate factors such as flood risk and distance from the 100-year floodplain. We began by examining more than 40,000 building footprints across selected census tracts in Harris County, Texas (the location of the City of Houston). We compared these building footprints with county property records and satellite imagery to identify and manufactured housing units. Machine learning was then used to predict which buildings across the state of Texas were single-wide manufactured homes. We demonstrate the effectiveness of machine learning for predicting the location of manufactured homes and illustrate the importance of studying spatial vulnerability among manufactured home residents by examining exposure to flood risk and the demographic and socioeconomic conditions in neighborhoods across the City of Brownsville, Texas.

EXPLORING THE IMPACT OF K-CULTURE INVOLVEMENT ON CULTURAL DIVERSITY UNDERSTANDING

Presenter(s): Lauryn Davis, Layna Cho, Miquela Ochoa, Olivia Brenner
Social Science General
Mentor(s): Mi Ran Kim (Eli Broad College of Business), Ok-Sook Park (College of Arts & Letters)

K-Culture (Hallyu) is a term used to describe the wave of Korean cultural influence that comprises traditional and modernized Korean-originated movies, music, beauty, drama, art, cuisine, virtual games, literature, and so forth (Korean Cultural Center, 2022). At present, the U.S.A. and other countries are creating demand for K-Culture. K-Culture was buoyed by COVID19, which allowed people to spend more hours in a digitalized world. This study explores the influence K-culture exposure has on Americans' willingness to understand better Korean and Asian cultures, willingness to alleviate Asian hate crime, and overall willingness to better understand differing ethnicities and races.

SOURCES OF POLICE OFFICERS? OCCUPATIONAL STRESS DURING COVID-19 LAW ENFORCEMENT: THE CASE STUDY FROM INDIA

Presenter(s): Sara Sundaram
Social Science General
Mentor(s): Mahesh Nalla (College of Social Science)

In this research, we assess police officers' perceptions of challenges faced by officers in the State of Haryana, India, during the Covid-19 lock-down imposed in India as a measure to control and minimize the spread of the virus. More specifically, we examine officers' fear and anxiety of infection (self and family) and fear of job loss as a consequence of Covid-19 infection while enforcing the government enacted compliance measures with mask-wearing and social distancing. Data for the study is drawn from a survey of 1,000 officers in the state of Haryana, India. Findings and policy implications are discussed.

GIVING CHILDREN THE POWR TO COMMUNICATE: OBSERVATIONAL DATA COLLECTION AND ANALYSIS WITHIN A STUDY.

Presenter(s): Amy Keyorkgy, Anna Fisher, Madeline Leppek
Social Science General
Mentor(s): Sarah Douglas (College of Social Science), Tiantian Sun (College of Social Science)

Children with complex communication needs (CCN) are those who cannot use speech alone to meet everyday communication needs. The POWR+ (Prepare, Offer opportunity, Wait, Respond, +Model AAC) online training program provides paraeducators evidence-based naturalistic developmental and behavioral intervention strategies to support communication development of preschool children with CCN. The training also provided teacher coaching support to guide the paraeducator in their implementation of the POWR+ training using the EMPOWR program. In order to monitor paraeducator implementation of the strategies and child's communication progress, we collected data related to paraeducator and child interactions, and coaching sessions between teachers and paraeducators. We also served as secondary coders using the Datavyu software. The timed event coding system included marking the occurrence of each target behavior (i.e., paraeducator provided communication opportunities, AAC models, responses, and child communication). Following coding, an evaluation of intervention effects was conducted to note any improvements in paraeducator behavior, child communication, and fidelity of teacher coaching. The POWR+ data collection and secondary coding procedures will be discussed as well as implications and future research directions.

MAKING ENDS MEET: PROVIDER PERCEPTIONS ABOUT FAMILY CARE RESOURCES IN DETROIT'S ETHNIC RACIAL COMMUNITIES

Presenter(s): Abigail Perrien, Sonia Moozhayil
Social Science General
Mentor(s): Anna Santiago (College of Social Science), Courtney Jones (College of Social Science), Emily Cohen (College of Social Science)

In the past 3 years, the COVID-19 pandemic has resulted in a significant loss of life, substantial economic costs, and unprecedented stressors for families. In Michigan, the pandemic has exacerbated an already overstressed care economy, limiting access to child care and elder care which helps explain why Michigan's overall workforce decreased by 181,000 women since April 2020 and has yet to fully rebound. This study examines how family care resources adapted to meet the pandemic-related family and community needs in the City of Detroit. Specifically, we examine how neighborhood organizations have supported families who have had to juggle work, child care, elder care, and other responsibilities while also making ends meet during and after the pandemic phase of COVID-19. We use data gathered from individual and focus group interviews with care providers serving families in seven ethnically and racially diverse Detroit neighborhoods: Southwest Detroit/Springwells, Warrendale/ Warren Avenue, Brightmoor, North Campau/Banglatown, Livernois, North End, and East Village. Using qualitative thematic analysis, this presentation will focus on the availability of family care programs and services; how family care providers and families were affected during the pandemic; how these services were adapted to support families; and whether these adaptations are still being utilized. We also explore what resources are still needed to support families in these neighborhoods.

STAY-PLAY-TALK INTERVENTION VIA TELEPRACTICE FOR TYPICALLY DEVELOPING SIBLINGS OF CHILDREN WITH DISABILITIES

Presenter(s): Aaditi Nambiar, Ava Ballagh
Social Science General
Mentor(s): Sarah Douglas (College of Social Science)

A number of studies have shown that sibling-mediated intervention focusing on social-communication benefit both typically developing (TD) sibling and their sibling with developmental disability (DD). However, implementing an intervention for family members can bring different challenges if it is only offered face-to-face (e.g., coordinating with the family's busy schedule, lack of available childcare for other children, travel distance to conduct the intervention). This study explored the impact of a sibling-mediated intervention, Stay-Play-Talk (SPT) to increase social-communication delivered via tele-practice. A multiple probe design was used to measure both TD siblings' social skills/ strategies used during play sessions and the social behaviors of children with DD. Results and implications for online training approaches will be discussed.

#BLACKTRANSLIVESMATTER: AN INTERSECTIONAL ANALYSIS OF TRANSGENDER HOMICIDE VICTIMS IN THE UNITED STATES

Presenter(s): Alix Zwingman, Andrea Kimmel, Sarah Grzadzinski, Thalia Epps
Social Science General
Mentor(s): Christina DeJong (College of Social Science)

The number of transgender people murdered in the United States has been increasing over the past several years, with 25 murderers in 2019, 43 in 2020, and 53 in 2021; and the large majority of those murdered during this period were Black transgender women. Prior research indicates that transgender people are at higher risk of victimization than other groups. In addition, knowing that Black and LGBTQ+ people also have higher risk of victimization than others, it seems clear these factors intersect to increase homicide risk. In this study, we use data from the Transgender Homicide Database to analyze the 218 homicides that occurred from 2015 to 2021, and determine whether the characteristics of these crimes can help explain the high rate of murders among Black transgender women.

MENTAL HEALTH LITERACY NEEDS OF RURAL AND MIGRANT YOUTH

Presenter(s): Cara Heberlein

Social Science General
Mentor(s): Joanne Riebschleger (College of Social Science), Kathryn Irish (College of Social Science), Rachelle Rosario (College of Social Science)

Mental health (MH) disorders among youth have risen sharply during the last decade. Youth living in rural areas have a higher prevalence of mental illness and twice the rate of completed suicide compared to youth residing in metropolitan areas (Fontanella et al., 2015). Mental health literacy programming may reduce stigma, improve wellbeing and empower youth with the knowledge to identify, cope, and seek help for mental illness (Lam, 2014; Grove et al., Reupert & Maybery, 2015; Bjornsen et al., 2017; McLuckie et al., 2014). The Youth Education & Support (YES) Program is an educational curriculum aimed at improving youth mental health literacy with demonstrated efficacy in the United States and Australian educational contexts (Riebschleger et al., 2009; Marinucci, et al., 2021). The curriculum that the program will utilize in Spring 2023 will come directly from emerging themes that were gathered after thematic analysis of each interview that was conducted. Methods: The research team, including a PURI BSW student, broke down and dissected each interview's transcript to find key words or phrases that participants said that would prove to be crucial data for a mental health literacy program. The data will be used to used to help customize a mental health literacy program with about 120 9th grade students in the particular rural community where the interviews were conducted. To our knowledge this is the first mental health literacy study to focus on rural and migrant youth.

DUMP THE CHUNKS: RECYCLING ON MSU'S CAMPUS

Presenter(s): Jerome Hamilton
Social Science General
Mentor(s): Nathan Moore (College of Social Science), William McConnell (College of Social Science)
MSU leads recycling in the Midwest, but there are still some gaps to fill. One of these gaps is the waste generated by MSU's Combo-X-Change (CXC) program. These quick and easy packaged alternative meals that are included in standard dining plans increase the probability that their materials are not being recycled. In an effort to reduce this waste, we devised a plan to sort through the trash collected from a Combo-x-change location (1855 Place) at MSU's Recycling center. During this sort, we identified food containers as our actionable opportunity. Pizza boxes sold from the 1855 Place Sparty's became the primary target out of the food containers because there was no stream for recycling corrugated cardboard as post-consumer waste at 1855 Place. Using signage and a receptacle for the CXC pizza boxes, we set up a pilot study to watch the behavior of students who had a CXC pizza box when they interacted with our receptacle. After this, an element of education on recycling at MSU was added to our box collecting to possibly grab some anecdotes from students as they recycled. It is the intention of this study to understand how to effectively divert waste from the trash stream and make it recyclable. Hopefully, transmitting this information about recycling on campus can change the behavior of students who use these dining options.

MUTUAL HOUSING AT SPRING LAKE

Presenter(s): Kade Peck
Social Science General
Mentor(s): Deyanira Nevarez Martinez (College of Social Science)

Food sustainability public policy protects the most vulnerable in our communities from climate change and environmental issues as much as people in the privileged elite. Environmental Justice is becoming increasingly important in public policy, especially housing. A prime example of a population that is vulnerable in this respect are farmworkers. In 2015, the community of Woodland, California opened the Mutual Housing at Spring Lake (MHSL) a Zero Net Energy Affordable Housing development for farmworkers in the city. This project delves into the MHSL case and analyzes community public policy strategies in framing the project in order to determine if this is a viable model for others to follow in their quest to advance both housing justice and sustainability in farmworking rural communities in California and potentially nationwide. This project uses data from twenty years of city planning documents, electronically available city council meeting agendas and minutes and media accounts of the development process to make its assessments of how this project was able to be successful. Findings show that the typical anti-development resistance often resulting from affordable housing developments was not documented in the press or in planning documents and this project aims to find out how this was able to occur. The data suggests three main reasons; first, the City of Woodland has allowed new residential development in contrast to nearby cities that have all but halted all new development. Second, they have strategically used affordable and sustainable housing development to facilitate other projects, and finally, used sustainability to achieve inclusive and socially just mixed income development.

SECULAR TRENDS DRIVING NEAR SHORING DECISIONS IN THE US

Presenter(s): Remy Fischer
Social Science General
Mentor(s): Tobias Schoenherr (Eli Broad College of Business)

There are multiple secular trends that are slowing down globalization. Pandemic risks, geopolitical instability, changing demographics, environmental concerns, and more are causing businesses to consider bringing their supply chains back to North America.

TALK THERAPIES AND NEGATIVE PEER RELATIONS

Presenter(s): Olivia Berke
Social Science General
Mentor(s): Brandy Ellison (College of Social Science)

Growing mental health issues that stem from negative peer relations are leaving people unsure of how best to combat them. Previous research shows how severe the mental health issues can be after a negative interaction with a peer as well as the ways that talk therapies are used best, based on the specific feelings of patients. However, the field is missing the connection between the two threads of research. This research works to bridge that gap by surveying respondents about how they feel after a negative peer interaction. When analyzing the data, respondents can be placed into categories of therapy that work to resolve those specific feelings. The findings of the study point to psychoanalytic psychotherapy as the best option for individuals struggling with mental stability due to negative experiences with peers.

STOCK PERFORMANCE OF SUSTAINABLE COMPANIES: DOES SIZE MATTER?

Presenter(s): Delani Stull, Jogi Katende
Social Science General
Mentor(s): Antoinette Tessmer (Eli Broad College of Business), Guanglong Pang (Eli Broad College of Business)

B-lab is a certification obtained by companies that work rigorously to maintain high scores on the globally used environmental, social, and governmental scale (ESG). B-lab certification is challenging to attain; therefore, it is considered the gold standard for sustainable companies. With this, we are left with two research questions. Can investors invest in sustainable companies without compromising performance? Is it more financially wise to invest in sustainable companies with a higher or lower market cap? Our findings could paint a picture for investors on whether it would be more financially wise to invest in sustainable companies, subsequently, should the companies have higher or lower market caps. We propose to track the performance of B-lab-certified companies with high market caps (large) and low market caps (small) while comparing these to the overall S&P 500 average. We identified every available B-lab-certified company on various global stock markets. We then split the companies into two portfolios based on their market caps. Our data will display the risks and returns of each portfolio and how they compare to the S&P 500 to highlight the possible financial gain or downfall of investing in companies with high sustainability ratings. After all, if investors feel incentivized by financial gain, our findings may provide additional motivation to invest in sustainable companies. We predict that the high market cap portfolio will outperform the low market cap portfolio because they have access to more resources.

IMPACTS OF LEED-CERTIFIED HOTELS: PERSPECTIVES FROM FINANCIAL PERFORMANCE

Presenter(s): Miquela Ochoa, Olivia Brenner
Social Science General
Mentor(s): Mi Ran Kim (Eli Broad College of Business)

Leadership in Energy and Environmental Design (LEED), conducted by The U.S. Green Building Council (USGBC), is a leading green hotel certification program in the U.S., which has seen a surge in applications over the last decade. LEED-certified buildings in the lodging industry reap greater revenues, have lower costs, and produce higher ROI compared to non-LEED-certified competitors. Research on the impact of LEED-certified residential and office buildings is abundant, while empirical evidence to support the effects of LEED certification in the hospitality industry is lacking. We will examine the effects of LEED-certified buildings by comparing financial data provided by Smith Travel Research (STR) among LEED-certified and non-LEED-certified hotels. This will help provide insights and implications to a diverse group of stakeholders and decision-makers, including hotel owners, investors, managers, guests, and employees. The main goal of this study is to examine the actual effects of LEED-certified hotels by comparing financial performance among LEED-certified hotels and non-LEED-certified hotels.

THE PEDIATRIC RESPITE BENEFIT IN MICHIGAN: A VITAL, YET OFTEN UNMET NEED

Presenter(s): Mikayla Stokes
Social Science General
Mentor(s): John Waller (College of Social Science)

Pediatric respite care entails the delivery of services and resources to provide relief for families "burdened" with supervisory care of medically complex children, dramatically improving family well-being. Research indidicates many families who sould be eligible for respite benefits receive none and must continue to provide high-level care for their children without support. Applying for and receiving respite resources and benefits varies greatly geographically and reflects differences in access to, knowledge about, and aid in receiving such help. The need for respite far outpaces the availability of funding and personnel to provide it. As many of these children are dependent on interventions to live, qualified respite caregivers are few, so even families who qualify may have difficulty locating adequate aid. Across the state, counties provide varying funds for respite, and follow inconsistent protocols for determining eligibility and allocating funds. As such, my research aims to utilize survey data, with responses from Community Mental Health Directors/Coordinators in each county across Michigan, to demonstrate the extent to which disparities in access exist, as well as identify some of the factors contributing to Michigan's unmet need for pediatric respite services.

THE IMPORTANCE OF ALMA MATER PRESTIGE IN HIRING: AN ANALYSIS OF THE STRENGTH OF HIGHER EDUCATIONAL PRESTIGE IN INFLUENCING PERCEPTIONS OF EMPLOYABILITY ACROSS INDUSTRIES OF VARYING STATUS

Presenter(s): Eli Duguid
Social Science General
Mentor(s): Nicholas Hays (Eli Broad College of Business)

Past research has analyzed how important educational status, cultural capital, and social networks are in determining an organization's recruitment and selection process. This presentation attempts to build upon previous research by examining how alma mater prestige shapes perceptions of an individual's employability across industries of varying status. In collecting data, we utilized results from two surveys. The first, a pilot, gained perceptions on a selected list of industries, universities, and created resumes to determine quality similarity between resumes and perceived status differences within universities and industries. Utilizing the selected industries, universities, and resumes determined in the pilot study, the second survey uses resumes of quality similarity to test for significant or insignificant preferences of a candidate based upon their randomly assigned alma mater.

TELEVISION NEWS AND THE (MIS)REPRESENTATION OF COCAINE AND OPIOID USERS: A SYSTEMATIC STUDY OF NBC NIGHTLY NEWS REPORTS

Presenter(s): Jerome Hamilton, Josie Danielkiewicz, Nel Robinson
Social Science General
Mentor(s): John Waller (College of Social Science)

It has become something of a cliché to assert that today's opioid users are depicted more sympathetically by the American media than were the users of cocaine, particularly in the form of crack, during the 1980s. The modern users of opioids, especially drugs like OxyContin® or synthetic opioids such as fentanyl, are widely said to be characterized as the unfortunate victims of a public health crisis while the users of cocaine in the 1980s were demonized as dangerous criminals who warranted harsh policing and incarceration. This project seeks to ascertain whether or not there is a factual basis for this widespread perception. We also evaluate the hypothesis that a differential framing of drug use can be at least partially explained by the association of cocaine use with African Americans in the 1980s and the association of opioid misuse with whites in the present. In order to evaluate these claims, we have coded online databases of NBC Nightly News broadcasts over two seven-year periods using a carefully-designed set of criteria. We provide compelling evidence that (a) depictions of cocaine use in the 1980s were significantly more negative and condemnatory than those of opioids in the 2010s; (b) Black use of cocaine in the 1980s was grossly exaggerated; and (c) the lack of sympathy for cocaine users expressed by NBC in the 1980s is to come extent explicable in terms of pervasive racist attitudes.

WOAH, HAW, GEE! WHO ARE WE: THE CULTURE SHIFT SPAWNED BY WOMEN'S INTRODUCTION TO M.A.C

Presenter(s): Kaya Wilske
Social Science General
Mentor(s): Aminda Smith (International Studies & Programs)

This project explores the development and impact of women being admitted to Michigan Agricultural College from 1868 to 1940, utilizing the construction of Morrill Hall as a key turning point in the history of women on-campus. As a historical analysis, this project engages the culture shift experienced and touches on the gendering of femininity, the impact women had on the college, as well as Michigan Agricultural College's response to the demand for women entering higher-education and the tools they used to accommodate the ever-growing class. This project reveals campus history and the key role M.A.C. played in the shifting culture of the world of women's rights, gender equity, the development of higher-education institutions, and the foundations of fields of study cherished by generations of students.

IS THE HIJAB EMPOWERING OR OPPRESSIVE? AN ANTHROPOLOGICAL STUDY

Presenter(s): Malka Alfadel
Social Science General
Mentor(s): Steven Fraiberg (College of Arts & Letters)

The Islamic veil, also known as the hijab, is one of the most obvious telltale signs of a Muslim woman. Many Muslims believe it is customary for every Muslim woman who has reached the age of puberty to wear the hijab. Many non-Muslims believe that those women are being oppressed by having their choice to wear it stripped away from them and that the answer would be to "liberate" them and force them to take it off instead. In this anthropological study, I will be examining Muslim women's experiences and listening to their opinions and stories regarding this to determine their own perspective and whether they truly feel oppressed by it. To conduct this research, I will employ various ethnographic data collection methods, including but not limited to semi-structured and elicited interviews, artifact collection and analysis, and retrospective accounts. I will be looking at the experiences of Muslim women who wear the hijab and those who do not, inside and outside Muslim countries. Through this project, I hope to gain more insight into the factors that inform a Muslim woman's decision to wear or not wear the hijab, as well as to tackle the stigma surrounding it.

SOCIOLOGY

FROM BETRAYAL TO COURAGE?: STAKEHOLDER PERCEPTIONS ON INSTITUTIONAL CHANGE

Presenter(s): Katie Burkhardt
Sociology
Mentor(s): Sarah Prior (College of Social Science)

I have been working on creating an instrument to measure staff's, students', and faculty's perceptions on whether Michigan State University has moved towards a model of institutional courage since the 2018 sexual abuse scandal. After getting respondents to this survey, I am analyzing the data collected in order to see whether these stakeholders at Michigan State University think that the institution has moved towards a model in which they work to protect everyone from sexual abuse, even when that means taking actions that aren't profitable or are even harmful to the institution itself. These actions that would constitute a model of institutional courage could include but are not limited to putting resources into creating departments that work to help sexual abuse survivors, reprimanding staff and faculty who have committed sexual abuse, and taking accountability for allowing these incidents to happen.

MSU CAMPUS CULTURE

Presenter(s): Cassidy Versen
Sociology
Mentor(s): Sarah Prior (College of Social Science)

Undergraduate students from different levels of Sociology classes were asked to participate in this research study on campus culture, specifically in their participation in "hook ups" and consent in these interactions. The goal of the study was to see if students' experiences reflect how college culture is portrayed in mainstream media. Preliminary analysis shows that students have a variety of perceptions of hookup culture and varying levels of engagement.

UNDERSTANDING CONTRIBUTING FACTORS OF MENSTRUAL STIGMA IN UNIVERSITIES TO ADDRESS BARRIERS TO PERIOD PRODUCT ACCESSIBILITY

Presenter(s): Harsna Chahal, Nupur Huria
Sociology
Mentor(s): Danielle Gartner (College of Human Medicine)

Period stigma is a significant yet often ignored public health crisis. The social shame and steep cost of menstrual products often push low-income people to adopt unhygienic practices during menstruation, negatively impacting their health, education, and dignity. To better understand Michigan State University students' and facilities' experiences with menstruating in academic settings, accessibility and barriers to obtaining menstrual products, and responses to hypothetical questions regarding receiving free menstrual products, we created a survey to create a qualitative method approach to understand better students' and facilities' experiences, knowledge, and barriers. The sample included 195 respondents with an age range of 16-33 (mean age = 21.6) and roughly 96.4% identified as a woman, 2.6% identified as non-binary, and 1.0% identified as men, with 31.3% respondents with an annual family household income less than 50,000 dollars and 20.0% respondents with no income.

CHARACTERISTICS OF GYM CULTURE AMONG UNDERGRADUATE WOMEN AT MSU

Presenter(s): Annika Jaros
Sociology
Mentor(s): Steven Fraiberg (College of Arts & Letters)

Gym culture, especially that among women, is a topic that isn't talked about by most because the gym is seen as male dominated. My ethnographic study aims to explore the characteristics of gym culture among women at Michigan State University. My research methods included: a survey of 100 female students who regularly participate in gym culture, one-on-one interviews, social media trends analysis, and observations of the campus gym. The survey encompassed questions related to clothing choices, motivation, social media following, and social interactions. The results show that there is a discernible difference in gym culture between men and women, and the culture is multifaceted and includes elements such as social support, social media pressure, and overcoming stigma. The study unveils aspects of gym culture among women that may not be recognized by those outside of the culture. Overall, this study provides insights into the unique differences of gym culture among women at Michigan State University. These insights could help to create a more inclusive and supportive environment for women who want to improve their health and fitness levels.

A SCIENCE-ACCEPTING MESSAGE INCREASES SUPPORT FOR CLIMATE CHANGE ACTION AMONG SELF-IDENTIFIED CONSERVATIVES

Presenter(s): David Koster
Sociology
Mentor(s): Aaron McCright (College of Social Science)

This research analyses climate science skepticism among self-identified conservatives following the Covid-19 pandemic. The aim was to explore how Covid science skepticism affects climate science skepticism and the impact of youth messengers. Both these angles are crucial to understanding the evolution of conservative climate change denialism and what strategies may be used to address it. Employing a 2-by-2 experimental design with video stimuli, we surveyed over 400 people with the crowd-sourcing website Amazon Mechanical Turk. Our results align with previous research including statistically significant correlations between trust in impact science and support for action on climate change. Other factors with statistically significant correlations include conspiratorial ideation and free market fundamentalism. Overall, this research highlights the stark contrast among self-identified conservatives' perceptions of production science versus impact science. In other words, the perceived credibility and trustworthiness of the messenger have a large impact on how the message with be received.

STUDENTS' PERCEPTIONS OF SEXUAL HARASSMENT IN RUSSIA: DO RAPE MYTHS AND GENDER STEREOTYPES MATTER?

Presenter(s): Jenna Gabriel, Lauren Plumley
Sociology
Mentor(s): Anna Gurinskaya (College of Social Science)

Prior research shows that attitudes and perceptions relating rape myths and gender stereotypes play a large role in how people respond to sexual harassment, alleged victims, and alleged perpetrators. Our study addresses whether attitudes toward rape myths shape attitudes toward sexual harassment. Based on the survey of over 2000 Russian university students about their experience and views on sexual harassment we look at whether gender stereotypes and myths about harassment and rape shape students' attitudes towards different harassment types. Using previous literature reviews, we look at definitions of rape myths, gender stereotypes, and sexual harassment and their perceptions in the non-western culture. Psychological impacts, cultural implications, and sociological framework will be highlighted and discussed.

VISUAL & PERFORMING ARTS

VISUAL EXPRESSION OF MUSIC

Presenter(s): Erica Blaine, Erin Simpkins, India Hirschowitz
Visual & Performing Arts
Mentor(s): David Biedenbender (College of Music), David McCarthy (Residential College in the Arts & Humanities)

Two primary categories of the performing arts are visual art and music, both of which are greatly interconnected. Emotion is a critical part of both music and visual arts, by utilizing the emotional effects of music can a person's portrayal of such music in the visual arts realm be influenced? In order to research this question participants were made to listen to three songs with distinct underlying emotions and paint whatever the song made them feel or think and then describe their emotional state during the process. The resulting paintings and questionnaires showed a clear link between the emotions of the songs and the colors and themes of the paintings created, as well as the physical and mental effects the songs had on participants.

FOLLOWING THE COMPASS: ENCOURAGING COMMUNITY ENGAGEMENT IN THEATER

Presenter(s): Sasha Franklin
Visual & Performing Arts
Mentor(s): David Biedenbender (College of Music), David McCarthy (Residential College in the Arts & Humanities)

According to the study "Arts participation: Steps to stronger cultural and community life" by Walker et al., less than half - about 46% - of American adults participate in the arts (2003). Additionally, in the 12 months before a study by the National Endowment for the Arts, only 4% of American adults participated in a theater production ("U.S. Patterns of Arts Participation," 2019). What is stopping people from performing? And how can arts participation be encouraged? This project focuses on the benefits of performing arts participation and encouraging community engagement in theater. Viola Spolin, a founding figure of American improvisational theater, invented theater games - an activity that can be taught easily to people with no training. Spolin's work and the history of improvisational theater in the United States are also significant to this project. Early improv groups relied heavily on amateur actors - and found that they did their best work before professionals took over the programs. This also points to the importance of community performing arts involvement. As a part of the project, a community theater night featuring Spolin games and other improv games will aim to introduce a few more people to the excitement of theater.

EVERY BRILLIANT THING/ MRS. HARRISON

Presenter(s): Katherin Poon
Visual & Performing Arts
Mentor(s): Karen Kangas Preston (College of Arts & Letters), Kirk Domer (College of Arts & Letters)

For Every Brilliant Thing by Duncan Macmillan and Jonny Donahoe, Katherin Poon served as the assistant scenic designer to Professor Kirk A. Domer. In residence for eight days during the tech/dress process at A.D. Players in Houston, TX, Ms. Poon served as a resident designer working alongside industry professionals at the George Theatre. She helped create a world based on the personal history of the solo actor and his depressive struggle and response to his mother's attempted suicide in a life-affirming journey. For Mrs. Harrison by R. Eric Thomas, Ms. Poon served as the assistant costume designer to Senior Academic Specialist Karen Kangas-Preston. Throughout the creative process at Williamston Theatre in Williamston, MI, Ms. Poon served in various capacities related to costume design, sourcing, and alterations. She helped create the fashion for two women writers/artists who find themselves trapped together at their 10-year college reunion fighting for the truth in a shared story where truth and memory are not aligned. As a theatrical designer, Ms. Poon embraced the reoccurring themes to elevate each script, heightening the impact the productions can have on viewers. To accomplish this result, she performed extensive research on the subject material and its context through script analysis. As a design assistant, Ms. Poon helped coordinate these requirements, restraints, and creative freedoms that weaved into the final design for each show.

THE ARCHIVE OF MALIAN PHOTOGRAPHY (AMP)

Presenter(s): Angie Petterson, Laine Lord
Visual & Performing Arts
Mentor(s): Candace Keller (College of Arts & Letters)

The Archive of Malian Photography's mission is to digitize, catalog, preserve, and make internationally accessible the archives of five of Mali's most important photographers. MATRIX has archived and shared approximately 100,000 of the most historically and culturally significant negatives and original prints dating from the 1940's to the present.

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SHE WEARS IT WELL

Presenter(s): Emelia Rush
Visual & Performing Arts
Mentor(s): D'Ann Desimone (College of Arts & Letters)

In her soft sculpture, She Wears It Well, Emelia Rush examines attitudes about women's bodies and the pressures for women and girls involved in the virtuoso dance world to conform to an ideal of perfection and beauty. Using a leotard as a stand-in for self, Ms. Rush uses embroidery, beading, and sequinning to adorn the body suit. Drawing with her needle, the construction of the piece becomes reflective and celebratory of the affirmative aspects of dance, while also examining some of the negatives that can accompany intense athletic activity. Using finished needlework on the outside of the sewn piece, the inside becomes reflective of the private, interior psyche. In relation to the soft exterior, the lining of fixed cross-stitch fabric becomes a metaphor of the rigid day-to-day of a perfectionist to gain a sense of control. The chaotic, tangled threads are intended to further symbolize the detrimental effects of these standards. The work equates ballet, art, and perfectionism. Through extensive research, Ms. Rush investigates the connection between the undermining of women's art - particularly art which uses craft materials or techniques - and the unattainable standards by which women are negatively judged.

INTERPRETATION AND INTERSECTION OF GENDER, IDENTITY AND THE SELF

Presenter(s): Maddy Curley
Visual & Performing Arts
Mentor(s): Lorelei Jones (College of Arts & Letters)

My intent for this project is an exploration of gender identity and sense of self, and my relationship to it, through the use of collage. The resulting piece(s) would be made of items and materials that hold significance in my life in isolation and how the merging of them reflect the complexities of my many intersecting identities.

THE POETRY LIGHTHOUSE PROJECT: SHINING LIGHT ON INCARCERATED VOICES AND COMMUNITY

Presenter(s): Audrey Rauscher, Reese'samone Tatum
Visual & Performing Arts
Mentor(s): Guillermo Delgado (Residential College in the Arts & Humanities)

We will create a magazine and exhibition (and possibly a reading event) and prints of poems written by the communities impacted by mass incarceration in Michigan. The URAs will collaborate with our mentor to create and curate a professionally printed magazine / chapbook and create broadsides of poems for an exhibit that will highlight the RCAH Prison Arts 'Zine Project: poems and 'zines created by RCAH students and members of the incarcerated communities and their families.

MELDING TECHNOLOGY WITH ART

Presenter(s): Erin Hallett
Visual & Performing Arts
Mentor(s): Peter Glendinning (College of Arts & Letters)

Scanning is a form of expression that has been overlooked by the general public. It is not only used to copy documents but to create art as well. This medium gives the artist an immense level of control. During my research, I have set a stage, laid the groundwork, and arranged the pieces to create compositions. Scanography is interesting because it looks like many things that it is not: like a drawing, painting, or photograph. It may seem effortless, but spatial recognition and color theory come into play with every item placed. For my presentation I will be using a poster board to explain scenography, share how paper and fabric cascade together over different types of lighting, transporting the viewer into a world of the imagination. It inspires me to create textiles, paintings, and photographs. I will invite viewers to scan the items in their pockets and show them how I create a world with my scanner. I hope to encourage them to give the art form a try by sharing my process. I am also currently working on making a magazine full of scans about femininity, allowing photographs, pieces of history, and the importance of friendship to intertwine in the pages in different ways each time. I will have prints available for people to consider if they like.

WHAT SHOULD PEOPLE DO?

Presenter(s): Elijah Persson-Gordon
Visual & Performing Arts
Mentor(s): Melissa Lehti-Shiu (College of Natural Science)

Philosophy is practical, but we often treat it as if it doesn't underlie everything we do. With some basic philosophical ideas and some information about our current world, we can expand our thinking and care a lot more for others. In this performance, I hope to entertain people, make them think, and inspire them to donate more.

MATTHIAS SCHMITT'S "GHANAIA" AND ITS MUSICAL CAPABILITIES

Presenter(s): Lacy Jewell
Visual & Performing Arts
Mentor(s): Jonathan Weber (College of Music)

As a musician, it is important to connect with the piece that is being performed. One of the best ways to dive deeper into a piece is to study the origins and the composer's intentions. Bembe, a traditional Afro-Cuban rhythm, inspired Matthias Schmitt's marimba work Ghanaia. Matthias Schmitt, a German composer, took his training from his years spent studying with Brazilian hand-drummer, Dudu Tucci, to compose Ghanaia. However, Schmitt also stated: "There has to be a possibility to write a piece that is appealing to the rhythmists and the ones who love harmonies and beautiful sounds." Schmitt's multicultural work is later described as "use of African rhythms combined with Schmitt's European musical experiences." To connect deeper with the Ghanaian origins of this piece, I will research and arrange percussion accompaniment that reflects Schmitt's inspirations from Bembe, Agbadza (from the Ewe people in Ghana), and western harmonies. In this presentation, I will briefly demonstrate these traditional styles of music, discuss my arrangement, and perform the marimba solo Ghanaia with percussion accompaniment.

SCIENCE, TECHNOLOGY, ENGINEERING & MATHEMATICS

DRONE DELIVERY 'CATCHING A RIDE' ON PUBLIC TRANSPORTATION

Presenter(s): Brady Berg, Gavin Gardner, Malachi Keener, Ross Davis
Science, Technology, Engineering & Mathematics
Mentor(s): Ioannis Papapolymerou (College of Engineering), Leo Kempel (College of Engineering), Woongkul Lee (College of Engineering)

NASA University Research Challenge participants at Michigan State University are producing a way for heavy payload drones with short flight times to extend the range of operation by landing and charging on existing public transportation networks. Using a generic hexacopter that is optimized for safety, affordability, and quietness the system is built to be integrated into last mile suburban delivery. The drone is secured to a bus using a proprietary latching system that charges the UAV during the commute. Controlling the backend is a dispatch software that calculates the optimal bus route to take and uploads a mission for full autonomous delivery. Join us to hear about how this project for undergraduate students has pushed drone infrastructure research over the last two years.

GRAIN SHAPE ANALYSIS OF MARS REGOLITH SIMULANT MGS-1 AND LUNAR REGOLITH SIMULANT LMS-1

Presenter(s): Charlie Herz, Jazzmyne Ortiz, Priyadharshini Mohanraji
Science, Technology, Engineering & Mathematics
Mentor(s): Michael Velbel (College of Natural Science)
Simulants of lunar and martian regolith have been used for decades to support interpretations of regolith properties from lander and rover measurements. The long-used, NASA-developed simulant JSC Mars-1 consists of glassy, phyllosilicate-poor, palagonitic volcanic ash from the south flank of Mauna Kea volcano on Hawai'i. It was selected mostly due to its similarities to regolith from the Viking Lander Sites in composition and spectroscopy. In the time since JSC Mars-1's introduction, however, Exolith Labs, a research organization at the University of Central Florida, produced several other simulants intended to replicate extraterrestrial regolith with greater specificity and accuracy, basing the recipe on much newer, higher-precision data from more recent mission data. This presentation describes and interprets similarities and differences in grain shape, form, and surface textures among two of these newer synthetic regolith samples, specifically the Lunar Mare High-Fidelity Moon Dirt Simulant (LMS-1) and the Mars Global Simulant 1 (MGS-1). Samples were prepared by mounting sand-size grains onto aluminum stubs and coating them with carbon. They were then imaged using a JEOL 6610LV scanning electron microscope in secondary electron imaging mode (SSEM), with energy dispersive spectroscopy (EDS). Grains were characterized using grain dimensions (equantcy/elongation), grain roundness-angularity, and grain-surface textures. Among the 120 MGS-1 grains examined, certain textural characteristics were observed on multiple grains, including parallel striations and very high angularity. We investigate whether LMS-1 shares these patterns, and if not, describe the ways in which its surface textures differ from MGS-1.

GRAIN SHAPE ANALYSIS OF MARS REGOLITH SIMULANTS MGS-1 AND JEZ-1

Presenter(s): Kierstin Hawkins, Rachel Loren
Science, Technology, Engineering & Mathematics
Mentor(s): Michael Velbel (College of Natural Science)

The Perseverance rover on Mars is currently collecting soil samples to be returned to Earth. In the meantime, analogs and simulants are being used to predict the properties of these samples. We studied SEM images of sand-size grains from Mars two regolith simulants - 100 grains from JEZ-1 and 80 grains from MGS-1. We determined the size and dimensions, rated the roundness using the Powers (1953) roundness scale, and determined the surface textures of each grain. Studying two different samples allows us to compare them and find the similarities and differences between simulants and see the different way soil may have formed on Mars. In studying these samples, we can get an idea of what to expect from the samples that Perseverance is collecting before they even come to earth. This is important because it will allow us to have an idea of what to look for in these samples and have an idea of what processes they went through to get to their current form.

GRAIN SHAPE ANALYSIS OF MARS REGOLITH SIMULANTS MGS-1, MGS-1S, AND MMS

Presenter(s): Lyric Pingilley, Maia McGillis, Pietro Terzini
Science, Technology, Engineering & Mathematics
Mentor(s): Michael Velbel (College of Natural Science)

Mars regolith simulants are a very useful tool for studying historical changes to the landscape and environment of Mars and gathering information for future human exploration missions. These samples are used to simulate the physical and chemical properties of Martian Sand, and examining them is useful in learning more about the possibility of ancient life on Mars. The samples examined throughout this study are Mojave Mars Simulants (MMS) and Mars Global Simulants (MGS-1 and MGS-1S). These grains were photographed using a Scanning Electron Microscope (SEM). The grains were then compared to various photographs of terrestrial quartz grains and then categorized by their different features. New categories for distinct features were created and categories from other studies were used for familiar features. In total, 16 categories were used to categorize both the MMS and MGS simulants, including: relief; conchoidal fracture; smooth concave curved scratches; smooth curved wavy zig zagging sharp edges; breakage blocks; cleavage; flat surface; smooth straight sharp edges; parallel striations; straight steps; arcuate steps; straight scratches; curved scratches; meandering ridges; V-shaped percussion cracks; and adhering particles. Many of the grains from the Martian regolith simulants bore similarities to the characteristics of the quartz grains and could be categorized, but some were not able to be categorized due to significant differences.

CLASSIFICATION OF ION SIGNALS: MACHINE LEARNING REVEALS MASS OF INDIVIDUAL ISOTOPES

Presenter(s): Saransh Mehta
Science, Technology, Engineering & Mathematics
Mentor(s): Ryan Ringle (Facility for Rare Isotope Beams)

The classification of ion signals using machine learning techniques to reveal the mass of individual isotopes is the focus of this project. With applications in fields such as nuclear astrophysics, particle interactions, and the medical industry, understanding the properties of rare isotopes is of utmost importance. A Single Ion Penning Trap (SIPT) is utilized to read electrical signals from ions as they spin in an electrically accelerated vacuum chamber. These signals are then converted into individual events, grouped, and processed through python-based machine learning algorithms, including Gaussian Naive Bayes, KNN, SVM, and neural networks. After evaluating each method's performance, the Naive Bayes algorithm was selected to identify the signals. The results can be used to calculate the mass of isotopes produced at the FRIB.

NITROGEN ANALYSIS OF GREENHOUSE ECOSYSTEM TO MANAGE CRAFT BEVERAGE WASTEWATER

Presenter(s): Madison Pritchett
Science, Technology, Engineering & Mathematics
Mentor(s): Carley Allison (College of Agriculture & Natural Resources), Steven Safferman (College of Agriculture & Natural Resources)

This project focuses on a sub-section of a larger project that aims to evaluate and determine design data for a greenhouse ecosystem for managing craft beverage wastewater. The treatment goal for the greenhouse effluent is to make it suitable for non-potable applications such as irrigation, toilet flushing, and landscape features. To achieve this, the greenhouse ecosystem needs to effectively remove nutrients from the wastewater, specifically reducing Nitrate levels below the maximum contaminant level of 10 mg/L as Nitrogen. To assess the success of the system, Nitrate, Nitrite, Ammonia, Total Nitrogen, and Dissolved Oxygen (DO) levels are measured twice weekly. Additionally, the impact of other variables, such as salt, yeast, and cleaning chemicals, on nitrogen consumption within the system will be analyzed. The findings of this analysis will contribute to understanding the performance of the greenhouse ecosystem for craft beverage wastewater management and nutrient removal.

SOCIAL SCIENCE, HUMANITIES & ARTS

ROBARTHE AND THE ART ROBBERY

Presenter(s): Phuc Nguyen
Social Science, Humanities & Arts
Mentor(s): Ilse Schweitzer (College of Arts & Letters)

"Robarthe and the Art Robbery" is a short story focusing on the relationship between technology and arts while illustrating inquiries about the border of creativity. Inspired by the classic novel Frankenstein by Mary Shelley, the story was written for the Honors Option of the class MI201 about media and information based on the basic idea about the dangers of humans' uncontrolled creative ability in science. However, the idea has been developed to achieve more profound insights about addressing conflicts in how technology can imitate and replace arts. Therefore, the fundamental premise of the story is that art is not merely defined but can be refined by any intelligence, whether natural or artificial. The unique factor of this project was the combination of AI art and my skills in editing during the creative process. Besides the story I wrote, there are five graphic images created by the AI program Mid-Journey through my input sentences and editing skill to be more compatible with the story. Moreover, the story features a short poem written by a browser to navigate the structure of the plot. Even though I completed this story last semester, I will still refine it with the instructions of Professor Schweitzer from my writing class (WRA195H) this semester and may update the story with the combination of the new technology of Chat GPT. The exhibit will include the main poster of the story, some prominent excerpts, an additional excerpt written by ChatGPT, and five graphic images corresponding to each chapter.

GENDER IN SPORTS

Presenter(s): Allie Cole, Ashton Gray, Dominick Stogiera, Kylie Camman
Social Science, Humanities & Arts
Mentor(s): Dan Li (College of Human Medicine)

We are going to create an animation showing the inequalities in atheltics. Our animation will go into detail about the different gender norms in our society, showing how unfair certain aspects of life are for some people of certain gender identities. It will be focused on sports and the different gender roles in the sports world. It will bring up topics about viewership, pay gap, recognition, and television coverage. It will show how men are set up from the beginning to succeed in sports and how women have to work harder to get more recognition for the same achievements in sports.

EXPLORING GENDER NORMS THROUGH CHILDREN'S TOYS

Presenter(s): Christina House, Ellie Barron, Zachary Colo
Social Science, Humanities & Arts
Mentor(s): Dan Li (College of Human Medicine)

How do gender norms manifest in the toys we select for children? Through the medium of video games, we explore the pervasiveness of gender norms on the toys we buy for children. The game begins by sorting toys for a boy and for a girl. As the game continues, the participant is guided with more specific prompts and is then asked to sort the toys again. By the end of the game, the participant will be able to look back at their selection and witness the differences in sorting based on the different prompts given. Through this game, the imprinting of gender ideals onto children, as well as the pervasiveness of societal gender norms will be examined.

WOMEN'S AND GENDER STUDIES TRIVIA

Presenter(s): Manu Sidhu, Sasha Franklin, Shrishti Jalan, Sonia Menon, Sophia Pham
Social Science, Humanities & Arts
Mentor(s): Dan Li (College of Human Medicine)

Our project, by utilizing the design aspect of a "Trivia Game", aims to spread awareness about the severity and relevance of gender based violence in the United States. Through a series of multiple choice, data-based questions, participants will get the opportunity to interact with our material as the game walks them through our research and its findings. To create the game, we will make use of Scratch, and animate the correct response to show up distinctly as compared to the incorrect ones to highlight the actual statistic and also display its source for the viewers discretion.

HOW WELL DO YOU KNOW ME? AN INVESTIGATION ON GUEST RECOGNITION PREFERENCES AND IMPACTS IN THE HOSPITALITY INDUSTRY

Presenter(s): Live Cannella
Social Science, Humanities & Arts
Mentor(s): Mi Ran Kim (Eli Broad College of Business)

The strength and success of the hospitality industry is deeply rooted in the support from repeat, loyal guests. Developing real relationship customers through strong implementation of guest recognition and personalization is more advantageous and cost-effective than extending assets for hospitality business of all scales (Magnini & Honeycutt, 2005). Given the plethora of benefits that building relationships with guests has on a business including but not limited to customer satisfaction, brand commitment, guest loyalty behavior, word-of-mouth tendencies, and employee relations, it is not surprising that there has been a visible increase of these practices in recent years. (B. A. Gutek, et al., 2000; R. M. Morgan & S. D. Hunt, 1994; M. S. Nyman, 1996; J. Barsky & L. Nash, 2003). As the utilization of guest recognition techniques has grown to multiple markets, many researchers pose a need to gauge the limits of guest recognition and understand when relationship building and need anticipation goes from helpful to harmful. This study examines what the best recognition practices are, how often to use personal touches, if specific individuals have greater effects on building relationships than others, and where guest experiences are harmed by extreme recognition and attentiveness.

SOCIAL MEDIA ENGAGEMENT IN KENYA WITH THE KUONA ARTIST COLLECTIVE

Presenter(s): Molly Wright
Social Science, Humanities & Arts
Mentor(s): Teresa Mastin (College of Communication Arts Sciences)

This project expands upon the work created during the US22 Education Abroad Program: Visual Storytelling in Kenya for the Kuona Artist Collective to create a social media engagement plan to see if consistent posts drive online traffic to the Collective. The project focuses on highlighting the student work from the Education Abroad trip while also showcasing the work of the Collectives Artists to generate exposure on a micro (individual artists) and macro (the Collective) level. This was done by organizing student work into "Artist Spotlight" posts for the collective's Instagram. These posts included portraits of each artist, photos of their work and studio, and information about the artists, such as social media tags, quotes, and background information. Doing this creates a singular space for viewers to connect with the artists and their work, providing mutually beneficial exposure and engagement with the accounts of all parties.

IMPACT OF THE COVID-19 PANDEMIC SCHOOL MODALITY POLICIES ON ADOLESCENTS

Presenter(s): Emma LaBarre
Social Science, Humanities & Arts
Mentor(s): Emily Durbin (College of Social Science)

As a result of the COVID-19 pandemic, remote learning has become a routine experience for millions of children and young adults. Given that remote or virtual learning is a new learning experience for most people, it is important that more research is carried out on the effects it has on different students' success. Such analyses are important for enacting education policies and knowing how to tailor online education, where necessary, to the needs of different kinds of learners. Research has already shown that a student's personality influences learning approaches and outcomes, and therefore information on personality's effects is relevant to decisions about virtual classes. The Big Five personality traits (openness, conscientiousness, extraversion, agreeableness, and neuroticism) have been studied in regard to learning in classrooms, but as there has just recently been a massive increase in the number of students using virtual learning, more research is urgently needed. This research project was conducted by analyzing data regarding the Big Five personality traits and education. The data analyzed in this research come from surveys conducted multiple times over the course of the COVID-19 pandemic by psychologists at the University of Michigan. The questions from these surveys that relate to personality and online learning were selected and the corresponding data were analyzed.

POLITICAL MISINFORMATION AND SOCIAL MEDIA

Presenter(s): Sydney Wojczynski
Social Science, Humanities & Arts
Mentor(s): John Waller (College of Social Science)

Misinformation is frighteningly difficult to detect. The process of verification is especially complicated on social media because there are minimal citations and the number of 'likes', comments, and the identity of the person posting the information may influence an individual's understanding. Reality checking can be badly compromised by relationships and influences on social media, such as how friends, family members, celebrities, or respective political groups post or present political (mis)information (Domguaard & Park, 2021). This research project is focused on social media norms and the spread of misinformation within political communities on the platform Instagram. Infographics, popular for their 'trendy' aesthetics and colors, have become a new and popular source of false or skewed political (mis)information on this platform. This is a potentially dangerous development given their high accessibility to impressionable people. To study this contemporary social media phenomenon, this project analyzes existing literature to better understand the importance of information's format in the news landscape of social media.

ASSORTATIVE MATCHING BY EDUCATION LEVEL IN EUROPE

Presenter(s): Calder Moore, Jack Metty, Jay Stansberry, Matt Dirisio, Meital Lurie, Rainy Jain
Social Science, Humanities & Arts
Mentor(s): Hanzhe Zhang (College of Social Science)

Conceptually, assortative matching occurs when individuals of the same or similar characteristics marry (or cohabit) with each other, but how prevalent assortative matching is differs by society and time. Theoretically, the faculty PI has developed new axiomatic measures of assortative matching for heterosexual couples (in two-sided marriage markets) and homosexual couples (in one-sided marriage markets), respectively. Empirically, the undergraduate students will examine the degree of assortative matching on college education (and other socioeconomic characteristics) across countries and periods. The data for the US are available on IPUMS USA (Integrated Public Use Microdata Series), and the data for other countries are available on IPUMS International. To provide a comprehensive example to guide undergraduate students, the PI and a graduate student will browse the literature and document the pattern of assortative mating on college education in the US. IPUMS International contains over 1 billion personal records from 547 censuses and surveys in 103 countries. Each undergraduate student will (1) review and summarize the literature on previous documentation of assortative mating for a continent of international countries (Asia, Europe, North America, South America, and Africa, respectively), (2) document assortative mating pattern for countries on each continent and across time in statistical packages such as STATA or R, and (3) compare the degree of assortative matching between heterosexual and homosexual couples (for the 30+ countries that legalized same-sex marriages).

ASSORTATIVE MATCHING IN MARRIAGE MARKETS

Presenter(s): Calder Moore
Social Science, Humanities & Arts
Mentor(s): Hanzhe Zhang (College of Social Science)

In this project, we look at how people match in marriage markets based on their education level using different methods and in different countries by birth cohort. We also consider same-sex partnerships, although this can sometimes be difficult depending on the country due to the legal status of same-sex marriages. Our data is from the IPUMS International census microdata.

REVENGE AND PRISON REFORM

Presenter(s): Lucas Nunn
Social Science, Humanities & Arts
Mentor(s): Matthew Grossmann (College of Social Science), Nick Pigeon (College of Social Science)

I want to explore the connections between a person's opinions on and beliefs related to the concept of revenge and their opinions on prisons. In essence, I want to examine how the connection between the concept of revenge and support for prison reform is informed by the individual opinions people have on the purpose of prison and how prisoners should be treated, using punitive and less rehabilitation focused attitudes as a measure of revenge favorability. I want to focus on the fact that very few people are satisfied with how prisons function in the United States currently, and the fact that many people want prisons to focus much more on helping those incarcerated to become productive members of society when they return. This should provide a suitable basis for a discussion on the connection between revenge-adjacent beliefs and prisons.

CHANGES IN EGG CHARACTERISTICS, EGG YOLK ANTIOXIDANT PROFILE, AND EGG LIPID OXIDATION (TBARS) ACROSS THE GRAZING SEASON IN A SOUTHERN OHIO-BASED PASTURE-RAISING SYSTEM FOR LAYER HENS

Presenter(s): Shreya Chavva
Social Science, Humanities & Arts
Mentor(s): Jenifer Fenton (College of Agriculture & Natural Resources)

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 of forages may vary throughout the seasons, and there is limited research assessing egg phytochemical profile changes throughout the grazing season. Therefore, the objective was to characterize monthly changes in egg characteristics, antioxidant profile, and lipid oxidation over the foraging season. Twenty-four egg samples were collected monthly from May to December, assessed for egg characteristics, and pooled to form n = 12 replicates per month. 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 ($p<0.05$). The yolk color was a darker orange in August and December compared to June and September ($p<0.001$). 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 (118.1 ± 24.0 ug/g fresh weight; $p<0.001$). Carotenoid content was higher in mid-summer and late fall ($p<0.001$). Total phenolic content was higher in August and September compared to July ($p=0.019$). Lipid oxidation significantly decreased over the growing season ($p<0.001$), coinciding with the increases in antioxidant content. These data demonstrate significant seasonal changes in the egg characteristics, antioxidant profile, and lipid oxidation of pasture-raised eggs from this region. Future analyses will associate the egg nutrient profile with forage, soil, and weather characteristics across the season.

BRIGHT STAR: THE INTERMINGLING OF ARTISTRY AND LEADERSHIP

Presenter(s): Jordan House
Social Science, Humanities & Arts
Mentor(s): Ranae Selmeyer (College of Arts & Letters)

For Bright Star, a musical by Steve Martin and Edie Brickell, Jordan House served as the paint charge to her own scenic design for the Michigan State University Department of Theatre's spring production. The musical carries its audience back and forth through time as they follow the lives of Alice Murphy and Billy Cane. It features young love, tragic loss, tenacity and passion, and, ultimately, the reunion of a family once torn apart. Brad Willcuts' directorial vision emphasized the value of perseverance and positivity, even in the darkest of times. Gaining valuable experience through collaboration with the design team, technical director, and a team of student painters, this scenic charge opportunity provided an entirely new perspective on the production process. Research revolved primarily around the necessary relationships for a charge artist to maintain throughout a production, as well as the learning, implementation, and teaching of painting techniques to create a numerous faux textures and various degrees of aging. Using Rosco Off-Broadway Scenic paints, color theory was employed to match paint elevations and inspiration photos provided by the designer. Professional-quality paint samples and a paint mixing guidebook were created prior to painting the scenery, becoming valuable additions to a student design portfolio.

ESPIONAGE IN POST WAR VIENNA 1945-1956

Presenter(s): Brandon Loy
Social Science, Humanities & Arts
Mentor(s): Matthew Pauly (College of Social Science)

When historians talk about the Cold War and the role of passing intelligence, Austria's position needs to be addressed or improved, with a greater focus being Germany and the City of Berlin. Through this project under Dr. Mattew Pauly's guidance for this project, I shifted away from Berlin and towards Vienna. The primary focus of this project was pealing back at the still secret world of espionage in the Austrian capital from the end of the Second World War up to the Hungarian Revolution in 1956. The allied powers divided Vienna, like Berlin after the war. The significant difference between the occupation and division of both cities is that Vienna was much more open to freedom of movement and had an international zone within its heart, allowing for less risky communications between the east and west. Throughout my research, the role of women spies used by both the west and the Soviets was highly prominent, and their parts in getting intelligence were highly critical in the first years of the Cold War. Vienna was host to several spy agencies, such as America's CIA and the United Kingdoms MI6, along with the predecessor to what would become the USSR, KGB, all worked carefully throughout the city trying to gain intelligence on one another. Intelligence gathered in the town would help determine the role the US would take in Korea if the war when global, and later the Austrian government's response to the troubles in Hungry.

THE VIABILITY OF A VIRTUAL TELEHEALTH EDUCATIONAL ACTIVITY IN ACHIEVING INTERPROFESSIONAL COMPETENCIES: A SCOPING REVIEW

Presenter(s): Eunjin Jeong
Social Science, Humanities & Arts
Mentor(s): Jackeline Iseler (College of Nursing)

Health care is delivered by interprofessional teams including nurses and other healthcare providers. Effective collaborative practice is a core competency for interprofessional teams, and thus, a focus of undergraduate and graduate health professions' educational programs. Virtual interprofessional education (IPE) is a growing model for delivering IPE training to nursing and other health profession students. Virtual IPE includes simulated patient care activities, and offers an accessible, convenient learning environment for students. However, little is known about the feasibility, viability, and student outcomes of virtually delivered IPE. This scoping review examined the literature to investigate the delivery approaches of an online virtual telehealth IPE, and how these IPE approaches are used to improve student competencies. We searched for studies using CINAHL, PubMed, and ERIC, and identified 340 references. Studies that evaluated virtual simulation with students from more than one discipline, measured competencies, and had pre/post-briefings were included. Studies that examined only one discipline, used virtual reality models or traditional didactic modes of learning, or used a hybrid or in-person learning approach were excluded. Six studies met the criteria and were reviewed. The virtual IPE approaches were compared across studies, and evidence was synthesized. Studies used a variety of delivery methods for IPE, and measured several outcomes, such as student perception of IPE, interprofessional communication, and telehealth skills. Understanding how virtual IPE is implemented and impacts student learning is critical for preparing these healthcare professionals for their future careers.

Research Mentors

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