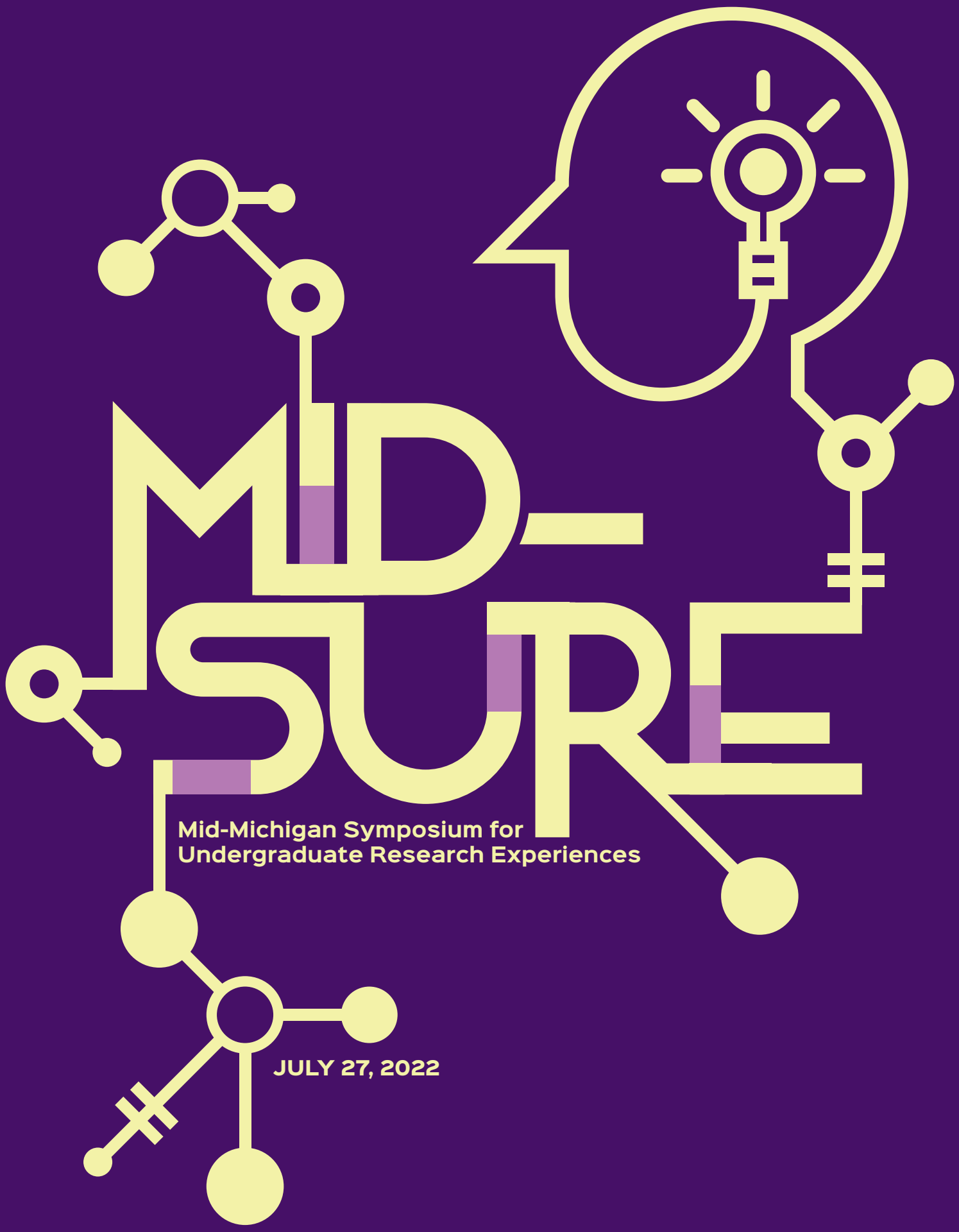

Mid-Michigan Symposium for Undergraduate Research Experiences

JULY 27, 2022

ACKNOWLEDGEMENTS

The goal of the 12th annual Mid-Michigan Symposium for Undergraduate Research Experiences (Mid-SURE) at Michigan State University (MSU) is to provide a forum for undergraduates in the region to share their research and creative activities with the university community and beyond. Over 375 undergraduate students from over 110 different institutions will present their outstanding research and creative endeavors at Mid-SURE on July 27, 2022. These students are mentored by more than 370 faculty, staff, graduate students, and government or industry researchers.

Partnering Programs

Many of the student presenters participated in an MSU-sponsored summer research program. We would like to thank the following MSU programs for encouraging their students to present at Mid-SURE 2022:

- Advanced Computational Research Experience for Students (ACRES)
- BEACON Center for the Study of Evolution in Action
- Biomedical Research for University Students in Health Sciences (BRUSH)
- Bridge to PhD in Neurosciences Program (BPNP)
- Communities and Future Earth Scientists (GeoCaFES)
- Cross-Disciplinary Training in Sustainable Chemistry and Chemical Processes (SCCP)
- Engineering Summer Undergraduate Research Experience (EnSURE)
- First-Time Research Experience in Environmental Health Science (ENDURE)
- Great Lakes Bioenergy Research Center Summer Undergraduate Research Program (GLBRC SURP)
- Internships and Research Experiences at Kellogg Biological Station (KBS)
- Louis Stokes Alliance for Minority Participation Summer Undergraduate Research Academy (MI-LSAMP SURA)
- Michigan Diaries
- National Institute of Environmental Health Science Summer Research Program (NIEHS)
- Physics & Astronomy Research Experience for Undergraduates
- Plant Genomics Research Experience for Undergraduates
- Research Education Program to Increase Diversity in Health Researchers (REPID)
- Research Experience for Undergraduates in Structural and Functional Neural Biology (ASPET SURF)
- Sociomobility Research Experience for Undergraduates
- Summer Research Opportunities Program (SROP)
- Summer Undergraduate Research Institute in Experimental Mathematics (SURIEM)

Behind the Scenes

Mid-SURE 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 graduate staff: Anapaola Almaguer-Morales, Paul Billock, Annabel Leonova
- Casie Chunko, Administrative Assistant for Academic Initiatives
- Heather Dover, Coordinator for Undergraduate Research and lead Mid-SURE 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.

About the Cover

The cover art was designed by Gabrielle McKeever ‘22, a Graphic Design major in the Department of Art, Art History, and Design. Please find her artist statement below:

Inspired by the innovation of MID-SURE, I created my own typeface in Illustrator for the title. Pieces of the letters are seen wrapped in purple, referencing electrical tape and the fact that innovation is never complete; there is always more to be done and space to grow. To further demonstrate this idea, circular shapes akin to molecules begin to grow off the edges of the title and stretch towards different ends of the page. These shapes represent the connectivity of ideas that accumulate at the conference, as well as the variation in backgrounds and areas of study. Finally, the geometric pathways lead into the silhouette of a figure, as the conference is not only about the celebration of ideas, but also of the individuals behind them.

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MID-MICHIGAN SYMPOSUIM FOR UNDERGRADUATE RESEARCH EXPERIENCES

Poster Presentation Schedule

Session A
8:30 AM – 10:00 AM

CATEGORY	SECTION	LOCATION
Agriculture & Animal Science	3	Online
Arts and Humanities	2	Online
Biochemistry & Molecular Biology	4 & 5	Online
Chemical Engineering and Materials Science	3	Online
Computer Science and Engineering	4	Online
Environmental Science and Natural Resources	2	Online
Health Sciences	4 & 5	Online
Kinesiology and Nutrition	1	Online
Physical and Mathematical Sciences	5	Online
Social Sciences	3, 4, 5, & 6	Online

Session B
11:00 AM – 12:30 PM

CATEGORY	SECTION	LOCATION
Agriculture & Animal Science	1	1202 STEM
Biochemistry & Molecular Biology	1	1202 STEM
Cell Biology, Genetics, & Genomics	1	1202 STEM
Chemical Engineering and Materials Science	1	1202 STEM
Computer Science and Engineering	1	2202 STEM
Education	1	2202 STEM
Health Sciences	1	2202 STEM
Mechanical Engineering	1	2202 STEM
Microbiology, Immunology, & Infectious Disease	1	2202 STEM
Neuroscience	1	3202 STEM
Pharmacology and Toxicology	1	3202 STEM
Physical and Mathematical Sciences	1	3202 STEM
Plant Sciences	1 & 2	3202 STEM

MID-MICHIGAN SYMPOSUIM FOR UNDERGRADUATE RESEARCH EXPERIENCES

Poster Presentation Schedule

Session C
1:00 PM – 2:30 PM

CATEGORY	SECTION	LOCATION
Agriculture & Animal Science	2	1202 STEM
Arts and Humanities	1	1202 STEM
Biochemistry & Molecular Biology	2	1202 STEM
Biosystems and Agricultural Engineering	1	1202 STEM
Cell Biology, Genetics, & Genomics	1	1202 STEM
Civil and Environmental Engineering	1	2202 STEM
Computer Science and Engineering	2	2202 STEM
Health Science	2	2202 STEM
Integrative & Organismal Biology	1	2202 STEM
Microbiology, Immunology, & Infectious Disease	2	2202 STEM
Neuroscience	1	2202 STEM
Pharmacology and Toxicology	2	3202 STEM
Physical and Mathematical Sciences	2	3202 STEM
Plant Sciences	3	3202 STEM
Social Sciences	1	3202 STEM

Session D
3:00 PM – 4:30 PM

CATEGORY	SECTION	LOCATION
Biochemistry & Molecular Biology	3	1202 STEM
Biosystems and Agricultural Engineering	2	1202 STEM
Chemical Engineering and Materials Science	2	1202 STEM
Computer Science and Engineering	3	1202 STEM
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Plant Sciences	4	3202 STEM
Social Science	2	3202 STEM

GRADUATE SCHOOL FAIR

We are pleased to incorporate a graduate school fair into Mid-SURE. Students who are interested in pursuing graduate school are encouraged to connect with representatives from the following institutions/departments.

Floor	Institution	Department
1st	Michigan State University	College of Osteopathic Medicine DO/PhD Program
1st	Michigan State University	BioMolecular Science Gateway
1st	Michigan State University	College of Engineering, Graduate Student Services
1st	Rensselaer Polytechnic Institute	MBA/M.S. Admissions
1st	University of Kansas	Self Graduate Fellowship
3rd	Michigan State University	School of Human Resources and Labor Relations
3rd	Michigan State University	MS in Pharmacology and Toxicology
3rd	Michigan Technological University	Graduate Enrollment Services
3rd	University of Michigan	School of Psychology, Student Services
3rd	Van Andel Institute	Graduate School

AGRICULTURE & ANIMAL SCIENCE

DOES CONTROLLED ATMOSPHERE STORAGE PRESERVE THE QUALITY OF ASPARAGUS
Presenter(s): Alexa Kaanta (Michigan State University)
Agriculture & Animal Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 101
Mentor(s): Philip Engelgau (Michigan State University), Randolph Beaudry (Michigan State University)

With Michigan being the leading producer of asparagus, there is a growing concern with the strain of asparagus, Guelph Millennium, used. It has a limited harvest window which leads to an excess of supplies and decreasing prices, ultimately hurting the growers. To help fix this problem, asparagus spears will be stored in controlled atmosphere storages to ease the pressure of the surplus in asparagus. After the spears are stored in various conditions and time lengths, the visual quality, firmness, and sugar content will be analyzed to determine the quality of asparagus. This study will repeat visual quality testing for another year after the initial tests. Hopefully, the data gathered will help show if controlled atmosphere storage preserves the quality of asparagus. The visual quality and firmness test are used to evaluate asparagus in a superficial analysis. The sugar content analysis will help to understand the preservation of sugars in storage.

POPULATION SURVEY OF THE PREVALENCE OF AAV2 VIRUS IN CANINES AND ITS POSSIBLE IMPACTS ON GENE THERAPY
Presenter(s): Ava Cabble (Michigan State University)
Agriculture & Animal Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 102
Mentor(s): Andras Komaromy (Michigan State University)

The goal of the research is to survey our colony of dogs and find the prevalence of the common gene therapy vector adeno-associated virus (AAV2) in the canine species. Animals Studied: Blood was drawn from 50 beagle-derived dogs between the ages of .5 years and 11 years old with variable genetics. Blood samples were taken from 50 dogs from the jugular vein. Serum was then extracted using a serum separator tube. An antibody titer test will be conducted on the serum to determine how many dogs had AAV2 from said serum.

IMPACTS OF WATER STRESS ON ROOT-KNOT NEMATODES IN WATER-TOLERANT PLANTS
Presenter(s): Emma Mccarthy (Michigan State University)
Agriculture & Animal Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 103
Mentor(s): Amanda Howland (Michigan State University)

Nematodes are some of the most abundant organisms on earth and can be beneficial or detrimental to other forms of life. Plant-parasitic species are harmful to agriculture as they feed on crop roots, thus decreasing yield costing the agricultural industry approximately $157 billion annually. Root-knot nematodes (Meloidogyne spp.) are especially catastrophic as they have the largest host range and are the most economically devastating plant-parasitic nematode. These nematodes rely on soil water for finding roots, and thus the ability to survive and reproduce. Our study used the drought-tolerant plant, daylily (Hemerocallis spp.), to determine the effect of four different water treatments on the northern root-knot nematode's (Meloidogyne hapla) survival and fecundity. Daylily plants were planted in 1.8 L pots and inoculated with 4,500 M. hapla eggs. The experiment lasted ten weeks; the four water treatments were

daily watering, every three days, every seven days, and every fourteen days. Plants were arranged in a randomized complete block design in the greenhouse. It was found that plants watered more frequently suffered fewer effects brought on by M. hapla. Other results indicate that the plants watered daily had significantly higher shoot and root weight ($p \leq 0.001$). This suggests for daylilies, the importance of watering outweighs the stunting effects of nematodes in growth. However, water does impact nematode abundance in soil, with daily watering significantly resulting in higher population densities ($p < 0.001$). This experiment is being repeated to confirm results to determine if drought really does impact plant-parasitic nematode abundance and fecundity.

UTERINE LUMEN SIZE AS A FUNCTION OF STAGE OF ESTROUS CYCLE, HORMONAL TREATMENT, AND DISEASE IN GAZELLES (GAZELLA, EUDORCAS, AND NANGER SPP.)
Presenter(s): Giuseppe Cavaliere (Michigan State University)
Agriculture & Animal Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 104
Mentor(s): Dalen Agnew (Michigan State University)

Gazelles are threatened or endangered and captive populations are kept as insurance populations. However, reproductive disease can impact the viability of these populations. Tools to evaluate the female reproductive tract are needed to understand these threats to fertility. This investigation focused on comparing the relative sizes of the myometrium, endometrium, and lumen as percentages of the cross-sectional area of the uterus in gazelles during estrus and diestrus stages as a means to identify and quantify hydrometra. Gazelles in this study were classified as being in the genera of Gazella, Nanger, and Eudorcas. Previous research is limited in gazelles; however, studies in rats and ruminants suggest the overall area for each of the uterine components, primarily the endometrium and lumen, change significantly throughout the estrous cycle and in disease states. Microscopic images of uterine cross sections of 19 gazelles were taken and processed using imaging software to determine the relative percentage of each compartment. The estrous phase of each gazelle was determined based on the provided history and ovarian findings. A Spearman's correlation was performed to determine if there was a relationship between lumen size, phase of the estrous cycle, contraception status, and presence of other lesions. These results will be significant because many gazelle species are considered endangered, and these tools are needed to understand their reproductive cycle and recognize disease to ensure proper management of captive populations.

INSECTICIDE LEVELS ON ONION THRIPS NATURAL ENEMIES
Presenter(s): Alyssa Garza-Bergeron (Michigan State University)
Agriculture & Animal Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 105
Mentor(s): Natalie Constancio (Michigan State University)

In Michigan, the onion industry is valued at about $10 million (USDA NASS, 2015). According to the Michigan Onion Committee, onion thrips (Thrips tabaci) management is currently the top research priority. Thrips induce leaf damage through a punch and suck feeding method, consuming cell contents, reducing the photosynthetic ability leading to a decrease in yield. The most common method of managing onion thrips is through calendar based insecticide applications, but this may lead to overapplication. Overapplication of insecticides can induce resistance in thrips, while also having a negative effect on their natural enemies. For our experiment, we are testing the effect of varying action thresholds on the natural enemy community. Using an action threshold system allows us to use less pesticides, which can benefit both the effectiveness against thrips, and reduce the negative effects against natural enemies. To test how different levels of insecticide use are affecting natural enemies, we have 8 different pesticide treatment programs, with 4 replicates per treatment, for a total of 32 plots. We are scouting 10 different onions from each plot and are recording both onion thrips numbers and natural enemies on each plant. We predict that plots being treated with higher levels of insecticides will have a decrease of the natural enemies. Natural enemies may be providing a free form of pest control, and it's important to understand

how they are affected by pesticides. Understanding the interactions between pesticides, onion thrips, and natural enemies is critical for developing an effective integrated pest management program.

TWEAKING THE PROCEDURE FOR GENETIC TRANSFORMATION IN RELATED GRASSES TO INCREASE EFFICIENCY AND EFFICACY OF TRANSFORMATION IN PROSO MILLET
Presenter(s): Lane Vitek (Michigan State University)
Agriculture & Animal Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 106
Mentor(s): Lauren Stanley (Michigan State University)

Proso Millet is a very drought tolerant cereal that has the potential to become an important crop for navigating the impending climate change crisis. Although utilizing millet's advantages can be a key factor influencing how we manage Earth's changing environment, the ability to genetically modify the crop to become even more well rounded can be a huge advantage. The spike dip method for genetic transformation has been properly established in other grass species,but has not yet been tested or altered to specifically suit millet. By exploring modifications to our current millet transformation procedure, we can effectively uncover the most essential components of the procedure, as well as discover the most efficient method to transforming millet. There will be one altered ingredient in each trial's suspension solution in which this experiment will illustrate varying efficiency; increased sucrose levels, increased silwet levels, and the addition of tobacco extract in the suspension solutions. I expect that each of the suspension solutions will perform more effectively than the original method due to each of their strengths, including a greater food source for the agrobacterium and increased permeability of cell membranes, both allowing a higher change for gene transfer. The results of this experiment could be a great contribution to navigating climate change and improving millet as a drought tolerant and environmentally resilient crop.

CHARACTERIZATION OF DRY PINTO BEANS NUTRITIONAL TRENDS OVER TIME IN MSU BREEDING PROGRAMS
Presenter(s): Rylee Hrnyak (Michigan State University)
Agriculture & Animal Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 107
Mentor(s): Miranda Haus (Michigan State University)

Dry beans (Phaseolus vulgaris) are an essential crop worldwide that provide a major source of protein, iron, zinc, and fiber. Breeding efforts have selected for optimization of seed productivity and harvestability via shoot architecture and plant maturity,but have not selected for maintenance or enhancement of seed nutritional quality. The purpose of this research is to determine if there are any consequences of breeding for shoot architecture or maturity on nutritional content. A panel was constructed representing historically relevant lines from 1900 to 2012 for specific growth habits of two wild bean species and 6 cultivars of pinto beans. The panel was evaluated during the 2020 and 2021 field seasons at MSU's Montcalm Research Farm. Maturity and growth habit data were recorded and young leaves and seeds were analyzed for nutrient concentrations. All data were analyzed using R Studio. In pinto beans, all macronutrients (Ca, N, P, K, Mg) and micronutrients (Zn, Fe) in the seed showed a decrease in nutritional value after 1999 in the most recently released cultivar. Alternatively, all leaf nutritional levels increased slightly after 1999 except for zinc which decreased slightly. Future work includes studying the effects of root size and architecture on dry bean nutritional status. This data will provide support for further research to explore the impact of breeding for selective traits on dry beans' nutrition content, in hopes to improve the nutritional levels of beans overall.

EVALUATING IF SEX AND TISSUE LOCATION HAS AN EFFECT ON PREADIPOCYTE CONCENTRATION WITHIN PVAT
Presenter(s): Caleb Ragsdale (Michigan State University)
Agriculture & Animal Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility

Presentation Number: 108

Mentor(s): Andres Contreras (Michigan State University)

Obesity is an expanding epidemic affecting millions of people and domesticated animals. The major causes of obesity can be attributed to fat tissue hypertrophy and hyperplasia. Obesity is known to be a precursor to insulin resistance and many cardiovascular diseases. Adipogenesis is a process that differentiates mesenchymal stem cells into adipocytes. Known intermediate cells (preadipocytes), have been seen to express a unique protein receptor called PDGFRa. Immunohistochemistry allows for these cells to be identified and quantified. However, it is currently unknown if sex differences or anatomical tissue location contributes to PDGFRa cellular concentration or their proximity to vascular cells. In this study, perivascular adipose tissue (PVAT) samples are taken from male and female Cre-LoxP mice. Using immunohistochemistry, PDGFRa cells along with smooth muscle cells are stained. The computer program Fiji is used to quantify not only the intensity of PDGFRa cells, but as well as their proximity to vascular cells from pictures taken microscopically. Based on preliminary data from two mice, abdominal PVAT (ABPVAT) appears to generate a higher amount of PDGFRa cells as well as a lower proximity to vascular cells compared to thoracic PVAT (ATPVAT). However, proper statistical analysis will be done as more samples are analyzed. Along with that, we anticipate that sex differences could still show a significant difference in both preadipocyte quantity and vascular cell proximity. It is important to understand how factors influence the rate of cellular differentiation throughout the system. Especially when developing new therapeutic solutions to obesity and resulting secondary conditions.

IMPACT OF EUROPEAN FOULBROOD DISEASE PRESENCE ON RATE OF FORAGING IN HONEY BEE (APIS MELLIFERA) COLONIES
Presenter(s): Joselyn Ralph (Michigan State University)
Agriculture & Animal Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 109
Mentor(s): Lauren Goldstein (Michigan State University), Meghan Milbrath (Michigan State University), Rufus Isaacs (Michigan State University)

European Foulbrood (EFB) is a honey bee (Apis mellifera) brood disease caused by the bacterium Melissococcus plutonius. Larvae become infected upon consuming food contaminated with this bacterium and usually die within 4-5 days. Diseased brood appear twisted, discolored, and misshapen. EFB infection is thought to be linked to stressors such as nutritional imbalance or weather conditions that favor infection, and several studies have confirmed a connection between EFB prevalence in honey bee colonies and their placement in blueberry farms for pollination. In this study, we aim to explore the impacts of disease prevalence on honey bee forager activity and the implications for subsequent pollination services. We sampled from 97 hives used for blueberry pollination in west Michigan. These colonies were graded for EFB disease state based on the presence or absence of symptomatic larvae. The hives were marked and later visited to collect forager activity samples. Hive entrances were observed for one minute to determine the number of foragers returning to the hive. This number serves as a metric of hive productivity. We conducted correlation analysis to determine the relationship between EFB disease presence and forager activity and these results are presented here. This study can serve as the foundation for future research regarding foraging capabilities of infected bees and possible disease transmission routes.

THE POWER OF PINTO BEANS
Presenter(s): Sydney Burtovoy (Michigan State University)
Agriculture & Animal Science
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 121
Mentor(s): Karen Cichy (Michigan State University)

Pinto beans produce nutrient dense flour; however, studies show flours of this origin fail to elicit many desirable sensory qualities in products baked with conventional wheat flours. Increased protein and varying starch ratios may explain this disparity. Given the protein, iron, vitamin, and mineral benefits pinto bean flours could provide, research in optimizing its quality parameters has the potential to help alleviate many nutrient deficiencies worldwide. Since previous Rapid Visco Analyzer (RVA) analysis discovered a significant relationship between starch ratio and genotype, further investigation of this macronutrient's effect on pasting was desired. Thus, in this study Megazyme starch assays were utilized to determine the starch content of over one-hundred and fifty pinto bean flour samples of differing genotypes; 46 from North Dakota and 103 from Washington. Then, pasting and gelation were evaluated with the RVA. Overall, pinto bean flours required more time to reach the peak viscosity (13 minutes) compared to standard wheat flours (9 minutes). Their peak viscosity tended to be either similar to or lower than that of hard, high protein wheat flour. Additionally, the breakdown viscosity was far lower in the pinto bean varieties, ranging from around -13 to 150cP in the North Dakota and -10 to 117cP in the Washington genotypes. Wheat flour ranged between 775 to 1419cP with increased protein content showing lower breakdown viscosities. This indicates that pinto bean's high protein and lower starch content contributes to the pasting properties of its flour which influences sensory and quality attributes of the final food product.

DOES LIGHT COMPOSITION IMPACT STRESS LEVELS OF SHELTER CATS?
Presenter(s): Mary Gardella (Michigan State University)
Agriculture & Animal Science
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 122
Mentor(s): Alexandra Yaw (Michigan State University), Hanne Hoffmann (Michigan State University), Jacquelyn Jacobs (Michigan State University)

While animal shelters are essential for keeping cats safe from unfit living conditions, they are a stressful environment. Stress increases cortisol and promotes undesired behaviors such as aggression and hiding. Reducing stress in shelter cats can make them more attractive for prospective adopters and reduce the duration of time in the shelter. Previous studies found that light composition impacts behavior, where blue light has an arousing effect, while dim and red light is calming. Based on this, we investigated how cats are affected by the shelter room light composition. We hypothesize that reducing light intensity and removing blue light wavelength will reduce cat stress as compared to white lighting. Three lighting conditions were studied (white, dim and blue-depleted light) during the first 6 days the cats were in the shelter, with assessment of stress through cortisol measures and behavioral approach tests in adult, single housed male and female cats. For all conditions, behavioral stress scores decreased over the enrollment period. A significant correlation was found between cortisol levels and behavior stress scores for cats on white light, but not on dim and blue-depleted light. Interestingly, preliminary data show that female cats had lower behavioral stress scores and lower cortisol levels on blue-depleted and dim light, as compared to white light. Male data is less clear, but trends in the same direction. This shows for the first time that room light manipulation can help shelters enact easy and inexpensive changes that make the adjustment period shorter and easier for incoming cats.

EFFECTIVE KETAMINE DOSES FOR COLIC AND HEALTHY HORSES
Presenter(s): Jiordan Washington (Michigan State University)
Agriculture & Animal Science
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 124
Mentor(s): Angela Hall (Michigan State University), Kirk Munoz (Michigan State University)

Ketamine is the main drug given to animals to induce anesthesia when getting procedures done and the most common dose is 2.2 mg/kg. Usually, the amount administered is often times higher than what was calculated to achieve an appropriate plane of anesthesia. This is important to determine because it would be helpful to avoid many complications during a procedure. This study directly involves all breeds of equine, large animal veterinarians, vet anesthesiologists, and horse owners all over. In this study, we

hope to determine the most effective dosage of ketamine to induce general anesthesia in horses and to determine if there is a difference in dosages between healthy and sick (colic) horses. We are also looking to see if breed has any effect on the dosage determined. This study will be done by pulling past medical records from Michigan State University Veterinary Medical Center of horses who have gone under anesthesia during a procedure. This is a retrospective study. We examined over 200+ anesthesia records from healthy and sick (colic) horses that underwent anesthesia while getting a procedure done to determine the dosage of ketamine that was calculated compared to the ketamine dosage that was actually administered during the first 20 minutes of induction of general anesthesia. The average dosage of ketamine used to induce general anesthesia in healthy and in sick (colic) horses was both 2.8 mg/kg. There was no significant difference among horse breeds for the amount of ketamine needed for induction. From our results, we found that

INTAKE OF FIBER BY YOUNG CHILDREN IN A MICHIGAN COHORT
Presenter(s): Kyra Pierce (North Carolina A&T)
Agriculture & Animal Science
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 125
Mentor(s): Sarah Comstock (Michigan State University)

High fiber intake in children supports healthy digestion, heart health, blood sugar regulation, bowel flow and can strengthen the immune system. According to the United State Department of Agriculture, the recommended daily amount (RDA) of fiber for children one to three years of age is 19 grams of fiber and children four to six years of age is 25 grams of fiber. The 2020-2025 Dietary Guidelines for Americans states that from infancy to 18 years of age children are at risk of consuming inadequate fiber. However, it is unknown if children between 1 to 5 years of age and living in Michigan consume adequate fiber. Notably, fiber is an essential nutrient for all stages of life. The purpose of this project is to determine if children in one Michigan cohort are meeting recommendations. To conduct this study dietary fiber intake questionnaires were collected for 86 6-month-olds, 24 9-month-olds, 38 12-month-olds, 17 24-month-olds, 43 36-month-olds, 31 48-month-olds, and 21 60-month-olds. The survey used the National Cancer Institute 5-factor screener to determine fiber intake over the span of a week. Responses can be used to determine how much fiber each child consumed on a daily basis. The survey was administered to parents who responded about child intake and wanted to participate. It is expected that fiber intake of all participating children in the Michigan area will be lower than the recommendation. If intake is indeed below the recommendations, then ways to help families increase fiber in their child's diets should be identified.

MORPHOLOGICAL ASSESSMENT OF UTERINE DISEASE IN RED PANDAS.
Presenter(s): Alana Gierbolini-Torres (University of Puerto Rico)
Agriculture & Animal Science
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 126
Mentor(s): Dalen Agnew (Michigan State University)

General interest in red pandas (Ailurus fulgens) has increased over the past few years; however, few studies have focused on their reproductive tract. Red pandas are seasonal breeders and thought to be induced ovulators with embryonic diapause. Contraception in red pandas is rarely used in zoos for population management, but the potential adverse side-effects are unknown. Morphologic tools can be used to measure and understand the normal estrous cycle and potential abnormalities in the reproductive tract. With this study, we intend to identify and quantify luminal cross sectional area in comparison to the entire uterine cross-section and correlate these findings with the phase of the estrous cycle, contraception use, or presence of uterine lesions such as hydrometra. Histological slides of female red panda uteruses and ovaries collected after elective ovariohysterectomies or at postmortem examination were examined and the ratio of lumen size to overall uterine cross-sectional area (including myometrium and endometrium) was calculated. In addition, any ovarian, uterine, oviductal, or cervical lesions were noted. Spearman's coefficient was used to determine if there are any correlations between the lumen size,

estrous cycle, or any other lesions. These results will allow better management of the reproductive health and contraceptive uses of captive red pandas.

ARTS & HUMANITIES

A HISTORY OF THE DEVELOPMENT AND DECLINE OF NOVI CORNERS TOWN CENTER
Presenter(s): Elizabeth Pall (Eastern Michigan University)
Arts & Humanities
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 201
Mentor(s): Richard Nation (Eastern Michigan University)

Situated along Grand River Road, Novi Corners served farmers in the region as a convenient location to sell their wares and buy their goods. The addition of the railroad after 1850 caused the town center to expand into its heyday. But Michigan car culture in the second half of the twentieth century spelled the end for Novi Corners. The completion of I-96 and the expansion of the Detroit suburbs overwhelmed this crossroads business district, with malls and parking lots. Today, Novi civic leaders lament the lack of a town center and have worked tirelessly without success to try to redevelop one.

LITERARY DEPICTIONS OF EGYPTIAN REGIMES, REVOLUTIONS, AND RESISTANCE
Presenter(s): Gabriel Sandoval (Michigan State University)
Arts & Humanities
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 202
Mentor(s): Martha Olcott (Michigan State University)

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. Mentored by Professor Martha Olcott, my James Madison College Senior Honors Thesis will explore 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 will work to compare their views by looking at the similarities and differences of their literary depictions. My intermediate knowledge of Arabic will also allow 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 of looking at the original Arabic is 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 is to gain a greater insight of these prominent authors' opinions about living through political turmoil in Egypt and how they conveyed these opinions through literary tools. I want to see where they align and differ, and what their unique experiences as citizens contributed to their works. I plan to complete my thesis in December 2022.

A SURVEY OF LGBTQ+ CHARACTERISTICS IN U.S. CHORAL CLASSROOMS
Presenter(s): Sydney Timmer (Eastern Michigan University)
Arts & Humanities
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 203
Mentor(s): Heather Shouldice (Eastern Michigan University)

Students in the LGBTQ+ community face unique challenges in the choral classroom. However, choral music educators may not be prepared to address LGBTQ+ topics and/or to implement LGBTQ+-inclusive practices in their classrooms, and no research exists examining the extent to which choir teachers are currently providing an inclusive environment. This study was designed to examine the LGBTQ+ inclusivity practices in secondary choral classrooms in the United States. Data was collected by sending out an

online survey to current secondary choral music educators that included questions pertaining to concert attire, ensemble names, teacher language, and LGBTQ+ representation in the choral classroom.

HOW PUBLISHING VOICES AFFECTS SHARING: ANALYSIS OF THE REACTION TO RESEARCHER-DIARIST INTERACTION.
Presenter(s): Anna Vredevelt (Calvin University)
Arts & Humanities
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 204
Mentor(s): Betsy Sneller (Michigan State University), Yongqing Ye (Michigan State University)

The MI Diaries Project (MI Diaries) is a longitudinal study that collects participants' self-recorded audio diaries to track linguistic changes over time. MI Diaries differs from other sociolinguistic studies, not having direct contact with participants, but relying on indirect interaction. This consists of sending out prompt-questions, and publishing "features". A feature is a segment of a diary, with all identifying information redacted, selected by a member of the story team to publish to the website. Every diarist that can obtain a feature gave permission when they initially signed on to the project. The weekly feature's purpose is to encourage engagement, and create community. This study investigates whether the timing at which a diarist is featured affects participation. I hypothesized that with time diarists may trust the project, yet if a feature is done too soon they may react negatively resulting in fewer submissions. I compiled a list of featured diarists in the year 2020, and grouped them according to on which diary entry they were first featured. I then recorded how much time elapsed for the following submission. The initial finding from this data set was not conclusive; Therefore, I am in the process of repeating the methods with the MI Diaries data from 2021 to diversify the data pool, and use non-featured diarists participation as a control group. This study will help MI Diaries understand how participants engage in a research project that relies on indirect interaction, provide a safe environment for participants, and improve participant engagement strategies.

COLLABORATIVE CAPACITY: HOW DOES ART-SCIENCE INTEGRATION FACILITATE KNOWLEDGE SHARING AMONG A TRANSDISCIPLINARY COHORT?
Presenter(s): Allie Swartz (Michigan State University)
Arts & Humanities
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 205
Mentor(s): Lissy Goralnik (Michigan State University)

Art-Science collaboration projects are increasing in popularity among formal and informal learning communities to promote outreach and education, however, there is often a barrier to this collaboration in the form of knowledge sharing. University of Alaska Fairbanks is the home of ITOC: In a Time of Change, an arts-humanities-science collaboration that facilitates transdisciplinary events and exhibits focused on social-ecological themes. Artists and scientists with differing ways of knowing across Alaska were asked to participate in creating a project that allows them to learn from one another and encourages science communication on a topic within the scope of the art-science exhibit on boreal forests. To explore the ITOC participants' perspectives on how to destabilize knowledge hierarchies through engaging collaborative learning, we analyzed 5 survey questionnaires that were distributed equally amongst all of the participants. Emergent themes from the surveys will be presented along with our goals and intentions for future methods of evaluating the collaborative capacity of participants in the ITOC program.

THE KEYSMASH AS A MODERN LINGUISTIC TOOL
Presenter(s): Olivia Ziemelis (Eastern Michigan University)
Arts & Humanities
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 206
Mentor(s): Daniel Seely (Eastern Michigan Univeristy)

Consider the following online exchange: Person 1 posts a blurred selfie with the caption "I dropped my phone as it took the picture!", and Person 2 responds with "HJFSGJSDH". Person 2 has utilized a keysmash, a linguistic tool that is becoming more common in online discourse. Though a seemingly random string of keyboard symbols, keysmashes carry meaning just as a word would. This poster presentation provides a detailed characterization of keysmashes and outlines the patterns of construction. Keysmashes are in fact systematic in their construction and uses, despite appearances. After an examination and analysis of both the form and function of keysmashes, this presentation will also consider the implications of this phenomenon in the broader framework of linguistic theory, contributing to the growing subfield of linguistics in social media.

"DESCRIBE IT." VS "COULD YOU DESCRIBE IT?": OBLIGATORY FORCE IN DIARY PROMPTS
Presenter(s): Newt Kelbley (Michigan State University)
Arts & Humanities
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 207
Mentor(s): Betsy Sneller (Michigan State University), Suzanne Wagner (Michigan State University)

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 verbal response than the same request with an imperative verb. This research question is important for the MI Diaries project. We create weekly questions for volunteer diarists to address in self-recorded audio responses. The goal is to collect large amounts of informal speech for sociolinguistic study. Therefore if modal verbs prime longer responses, then more modals will improve our prompts for better data collection. In this study, Amazon Turk respondents (age 18+, US English-speaking) will be randomly assigned to one of two conditions (Imperative, Modal) and asked to record their response to a question, such as: (a) [No modal] Have you ever been to a movie theater? Describe the experience. or (b) [Modal] Have you ever been to a movie theater? Could you describe the experience? I anticipate that the questions with modals (b) will receive longer responses on average in both word count and time. This is because (b) has lesser obligatory force, making respondents more willing to respond by preserving their positive self-identity (Hesson 2014). The question without the modal (a) is a command instead of a polite request, demanding more and causing shorter responses.

A CASE STUDY OF AN AUDIO DIARIST'S SPEECH FORMALITY OVER TIME
Presenter(s): Abigail Garner (Pomona College)
Arts & Humanities
Section: 2
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 211
Mentor(s): Betsy Sneller (Michigan State University), Jack Rechsteiner (Michigan State University), Suzanne Wagner (Michigan State University)

MI Diaries is an ongoing sociolinguistics research initiative documenting Michigan English. While personal audio diaries are an efficient and accessible way to collect large amounts of sociolinguistic data, diarists recording themselves are not directly interacting with a conversational partner and may not produce the kind of vernacular speech that is most useful for linguistic analysis. However, it is possible that repetition of the recording and submission process may lead to increased task familiarity and thus decreased speech formality over time. I will conduct a quantitative case study of one participant's use of (ING) (-in' as in runnin' and -ing as in running), which has been shown to be a reliable indicator of speech formality (Labov 2006). After establishing the participant's baseline use of (ING) in their first five diaries, I will analyze whether this participant uses a higher rate of the informal variant -in' after one year of submitting diaries and two years of submitting diaries. I hypothesize that this participant will become less formal in their speech over time, indicating that audio diaries are a viable way to successfully elicit a speaker's idiolect. Audio diaries are a new and understudied method of collecting sociolinguistic data. My study will

contribute to a foundation for future, larger-scale inquiry into audio diaries and their uses in linguistic research.

MEDIA DEVELOPMENT AMIDST THE CRISIS IN YEMEN: POLITICAL CARTOONS AS MEANS OF LIBERATION
Presenter(s): Abbie Barnum (Michigan State University)
Arts & Humanities
Section: 2
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 212
Mentor(s): Sadam Issa (Michigan State University)

While first recognized in 2007 as a freshly independent nation, Yemen soon began to be recognized as one of the largest refugee crises the world has seen. As a result of widening political divisions, the modern-day crisis has evolved. A series of transitions of power coupled with rising prices of goods has resulted in a Houthi takeover of prominent cities such as Sanaa, Saudi intervention, and a divisive military movement. Given the scale of this conflict, disease, and poverty have taken root. Yemen is now being noted as the Arab world's poorest country with a poverty rate of 75%. These factors coupled with decreased global humanitarian aid due to the COVID-19 pandemic have resulted in many Yemenis fleeing their country in hopes of finding humanitarian aid elsewhere. The UN Refugee Agency has commented on the crisis stating that it is "the worst in the world" and although this has been disputed it is evident that the humanitarian crisis in Yemen must be addressed (Almahbashi 2020). Yemenis have taken to addressing the crisis through various means, one such being political cartoons. Through my analysis of political cartoons depicting the crisis in Yemen, I hope to amplify the voices of unheard Yemenis targeted by the refugee and humanitarian crises. Through analyzing three separate Yemeni political cartoons I argue that political cartoons serve as a means of liberation for cartoonists by offering a means of political power amidst the ongoing crisis in Yemen.

WHEN DOES TWO CUPCAKES BECOME THREE?: PRAGMATIC EFFECTS ON TELICITY
Presenter(s): Newt Kelbley (Michigan State University), Sophie Cleland (Michigan State University)
Arts & Humanities
Section: 2
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 213
Mentor(s): Jingying Xu (Michigan State University)

This study investigates the pragmatic effect of an authoritative spectator on adult's interpretations of verb telicity. The linguistic concept of 'telicity' is generally defined as whether an event encodes a natural final endpoint or not. Telic events have a natural endpoint (e.g., 'The man ate two sandwiches'), while atelic events have an arbitrary endpoint (e.g., 'The man carried two bags'). The telicity of an event depends on the interaction between the verb and properties of its object. In this study we examine to what extent pragmatic information alters a speaker's judgements of descriptions of telic and atelic events. Previous work found that participants sometimes produced a 'yes' answer to a question such as 'Did he eat the cookies?' even in a context where the character had not finished eating them. Participants were sensitive to the presence of quantity-sensitive verbs (e.g., 'build'); and the presence of a cardinal number in direct objects (e.g., 'two houses'). These factors prompt telic readings while verbs such as carry do not prompt telic readings independently from the object. Interestingly, 'eat/drink''s telic interpretation counterintuitively depended greatly on the type of determiner in the object. Recently, Grigoroglou and Papafragou (2018) found pragmatic considerations may also affect event descriptions. In our experiment we test the pragmatic effect of having an authority figure (such as a policeman) make the statement to be judged. We hypothesize that statements made by such figures will make participants more sensitive to the factors that control telicity judgements.

CELEBRATIONS IN THE MITTEN STATE: POTENTIAL LEXICAL DIFFERENCES WITHIN REGIONS AT A STATE LEVEL
Presenter(s): Hailey Deptula (Grand Valley State University)
Arts & Humanities

Section: 2
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 214

Mentor(s): Adam Barnhardt (Michigan State University), Betsy Sneller (Michigan State University)

The state of Michigan is home to complex sociolinguistic patterns and language shifts that have been documented by linguists, some in the realm of phonology such as the Northern Cities Vowel Shift and others having more to do with differences in the particular words people use across the state. This research will look at a pattern fitting into this latter category - namely, the lexical variation exhibited in the speech of Michiganders living in different parts of the state when specifically referring to a student's graduation celebration. In Michigan, how does the pair open house/graduation party pattern geographically across various regions? This research will utilize self-provided survey responses to uncover this potential regional variation. The survey will be shared with MI Diaries (an ongoing longitudinal sociolinguistic project collecting audio diaries from Michiganders) participants, and on additional social media outlets to gain wider perspective. Michigan residency and location will be confirmed through responses. There is space for additional social analyses, such as an investigation into whether this lexical variation is correlated with participant age, or time spent in Michigan. I hypothesize that "open house" will be used more than "graduation party" west of Lansing. These findings will contribute to the larger picture of language use in the state and the understanding of how language varies across inter-state regions. As language intertwines with social structure, these differences could demonstrate cultural shifts over time.

THE EFFECT OF ELECTRONIC TOYS ON CHILDREN'S SPOKEN LANGUAGE DIFFERS BY AGE
Presenter(s): Tecka Vantrease (Middle Tennessee State University)
Arts & Humanities
Section: 2
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 215
Mentor(s): Courtney Venker (Michigan State University)

Children’s learning environments are becoming increasingly digitized. Parents of early-aged children are substituting quality social play interactions with electronic toys. Electronic toys are more likely to overshadow the parent-child interactions, thus creating a breakdown in the language learning experience. The purpose of this study was to test whether the effect of electronic toys on children's spoken language differs by age. We hypothesized that electronic toys would decrease spoken language more in younger children than in older children. Participants included 14 typically developing children between the ages of 2-5 and one of their primary caregivers. Parents and children played together for 10 minutes on two different days. Participants received a traditional toy set for one play session and an electronic toy set for the other. The toy sets contained ‘matched’ toys. We instructed parents to play with their child like they normally would at home. Systematic Analysis of Language Transcripts (SALT) software was used to derive the number of child utterances from existing transcripts. Data was analyzed using an independent samples t-test in Excel. As predicted, electronic toys decreased spoken language significantly more in younger children (2-3 years old) than in older children (4-5 years old; $p = .026$). This study provides parents and clinicians with information regarding interactions with different age groups of children in the presence of electronic toys.

STREET TEAMS TESTIMONIAL VIDEO
Presenter(s): Nolan Duff (Michigan State University)
Arts & Humanities
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 221
Mentor(s): JeanaDee Allen (Michigan State University)

The Street Teams Testimonial Video is a project with the purpose of giving a glimpse into what MSU Street Teams is all about. It is essentially a cohesive edit of testimonial videos from students and non-profit partners that have worked alongside Street Teams in the past.

SYNTHESIZING SIGN-OFFS: AN EXPLORATION OF THE EFFECT OF GENDER ON VALEDICTION

Presenter(s): Olivia Jessner (Stanford University)
Arts & Humanities
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 222
Mentor(s): Betsy Sneller (Michigan State University), Jack Rechsteiner (Michigan State University), Suzanne Wagner (Michigan State University)

MSU's MI Diaries project tracks language change over the pandemic from diaries that Michigan-based participants submit following prompts designed to elicit personal narratives. As an REU student, I have access to the diaries. This research project will involve a qualitative analysis of the distribution of sign-offs in audio diaries available to me through MI Diaries, questioning how the presence of a sign off is affected by gender. I will review 50 diaries, 25 from self-identified women and 25 from self-identified men. I will look at their sign off at the end of each diary/the language used in their valediction (the "act of bidding farewell" (Merriam-Webster)), provided it exists. The first stage of research will explore the dataset to decide precisely what will and will not count as a sign-off. Then, for each diary, I will code accordingly. I predict that the presence of a sign-off will be greater in the entries done by women, a hypothesis that comes from knowledge of the greater societal pressures on non-men to be polite and that is supported by scholarship that finds that gender affects the "affective load" of a greeting/farewell (Bibiri and Mocaneu). Currently, most of the available scholarship about gender and its effect on greetings/valedictions centers greetings (McKeown and Zhang); doing this research project would help me shed light on the lesser-reported valediction's intersection with gender. My research will explore whether existing findings on gender and greetings can be applied to valediction and will expand current gendered language scholarship.

CAUGHT IN THE PANDEMIC: THE CHANGE OF RATES OF THE CAUGHT-COT MERGER IN MICHIGAN SPEAKERS THROUGHOUT THE COVID-19 PANDEMIC
Presenter(s): Olivia Marquardt (West Chester University)
Arts & Humanities
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 223
Mentor(s): Adam Barnhardt (Michigan State University), Betsy Sneller (Michigan State University)

My research looks to focus on an aspect of the low-back-merger, the caught-cot merger, within Michigan speakers since the start of the Covid-19 pandemic. The caught-cot merger is when the vowels /?/ and /?/ have the same pronunciation. The merger is widely spread across the U.S., and though Labov, Ash, and Boberg (2006) said Michigan speakers were strongly resisting this merger, Nesbitt, Wagner, and Mason (2019) have found that the rates of this merger are starting to appear more frequently within Michigan English. How have the rates of low-back-merger adoption changed throughout the course of the pandemic? Have the rates increased throughout the period of quarantine? What factors correlate with that rate change? To gather this data, I will use audio diaries submitted to MI Diaries, a research project that is observing language change in Michigan over the course of the pandemic. Participants receive weekly emails with questions, and one of these will be, "Do you pronounce the words caught and cot differently?" thus providing the necessary data. However, because self-reported pronunciations are not always reliable, I will measure usage of the vowels in caught and cot when the vowel is in the primary stress position of a word. I hypothesize that there will be a trend in the direction of the vowels becoming more merged since the beginning of quarantine to now. I think this is due to a lack of interaction amongst individuals, causing them to shift how they speak.

MACHINE LEARNING AND THE MONTREAL FORCED ALIGNER
Presenter(s): Hannah-kiran Thukral (Mount Holyoke College)
Arts & Humanities
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 224
Mentor(s): Betsy Sneller (Michigan State University), Suzanne Wagner (Michigan State University), Yongqing Ye (Michigan State University)

Forced aligners are a tool used to automate the task of matching an orthographic transcript with the individual phonemes of the transcribed audio. The Montreal Forced Aligner (MFA) claims that its open source toolkit in addition to its triphone processing, allows it to align larger chunks of audio than its competitors. In this project, I want to investigate how effective the MFA is at aligning acoustic data collected by the Michigan Diaries (MI Diaries) project. MI Diaries is a longitudinal study collecting self-recorded audio diaries from Michigan residents aged 3 and up to preserve their speech and to track how Michigan English may have changed over the course of the pandemic and beyond. Machine learning advances in facial recognition tend to work best on white male faces, because they have the most training with them. Does the Montreal Forced Aligner have a similar problem? How does the training data for the MFA affect its ability to process lower pitched voices in relation to higher pitched voices? To determine this, I will run the MFA on 6 Michigan Diaries entries, 3 female and 3 male diarists, whose pitches fall in the average range for their respective genders. I will then align the audio by hand and see how effectively the MFA determines the vowel boundaries on the 6 entries. I aim to see if the MFA is biased towards lower pitched voices. This project will help shed light on the effects of training data on tools built using machine learning.

BIOCHEMISTRY & MOLECULAR BIOLOGY

COMMODITY CHEMICAL SYNTHESIS FROM CH4 AND CO2: INVESTIGATION OF THE C-TERMINUS OF TAUTOMERASES CIS-CAAD AND CG10062
Presenter(s): Nada Al-Ahmad (Central Michigan University)
Biochemistry & Molecular Biology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 301
Mentor(s): Karen Draths (Michigan State University), Kate Silva (Michigan State University)

Sustainable approaches to acetylenecarboxylic acid (ACA) production from the two most problematic greenhouse gasses, methane and carbon dioxide, have been reported. Our research seeks to discover methodology to transform ACA into commodity chemicals including 3-hydroxypropionic acid (3-HP), a critical U.S. DOE-identified target of the biorefinery industry. Previous research explored enzyme-catalyzed hydration of ACA, forming malonic semialdehyde (MSA). Enzyme-catalyzed reduction of MSA enables 3-HP synthesis while enzyme-catalyzed oxidation enables malonic acid (MA) synthesis. 3-HP and MA production from CH4 and CO2 provides a sustainable alternative to utilization of petroleum or plant-derived carbohydrate feedstocks. Our focus on the tautomerase enzymes cis-3-chloroacrylic acid dehalogenase (cis-CaaD) and Cg10062 is based on their ability to catalyze MSA formation from ACA. Structurally, cis-CaaD and Cg10062 are remarkably similar, including six active site amino acid residues implicated in ACA hydration. Yet cis-CaaD exclusively catalyzes ACA hydration whereas Cg10062 also catalyzes ACA hydration with decarboxylation. Thus, cis-CaaD and Cg10062 produce different MSA and acetaldehyde (ACH) ratios. Preliminary research sparked interest as to whether the C-termini of these enzymes influence amino acid positioning within the enzyme active site, which may influence production formation. Protein engineering was used to prepare three enzyme variants including cis-CaaD truncated at residue 119 and two chimera proteins: cis-CaaD containing Cg10062 C-terminus (amino acids 120-149) and Cg10062 containing cis-CaaD C-terminus (amino acids 120-150). Kinetic data and crystallographic studies provide insight into the impact of the C-termini on these enzymes and whether it accounts for differences in products formed by cis-CaaD and Cg10062.

SCREENING FOR TROPANE AND PYRROLIDINE ALKALOID MODIFYING ENZYMES FROM ATROPA BELLADONNA
Presenter(s): Darya Aminia (Kenyon College)
Biochemistry & Molecular Biology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 302
Mentor(s): Hannah Parks (Michigan State University)

Specialized metabolites are structurally diverse molecules produced by plants to adapt to various ecological niches and stresses. Tropane alkaloids are medicinally important specialized metabolites that are characterized by a bicyclic, nitrogen containing ring and includes the compounds scopolamine, hyoscyamine, and cocaine. Scopolamine and hyoscyamine are produced within the roots of select species in the Solanaceae family, including Atropa belladonna (Deadly Nightshade). Pyrrolidine alkaloids co-occur with tropane alkaloids in plants and these metabolite classes are intrinsically linked as the N-methyl ?1-pyrrolinium cation is the precursor of pyrrolidine alkaloids and also comprises the first ring of the tropane core. Metabolite profiling revealed a large array of tropane and pyrrolidine alkaloid derivatives that possess one or more decorations, including hydroxylations and glycosylations. The enzymes responsible for catalyzing this chemodiversity are unknown. The aim of this study is to identify the enzymes responsible for tropane and pyrrolidine alkaloid decorations in A. belladonna roots. We developed a transient expression system in the leaves of Nicotiana benthamiana in which we can synthesize or infiltrate alkaloid scaffold molecules. This platform allows the testing of candidate enzymes, including cytochrome P450s, 2-oxoglutarate-dependent dioxygenases, and glycosyltransferases that may catalyze modifications to these alkaloid scaffolds. A collection of these potential alkaloid modifying enzymes have been cloned from A. belladonna roots and these will be screened for activity with diverse alkaloid substrates. Candidate enzymes that possess alkaloid modifying activity will be subjected to further studies, including in vitro enzyme assays and gene-silencing.

IDENTIFICATION AND CHARACTERIZATION OF THE ROOT ACCUMULATING SESQUITERPENOID GLYCOSIDES IN THE BIOENERGY CROP SWITCHGRASS (PANICUM VIRGATUM) USING METABOLOMICS AND BIOASSAY
Presenter(s): Lina Blanco (University of Puerto Rico - Mayaguez)
Biochemistry & Molecular Biology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 303
Mentor(s): Xingxing Li (Michigan State University)

Switchgrass (Panicum virgatum) is a perennial grass native to North America being developed as a dedicated bioenergy crop. It has become a leading candidate to be used as feedstock for biofuel production given its high yield and capacity to be cultivated with low agronomic input in lands not suited for traditional agriculture. Previously conducted studies utilizing untargeted liquid chromatography-mass spectrometry (LC-MS)-based small molecule analysis revealed a distinctive metabolite profile in the subterrain tissues of switchgrass, with abundant steroidal saponins, sesquiterpenoids and diterpenoids. We hypothesize that these compounds play an essential part in the rhizosphere by promoting or inhibiting growth of beneficial and pathogenic microorganisms, respectively. In this study, we focused on identifying and determining the function of glycosylated compounds based on C15 sesquiterpene cores. Screening 13 switchgrass cultivars using LC-MS revealed that these sesquiterpenoids exclusively occurred in the underground tissues of upland switchgrass ecotypes. Untargeted and targeted LC-MS will be used to determine in which developmental stage these sesquiterpenes are accumulated by dividing the root into parts such as the rhizome and upper root, setting a standard for future extraction for metabolomics analyses. We will also perform fungal bioassays using six fungal species isolated directly from the switchgrass rhizosphere with purified compounds to characterize their bioactivities. The acquired knowledge demonstrates beneficial metabolites that can aid in breeding efforts aimed at developing optimized crops that show high yields without the use of chemical pesticides and fertilizers.

CHARACTERIZATION OF SORGHUM BICOLOR TERPENE SYNTHASES, OXIDOSQUALENE CYCLASES, AND ROOT EXUDATES
Presenter(s): Tyler Criss (Michigan State University)
Biochemistry & Molecular Biology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 304
Mentor(s): Trine Andersen (Michigan State University)

Sorghum bicolor is a drought-tolerant crop widely cultivated in environments with poor soil conditions and high temperatures. These traits, along with its quick growth has made it an ideal feedstock for second-generation biofuel production. However, knowledge of its specialized metabolites are limited. Terpenoids are the biggest class of specialized metabolites and amongst other functions plays a part in herbivore and pathogen resistance in plants. The first committed step in the biosynthesis of most classes of terpenoids (e.g. mono-, sesqui-, and di-terpenoids) are performed by a class of enzymes called terpene synthases (TPSs), while oxidosqualene cyclases (OSCs) are used in triterpenoid biosynthesis instead. Previous studies have identified that several OSCs have been linked to the biosynthesis of triterpenoids in the cuticle of S. bicolor, increasing its water retention and drought tolerance. The crop also produces sesquiterpenoids in response to insect herbivory, and here several TPSs have been characterized. However, the characterized enzymes are only a fraction of the existing TPSs and OSCs in the plant. To illuminate the terpenoid metabolic landscape in S. bicolor, multiple uncharacterized TPSs and OSCs produced in the aerial portion of the plant have been cloned out and characterized via transient expression in Nicotiana benthamiana. Cluster analysis was also performed to identify gene clusters and duplications related to the characterized TPSs and OSCs. By elaborating on the terpenoid landscape in S. bicolor, the plant may be engineered in the future to produce terpenoids of economic interest in its cuticular wax. Additionally, S. bicolor was grown in a hydroponics system to isolate and characterize root exudates released from the roots in water. Together, both projects will expand upon the foundational knowledge necessary to engineer sorghum and its rhizosphere.

VALIDATION OF PLASMA PROTEIN BIOMARKERS PREDICTIVE OF COVID-19 SEVERITY
Presenter(s): Sean Foster (Michigan State University)
Biochemistry & Molecular Biology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 305
Mentor(s): Christina Chan (Michigan State University), Kevin Chen (Michigan State University)

In contrast to its effect in healthy patients, IL-6 inhibited apoptosis (promoted survival) of fibroblasts taken from IPF patients, suggesting altered effects of the cytokine based on the presence of existing illness18. It is unknown the role elevated IL-6 level plays in the development of COVID-19 related pulmonary fibrosis and whether SARS-CoV-2 induced pulmonary fibrosis would cause similar changes in fibroblast response to cytokines as in IPF. In addition to the apoptotic damage, alveolar cells going through EMT may create a pro-fibrotic microenvironment by altering the extracellular composition19. In particular, TGF-beta1expression is increased in epithelial cells in advanced pulmonary fibrosis20. Elevated IL-6 can cause TGF-beta1 production in cardiac fibroblasts through Smad3 signaling21, and IL-15 plays a role in inhibiting TGF-beta1 signaling in renal fibrosis22.Exposure of alveolar epithelial cells to TGF-beta1 in vitro causes upregulation of mesenchymal markers, suggesting that TGF-beta1 secretion could promote fibrosis through multiple pathways23.

A PYTHON-BASED APPROACH TO TEACHING METABOLIC MODELING
Presenter(s): Antwan Green (Michigan State University)
Biochemistry & Molecular Biology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 306
Mentor(s): Joshua Kaste (Michigan State University), Yair Shachar-Hill (Michigan State University)

In metabolic modeling research, different biochemical reaction pathways and networks are simulated to better understand their operation and to allow for biotechnological production. The process of constructing these models is often arduous, and there is relatively little material available for hands-on teaching of the concepts and practice. In the literature that does attempt to teach this material, the exercises usually only allow students to learn about metabolic modeling in specific contexts of specific reactions, losing out on the wider concepts. To fill this gap in the learning and acquisition of this material, we take advantage of the programming language Python. Python allowed us to create interactive simulations that allow students to take a hands-on approach to learn metabolic modeling using time-course simulations of fluxes, metabolite levels, and isotopic labeling. Using its user-friendly interface and excellent modification ability, we created a workshop where students learn about metabolic modeling through a host of different exercises, each of which aims to give them a greater sense of competence about the concept(s) presented. This presentation will describe the workshop's exercises on staples of metabolic research, including Metabolic Flux Analysis, Metabolic Control Analysis, and Flux Balance Analysis, and our progress towards refining and making them available to the educational community.

MITOCHONDRIAL CALCIUM UPTAKE THROUGH THE MCU COMPLEX IS AFFECTED BY INTERACTION BETWEEN THE ARYL HYDROCARBON RECEPTOR AND TSPO IN MOUSE LUNG EPITHELIAL CELLS.
Presenter(s): James Torres (Pontifical Catholic University of Puerto Rico)
Biochemistry & Molecular Biology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 307
Mentor(s): John LaPres (Michigan State University)

The Aryl Hydrocarbon Receptor (AHR) is a ligand-activated transcription factor which is responsible for sensing planar aromatic hydrocarbons, such as 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), in our environment. In the absence of ligand, AHR is in the cytosol and when exposed to TCDD, it moves to the nucleus where it regulates the expression of a large battery of genes which many of these encode detoxifying enzymes and other mitochondrial-associated proteins. Previous RNAseq data suggest that loss of AHR impacts the expression of genes that encode subunits of the mitochondrial calcium uniporter (MCU), most notable the MICU2 subunit. Interestingly, loss of the Translocator Protein (TSPO), an outer mitochondrial membrane protein, also impacts MICU2 expression. We hypothesized that crosstalk between AHR and TSPO regulates MICU2 expression and mitochondrial calcium loading. To test our hypothesis, we used wild type (WT), AHR-/-, and TSPO-/- mouse lung epithelial cells (MLE-12). These cells lines were treated with PK11195, a TSPO ligand, TCDD, and both currently or their respective vehicles solvents (i.e. ethanol and DMSO). Following a 6-hour exposure, RNA was isolated and the expression of genes encoding MCU subunits were analyzed using SYBR Green RT-PCR. Results showed loss of TSPO and AHR caused a decrease in MICU2 expression. In contrast, treatment with TCDD or PK11195 did not alter MICU2 expression. These results suggest that AHR and TSPO may participate in crosstalk, playing a crucial role in regulating the expression of genes that encode MCU complex subunits, specifically MICU2 and this crosstalk might be critical to mitochondrial calcium homeostasis.

THE CIRCADIAN CLOCK AND ITS REGULATION OF CELLULAR AND ORGANISMAL METABOLISM
Presenter(s): Matthew Hans (Michigan State University)
Biochemistry & Molecular Biology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 311
Mentor(s): Anna Wicher (Nothwestern University)

The primary research focus in our laboratory is to understand the molecular mechanisms through which the circadian clock regulates cell and organismal metabolism and the reciprocal feedback of metabolism on circadian oscillators in animals. Our long-range goal is to exploit insight into the clock to identify regulatory nodes within metabolic pathways important in beta cell biology, mitochondrial function, NAD+ biosynthesis, NAD+ dependent ADP-ribosylation and deacetylation reactions, and to determine the

impact of these epigenetic modifications on proliferation and stress response. These studies will elucidate the relationship amongst brain, behavior, and physiology at both the cell and molecular level. We anticipate that a better understanding of clock processes will lead to innovative therapeutics for a spectrum of diseases including diabetes, obesity, autoimmunity, and cancer.

TRAPPING GLUCOSE OXIDASE AND NON-ADHERENT CELLS FOR PROLONGED METABOLIC MEASUREMENTS.
Presenter(s): Jeremiah Hutson (Michigan State University)
Biochemistry & Molecular Biology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 312
Mentor(s): Denis Proshlyakov (Michigan State University), Nathan Frantz (Michigan State University)

Diabetic retinopathy (DR) is the leading cause of blindness in working aged individuals and like many metabolic diseases is characterized among others by mitochondrial dysfunction. Retinal tissue derived from diabetic donors is extremely limited for metabolic measurements. Primary adherent retinal cells are currently used to study DR, but measurements on non-adherent cells such as CACs, progenitor cells, and leukocytes have proved challenging due to their buoyancy and mobility. We introduce a novel technique to trap non-adherent cells and isolated mitochondria for metabolic measurements, referred to as caging. To explore this technique, glucose oxidase (GOx) was used as an enzymatic model for cellular metabolism as GOx catalyzes the consumption of both oxygen and D-glucose. We demonstrate that GOx can be caged under a semipermeable membrane and remain enzymatically active. Additionally, GOx activity can be manipulated by controlling diffusion time through the cage. By using filter paper below the membrane to control thickness of the cage, we characterized a correlation between transport efficiency of metabolites and cage depth. Finally, from the GOx metabolic model, we show these results can be applied to non-adherent T-cells (u937) caging as the membrane remains permeable to respiratory nutrients and inhibitors but impermeable to the larger non-adherent cells. Under caging conditions, we show a single sample of non-adherent cells can remain metabolically active throughout hours of experiment. As a result, we show that caging provides a crucial methodological advancement for experimentation on non-adherent cells to help reveal their roles in metabolic diseases such as DR.

DETERMINING FUNCTION OF AUTOPHAGY PROTEINS: TESTING THE EFFECT OF ATG10 MUTANTS ON AUTOPHAGY
Presenter(s): Konrad Lautenschlager (Eastern Michigan University)
Biochemistry & Molecular Biology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 313
Mentor(s): Steven Backues (Eastern Michigan University)

Autophagy is a necessary recycling process that occurs in eukaryotic cells, but the functions of the proteins that carry it out aren't completely understood. It is known that the autophagic protein Atg7 operates upstream of Atg10 in a cascade that covalently attaches Atg12 to Atg5 and ultimately Atg8 to the lipid PE. This is necessary for forming autophagosomes, double membrane vesicles that carry out autophagy. Atg7 affects both the size and number of autophagosomes formed, while Atg8 affects primarily the size. Our hypothesis is that Atg10, like Atg7, affects both autophagosome size and number. Our lab is creating Atg10 mutants that show a partial loss in autophagic activity; comparing these to the wild type will allow us to analyze the differences in autophagosome size and number that result from the reduction of Atg10 function. We can verify the partial loss of function in our mutants by testing their effect on the conjugation of the Atg12-Atg5 complex using Western blotting. Additionally, we use the Pho8?60 assay and the proteolytic maturation of Ape1, a specific autophagic cargo, to determine the level of autophagic activity. Once we have verified mutants, transmission electron microscopy can be used to image the autophagosomes in the cell and both size and number determined mathematically. Our initial Atg10 mutants, H131A and Y73Q, have shown a loss in function, but not significant enough compared to the wild type to make these measurements. As a result we will now be creating a double mutant in hopes of more reduced function.

CHARACTERIZATION OF PROTEINS AND PROTEIN COMPLEXES BY CAPILLARY ZONE ELECTROPHORESIS-MASS SPECTROMETRY
Presenter(s): Scott Mitchell (Taylor University)
Biochemistry & Molecular Biology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 314
Mentor(s): Liangliang Sun (Michigan State University)

Delineation of proteins and protein complexes is crucial for understanding their biological functions in regulating biological processes. Capillary Zone Electrophoresis-Mass Spectrometry (CZE-MS) is a powerful tool for studying proteins and protein complexes. CZE offers highly efficient separation of proteins and protein complexes in liquid phase based on their electrophoretic mobilities, which relate to their charge-to-size ratios. High resolution MS can provide accurate mass measurement of proteins. The purpose of this study is twofold. First, we studied how the background electrolyte (BGE) of CZE effluences the separation resolution of a standard protein mixture containing proteins in a mass range of 8-66 kDa. During this we learned that this method in a native condition with an ammonium acetate buffer (pH 6.8) as the BGE allowed the separation and detection of intact protein complexes, i.e., myoglobin-heme complex and carbonic anhydrase-zinc complex. This led to the second goal of the project, studying the interaction between carbonic anhydrase and its known inhibitors by the native CZE-MS method. We expect to observe clear evidence of inhibitor binding through a mass shift of the protein. We will also estimate the dissociation constant to evaluate the inhibition efficiency. This can be further developed and utilized alongside research of carbonic anhydrase inhibitor therapies for diseases such as glaucoma and various forms of cancer.

MODIFYING PHAGE FOR IMPROVED BIOCONTROL AGAINST PATHOGENIC P. SYRINGAE DC3000 TOMATO PV.
Presenter(s): Anna Kim (Michigan State University), James Suggitt (Michigan State University), Jenna Thibodeau (Michigan State University), Ram Sanath Kumar (Michigan State University), Roksana Riddle (Michigan State University)
Biochemistry & Molecular Biology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 315
Mentor(s): Bjoern Hamberger (Michigan State University), Daniel Ducat (Michigan State University), Masako Harada (Michigan State University), Michaela TerAvest (Michigan State University)

The United States CDC estimates 2.8 million bacterial, drug-resistant infections that result in 35,000 deaths annually1. Pseudomonads are bacterial genera amongst the most resistant to antimicrobials, not only in clinical settings but also in plant systems4. P. syringae is a particularly damaging infective agent in plants for multiple diseases including bacterial cankers and apical plant necrosis affecting nearly all major agricultural crops2,5,8. New drug-based therapies for P. syringae are of limited effectiveness yet continue to be the primary biotechnological approach for biocontrol4; the high-level of drug-resistant microbes are sparking renewed interest in alternative strategies for plant infections, such as bacteriophage therapy. Phages are natural predators of bacteriusing them as a host to reproduce and have been used as a plant pathogen biocontrol including P. syringae6,7,9. However, phage application to crops reduced phage viability due to harsh leaf environmental conditions including UV irradiance and pH levels3. Our team has isolated two novel P. syringae DC3000 tomato pv. phages from the Red Cedar River and tomato plant soil. We aim to characterize these phages and test strategies for enhancing their environmental robustness as a proof-of-principle approach to improve the utility of phage therapies for Psudomonad biocontrol. We propose modifying the phage capsids through novel methods of CRISPR and BRED to increase capsid rigidity. We will leverage SpyTag on the capsid with SpyCatcher amino acids to improve capsid protein interactions. Increased rigidity will resist UV or pH induced protein damage and unwanted modification increasing phage viability on the plant surface.

GROWING ENTEROCOCCUS FAECALIS IN BILE ACIDS

Presenter(s): Andrew Simmons (Chowan university)
Biochemistry & Molecular Biology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 316
Mentor(s): Robert Quinn (Michigan State University)

Bile acids are a large family of molecules that have a steroidal structure and are synthesized from cholesterol in the liver and actively secreted along with cholesterol and phospholipids into the bile. The bile acid function is the absorption of dietary lipids and fat-soluble vitamins but is signaling molecules with diverse endocrine and paracrine functions. Enterococcus faecalis is a bacteria that lives in your GI tract. The bacteria are mostly harmless when it is in the intestines but if it somehow makes their way to other parts of the body then it is a serious matter. In this experiment, the following questions will be determined. At what concentration of acid can the bacteria grow? Is it possible for the bacteria to evolve where it can grow but not as rapidly as it did before? To accomplish this the Enterococcus Faecalis will be put under selective pressure for it to evolve in order to answer the questions

A PATHWAY FOR ENGINEERING ENVIRONMENTAL BACTERIOPHAGE AS AN AGRICULTURAL BIOCONTROL
Presenter(s): James Suggitt (Michigan State University)
Biochemistry & Molecular Biology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 317
Mentor(s): Bjoern Hamberger (Michigan State University), Masako Harada (Michigan State University), Michaela TerAvest (Michigan State University)

Bacteriophages have both highly specific hosts and novel methods of overcoming bacterial defense mechanisms. These qualities hold immense promise as phage therapies are developed to replace traditional biocontrols1. In agriculture, both antibiotic and copper sulfate sprays face rapidly evolving bacterial resistance2. While environmentally isolated phage has shown progress against bacterial infection in a laboratory environment2, field applications show phage therapy remains nonviable in agriculture3. Part of this difficulty is due to UV irradiation of the phage, rendering it unable to infect the target bacteria3. As such, UV resistance will increase phage longevity, increasing its effectiveness and commercial viability in production agriculture. P. syringae is among the drug-resistant microbes sought to be treated with phages. P. syringae causes black sores, tissue damage, and bacterial cankers, which lead widespread necrosis4. In this study, environmental phage was isolated and characterized against P. syringae DC3000, while its genome was annotated, providing insights for modification. I also obtained currently available commercial phage to increase UV resistance through the insertion of the SpyCatcher-SpyTag system into the capsid protein. The SpyCatcher-SpyTag system allows for the creation of a fusion protein from two subunits, each of which can attach to another protein structure5. In this case, SpyTag will be integrated into the phage capsid protein as a binding site for a SpyCatcher tagged protein complex. As such, the protein can serve as a "sunscreen", protecting the phage from UV irradiation. In turn, modified phages will be tested against both wild-type and unmodified phage using in vitro assays.

IDENTIFICATION OF A GENETIC MODULE UNDERLYING AN EXAGGERATED SEXUALLY DIMORPHIC TRAIT
Presenter(s): Nadia Sbisa (Kalamazoo Valley Community College)
Biochemistry & Molecular Biology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 318
Mentor(s): Haosu Cong (Michigan State University)

In Drosophila, cuticular hydrocarbons (CHCs) are contact pheromones. In D. erecta, the female CHCs are much longer than the males, which demonstrates that CHCs are a sexually dimorphic trait in D.erecta. Therefore, we want to ask a question: What are the genetic mechanisms responsible for the evolution of

this sexually dimorphic trait? We found an elongase gene that is exclusively expressed in female D.erecta oenocyte cells, and we hypothesize that the sexually dimorphic expression pattern of this gene is due to sex specific gene regulation. The objective of this project is to locate the sex specific transcription factor binding site that is responsible for a sexually dimorphic expression pattern of the candidate gene. To do this, we tested different sequences within the regulation region by integrating it with GFP and making constructs. The cloned constructs were then injected into Drosophila embryos. We observed the GFP expression of each DNA sequence to determine which one is responsible for driving the sexually dimorphic gene expression pattern. The results of this experiment will determine the specific location of the sex specific transcription factor binding site in the gene regulation region. We hope this study can provide us with insight about the evolution of sexual dimorphism and chemical communication.

ENGINEERING AN ANTI-GD2 ANTIBODY: A COMPUTATIONAL APPROACH
Presenter(s): Theodore Belecciu (Michigan State University)
Biochemistry & Molecular Biology
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 331
Mentor(s): Daniel Woldring (Michigan State University), Sam Schmidt (Michigan State University)

Tumor associated carbohydrate antigens (TACAs) are a class of compounds which are abundantly expressed in certain cancers like neuroblastomas. Antibodies that target these TACAs are of high interest to the scientific community because they can reduce off-target effects while maintaining high specificity. Recently, a TACA called NHAcGD2 has been identified which has the potential to facilitate highly specific binding to certain tumors. In this project, we develop a computational workflow for engineering antibodies with improved binding affinity to NHAcGD2. This project initially consists of a computational protein-ligand docking followed by pose optimization. Afterwards, antibody affinity maturation is computationally simulated on the antibody CDRs. This last procedure is repeated until a certain binding energy threshold is reached between the antibody and NHAcGD2. This procedure enables us to generate large libraries of potentially strong antibody binders that can then be tested in a laboratory setting. We hope this computational protocol will help expedite existing wet-lab antibody engineering methods.

AN ASSESSMENT OF TART CHERRY BY-PRODUCT AND AGNP IN C. ELEGANS AS A MODEL FOR HUMAN BIOLOGICAL SYSTEMS
Presenter(s): Kylia Mack (Georgia Southern University)
Biochemistry & Molecular Biology
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 332
Mentor(s): Evangelyn Alocilja (Michigan State University)

Michigan produces over 90,000 tons tart cherries each year, making it the largest producer in the entire United States. The carbon footprint of tart cherries Is low, but its by-product like pit and pomace are unacknowledged pollution. Gold nanoparticles are another major component to this research because these particles have a huge 1.5-billion-dollar industry as projected for 2025. We will investigate the gold nano particles to understand the pollution effects of them on the human body. The we investigate the behavior effects of toxic metals and tart cherry pomace and pit because they are directly related to human body biologically. A non-balanced biological system can be fatal because life requires the biological system to run efficiently or fatality is possible. Assessments of defecation, reproduction and oxidative stress are then recorded. The imaging methods of TEM used in previous research and literature will be mirrored in our methodology. TEM or transmission electron microscope will be used to examine gold nano particles to ensure nano-size. Tart cherries and AGNP are leaders in some of the world largest industries, so the greater impact on society should be investigated. For the hypothesis I expect to see a significant change in biological effects as we analyze the toxicity of MN and GN particles. We also expect to see that tart cherry pit & pomace contribute to an increased metabolism and reproductive abilities of the c. elegans.

IDENTIFYING ANTIMICROBIAL RESISTANT GENES IN UROPATHOGENIC BACTERIA

Presenter(s): Gabriel Durand (Universidad de Puerto Rico Recinto de Aguadilla)
Biochemistry & Molecular Biology
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 333
Mentor(s): Charles Whitehead-Tillery (Michigan State University), Linda Mansfield (Michigan State University)

Uropathogenic Escherichia coli (UPEC) are the primary cause of urinary tract infections (UTI). Although beta-lactam antibiotics are commonly prescribed to treat UTIs, however, there has been a rise in antibiotic resistance. Studies have shown that Extended Spectrum Beta Lactamases (ESBLs) are one class of enzymes that confer resistance for Beta-lactam resistance. ESBLs are commonly encoded on plasmids and can be transferred to antibiotic susceptible bacteria via conjugation. This is possible thanks to mobile transfer genes which allow movement of the DNA within the cell or unto other cells. The question we want to answer what specific genes are involved in the transfer of these resistances to other bacteria? In order to answer this question, we will be annotating four plasmid sequences from ESBL producing UPEC isolates which will facilitate future experiments regarding UTIs. With these plasmid sequences we are specifically focusing on identifying mobile transfer genes and ESBL genes using the Pathosystems Resource Integration Center, an information database that annotates these plasmids along with their position and orientation within the plasmid. SnapGene will allows us to map out the plasmid in an easy form to read. Once the plasmids are mapped out, we will use the Natural Center of Biotechnology Information Basic Local Alignment Search Tool (BLAST) to further characterize the mobile transfer genes by properly labeling them. The work we do mapping these plasmids will aid future experiments aimed at understanding the spread of antimicrobial resistance genes and open the doors to create better treatments for antibiotic resistant infections.

A QUANTITATIVE ANALYSIS ON THE REMOVAL OF ESTROGEN RECEPTOR 1 IN ADULT AND ADOLESCENT MICE, GLAND BRANCHING AND LEUKAEMIA INHIBITORY FACTOR PRODUCTION.
Presenter(s): Jarrett Lloyd (University of Maryland, Baltimore County)
Biochemistry & Molecular Biology
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 334
Mentor(s): Ripla Arora (Michigan State University)

Uterine glands secrete proteins necessary for embryo survival, implantation and pregnancy success. One such secretion essential in rodents and humans is Leukaemia Inhibitory Factor (LIF). The hormone estrogen binds to uterine estrogen receptors (ESR1 and ESR2) and estrogen signals the production of LIF. However, the exact mechanisms by which estrogen influences uterine gland structure and function is not known. Our lab has shown that embryonic loss of ESR1 reduces gland branching in the uterus, but adult epithelial deletion of ESR1 does not affect gland branching. This project aims to characterize the role ESR1 in uterine gland function. In this study, we analyze the effect of ESR1 depletion on gland function by measuring the expression of LIF. Additionally, we evaluate gross anatomy of the uterine glands and quantify glandular LIF expression in ESR1-depleted uterine glands. Last, we analyze 30 tissue slices with image analysis software, Image J and IMARIS. The total surface area and volume of LIF mRNA in proportion to a gland marker will be quantified. We hypothesize that LIF production will decrease when ESR1 is deleted in adolescent and embryonic mice. Since loss of ESR1 affects branching morphogenesis more severely when deleted embryonically, we also expect to see a more severe reduction in LIF expression in these mice as well.

CLONING OF ADAMTS1 TO STUDY PROTEIN-PROTEIN INTERACTIONS WITH THE SARS-COV2 ORF8 PROTEIN
Presenter(s): Jeannie Lam (Michigan State University)
Biochemistry & Molecular Biology
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 335

Mentor(s): Masako Harada (Michigan State University)

ORF8 is an accessory protein in SARS-CoV2 that aids in the down-regulation of MHC-I in cells. ADAMTS1 is an enzyme that is angioinhibitic and has a role in inflammatory processes. ORF8 has previously been shown to interact with some ADAMTS family members. In this project, our goal is to create recombinant plasmids with the ADAMTS1 insert to study the protein interactions between ORF8 and ADAMTS1. We have designed primers based on the ADAMTS1 insert. The techniques used in cloning the ADAMTS1 cDNA and pcDNA3.1 are polymerase chain reaction (PCR), gel electrophoresis, and purification. This ADAMTS1 insert along with the pcDNA3.1 backbone are recombined 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. In silico cloning successfully generated the ADAMTS1 construct with ORFs to express ADAMTS1, followed by the cloning experiments to amplify the insert and generate backbone by restriction digest. The plasmids will be used to study the protein-protein interactions between ORF8 and ADAMTS1, to support the understanding of ADAMTS1 in immune response.

PROSS STABILITY-DESIGN CALCULATION TO STABILIZE THE STRUCTURE OF THE NRFH FOR BETTER EXPRESSION YIELD
Presenter(s): Javi Tobar (Michigan State University)
Biochemistry & Molecular Biology
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 337
Mentor(s): Eric Hegg (Michigan State University), Julius Campecino (Michigan State University), Krystina Hird (Michigan State University)

Microorganisms compete with plants for the ammonium-based fertilizer applied to agricultural lands. These microorganisms convert ammonium to nitrate. Nitrate is not well retained in the soil and is easily leached into waterways. This is detrimental to the marine ecosystem. Fortunately, a number of microorganisms convert nitrate back to ammonium via the dissimilatory nitrate reduction to ammonium (DNRA) pathway. The DNRA mechanism involves two steps: reduction of nitrate to nitrite and then reduction of nitrite to ammonium. These conversions involve several enzymes including NrfH and NrfA, which are the drivers of the second step. NrfH is a redox partner of NrfA. Its main function is to shuttle electrons to NrfA from the membrane quinol pool. The NrfA-NrfH complex could not be characterized because NrfH and NrfA are particularly difficult to overexpress because they contain multiple hemes and NrfH is a membrane-associated protein. In previous studies, NrfH has been isolated via native expression which yielded low amounts of protein. The goal of this study is to create a strategy that allows us to discover a stable variant of NrfH that can be overexpressed. We will do this in silico using Protein Repair One Stop Shop (PROSS), a software that predicts stabilizing amino acid substitutions that may stabilize NrfH. Then we will overexpress the most promising NrfH variant in Shewanella oneidensis. We hypothesize that the stabilized variant of NrfH will overexpress better than the wild-type protein. Our results will help us overexpress enough protein to characterize NrfH and its interactions with NrfA.

DETECTION OF SYNTHETIC SWINE VIRAL DNA USING A NANOPARTICLE-BASED BIOSENSOR
Presenter(s): Ines Kenhoung (Bowie State University)
Biochemistry & Molecular Biology
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 337
Mentor(s): Evangelyn Alocilja (Michigan State University)

In this review, investigations on nanotechnology-based biosensors for pathogenic virus detection with a focus on biosensors could open the door to the early diagnosis of viral infections and the provision of a healthy life for patients who have been exposed to them. Viral infections inflict devastation and significantly threaten human and animal safety. There is a need for quick and precise viral identification. For the detection of harmful viruses, numerous biosensors have been developed and made available for use. Nanotechnology has overcome these difficulties, allowing for real-time direct molecular target

identification. A double-stranded DNA virus swine virus causes a severe, extremely contagious disease. Consequently, a quick method of virus detection is crucial for disease prevention. MATLAB was used to organize and analyze complex data sets obtained from a gold nanoparticle biosensor for the swine virus. Twelve probes of different lengths were used and will be compared using this code. Factors that were also analyzed in these trials were sensitivity and specificity. Specificity measures how the probes are specific to the Swine Virus being tested. Sensitivity measures how low of a concentration the biosensor can detect. A control using nuclease-free water and nontarget DNA are used to test the cross reactivity of the probes and compared against the target synthetic DNA. This paper shows which are the best probes based on their sensitivity and specificity.

IMAGING OF THE LUNG USING MPI WITH SPIONS
Presenter(s): Manhar Khanna (Hunter College)
Biochemistry & Molecular Biology
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 341
Mentor(s): Ping Wang (Michigan State University)

Magnetic particle imaging (MPI is a new and relatively underutilized imaging technique that specifically and sensitively detects superparamagnetic iron oxide nanoparticles (SPIONs) within a sample. SPION-based MRI imaging/tracking is one that does cater to a high sensitivity. However due to the nature of MRI there is a low specificity due to noise from biological tissues. Moreover, there are nuclear imaging techniques that are highly sensitive and specific, but expose patients to ionizing radiation. Using an MPI in conjunction with SPIONs could help overcome these challenges. Methods: Using superparamagnetic iron oxide nanoparticles (SPIONs) we see that we can label and track these aerosols in vivo with a decent sensitivity using an underutilized technique known as magnetic particle imaging (MPI). A plethora of proof-of-concept experiments are done for different lung applications like those involving tracking the primary deposition in vivo, high resolution of the collective mucociliary clearance pathway starting from the lung, moving up to the epiglottis and down to the GI tract. Results: In the past, lung imaging of SPIONs using magnetic resonance imaging (MRI) was not successful and limited. In these results, we find that we are able to image the lung with a high sensitivity using MPI with SPIONs. Conclusion: It is shown how MPI in conjunction with SPIONs can be used as a novel imaging technique that will allow for breakthroughs in many realms of the clinical setting such as the domain of treatment.

PREDICTING PEPTIDE-BINDING USING ALPHAFOLD2
Presenter(s): Dayna Olson (Michigan State University)
Biochemistry & Molecular Biology
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 342
Mentor(s): Michel Sanner (Scripps Research)

HIV protease is an essential enzyme for the maturation of the HIV virion, and a common drug target. Molecular docking is widely used in structure-based rational drug design, and while it is effective at predicting small molecule binding to proteins, it remains challenging to correctly predict peptide binding, as this requires exponentially more calculations. Deep learning software AlphaFold2 has been shown to accurately predict 3 dimensional protein from its primary amino acid sequence. Recently it was shown that it is also capable of co-folding 2 or more sequences. Here we evaluate AlphaFold2 ability to co-fold HIV protease with various peptide sequences including its known cleavage sites as well as known peptides not cleaved by this protease. We will compare the docking success rate of AlphaFold2 with those obtained with AutoDock CrankPep (ADCP), another state-of-the-art peptide docking method both in terms of docking success rates and the ability to discriminate between native substrates and non-cleaved peptides.More efficient and accurate peptide docking methods will support the development of novel peptide-based therapeutic approaches beyond HIV.

THE EFFECTS OF EARLY LIFE ADVERSITY ON MAST CELL LIPID DROPLET ACCUMULATION
Presenter(s): Joshua Regan (Jackson State University)

Biochemistry & Molecular Biology
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 343
Mentor(s): Janelle Lemon (Michigan State University)

Early life adversity (ELA) increases the risk of chronic inflammatory and metabolic disease in adulthood. We are investigating the role of mast cells as drivers of chronic inflammatory diseases associated with ELA. A number of ELA associated chronic inflammatory diseases are also characterized by increased mast cell activation. Mast cells are among the first immune responders to pathogens and stress. Since mast cells are derived from bone marrow resident hematopoietic stem cells, we wanted to determine if ELA changes in phenotype are self-acted at the gene level. Preliminary RNA sequencing of unstimulated bone marrow derived mast cells (BMMCs) from normally handled (NH) and neonatal maternally separated (NMS) male and female mice. Neonatal maternal separation is a protocol to induce ELA. Transcriptome data showed many genes related to lipid metabolism are differentially regulated between NH and NMS BMMCs. We hypothesized that ELA induces a hyperinflammatory phenotype in mast cells by upregulating lipid metabolism pathways, boosting the capacity of mast cells from mice who experienced ELA to accumulate lipids and produce pro-inflammatory eicosanoids in response to a challenge. To test this hypothesis, we are using ImageJ software to measure the fluorescence intensity of Oil Red O stained BMMCs to compare the lipid droplet content between NH and NMS groups. We expect an increased amount of ORO stained lipid droplets in BMMCs from the NMS mice compared with the NH group. This research will help us understand how ELA is programming mast cells towards a hyper-inflammatory phenotype and increased risk for inflammatory diseases in individuals with a history of ELA.

CHARACTERIZING EFFECTOR-METAEFFECTOR PAIRS IN LEGIONELLA PNEUMOPHILA
Presenter(s): Ethan Wolfe (Michigan State University)
Biochemistry & Molecular Biology
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 344
Mentor(s): Janani Ravi (Michigan State University)

Early life adversity (ELA) increases the risk of chronic inflammatory and metabolic disease in adulthood. We are investigating the role of mast cells as drivers of chronic inflammatory diseases associated with ELA. A number of ELA associated chronic inflammatory diseases are also characterized by increased mast cell activation. Mast cells are among the first immune responders to pathogens and stress. Since mast cells are derived from bone marrow resident hematopoietic stem cells, we wanted to determine if ELA changes in phenotype are self-acted at the gene level. Preliminary RNA sequencing of unstimulated bone marrow derived mast cells (BMMCs) from normally handled (NH) and neonatal maternally separated (NMS) male and female mice. Neonatal maternal separation is a protocol to induce ELA. Transcriptome data showed many genes related to lipid metabolism are differentially regulated between NH and NMS BMMCs. We hypothesized that ELA induces a hyperinflammatory phenotype in mast cells by upregulating lipid metabolism pathways, boosting the capacity of mast cells from mice who experienced ELA to accumulate lipids and produce pro-inflammatory eicosanoids in response to a challenge. To test this hypothesis, we are using ImageJ software to measure the fluorescence intensity of Oil Red O stained BMMCs to compare the lipid droplet content between NH and NMS groups. We expect an increased amount of ORO stained lipid droplets in BMMCs from the NMS mice compared with the NH group. This research will help us understand how ELA is programming mast cells towards a hyper-inflammatory phenotype and increased risk for inflammatory diseases in individuals with a history of ELA.

A NOVEL AND POTENTIAL SITE FOR ISLET ORGANOIDS TRANSPLANTATION: BROWN ADIPOSE TISSUE
Presenter(s): Keenan Perkins (Florida A&M University)
Biochemistry & Molecular Biology
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 346

Mentor(s): Aixia Sun (Michigan State University)

A novel and potential site for Islet Organoids Transplanations: Brown Adipose Tissue. In patients with complicated diabetes, pancreas or islets of Langerhans transplantation is a promising curative treatment. For clinical islet transplantation, intraportal islet infusion in the liver is commonly used. However, liver transplantation is associated with a variety of complications, including loss of functional islet mass, bleeding and thrombosis, and progressive deterioration of intrahepatic islet function. Several tissues and organs have been studied for islet transplantation, including the kidney sub-capsule, skeletal muscle, subcutaneous and intramuscular spaces, epididymal fat pad, spleen, thymus, bone marrow, lymph node, eye, and others. However, the optimal trans-plantation site, allowing for a reduction in the number of engrafted islets while extending islet graft survival, has yet to be determined. With the Methods there is "The wild-type (WT) C57BL/6J male mice and transgenic red fluorescent protein (RFP+) C57BL/6J male mice were obtained from Southern Medical University's Center of Experimental Animals. In our study, RFP transgenic mice were created using the previously described method". The background of this project is that "Adult RFP+ C57BL/6J mice pancreases were perfused in situ with collagenous P (Roche) through the bile duct to digest islets using the method described by Sutton et al. The islets were then washed in PBS before being handpicked at room temperature.

EXPRESSION ATLAS OF INDIVIDUAL CELLS WITHIN THE BLOOD BRAIN BARRIER
Presenter(s): Yvan Hamed Pacheco Romero (University of Puerto Rico - Humacao)
Biochemistry & Molecular Biology
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 347
Mentor(s): Jeremy Prokop (Michigan State University)

The Blood-Brain Barrier (BBB) is a filtering system that prevents toxic and pathogenic molecules in the blood from entering the central nervous system (CNS). Part of the problem is that the BBB also prevents potentially beneficial medicines from being able to cross into the brain. Endothelial cells, astrocytes, and pericytes are the main components of the BBB and are responsible for its proper function. Endothelial cells and pericytes perform specific roles when part of the BBB, relative to when they are found in different areas of the body. We attempt to understand whether they have differential genetic profiles unique to the BBB. In this study, we perform a literature review and leverage data from the Allen Brain Atlas to identify marker genes in each of these cell types. Then, we developed a strategy to look at over 1000 single cell experiments from mice and over 300 from humans, that include over 180 tissues and 5.5 million cells. We used the single cell sequencing data from the Panglao Database to screen clusters that overlap between endothelial cells, pericytes, and astrocytes within a Single Cell dataset of brain tissues. We have identified these datasets and in the future we hope to create matrices of the differential genetic profiles for the cell types across the regions of the mouse brain. Gaining a better understanding of the BBB composition and function is important for future researchers interested in novel drug delivery therapies that are able to cross the BBB.

BIOSYSTEMS & AGRICULTURAL ENGINEERING

INVESTIGATING THE RELATIONSHIP BETWEEN REDUCING CONDITIONS AND PHOSPHORUS LOSS
Presenter(s): Anna Burgess (Michigan State University)
Biosystems & Agricultural Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 401
Mentor(s): Ehsan Ghane (Michigan State University)

Although phosphorus is an essential nutrient for plant growth, its rising levels in many major bodies of water, such as Lake Erie, have led to the growth of algal blooms. These are harmful not only to the environment but also to human health. A major source of this phosphorus is the farms and agricultural

lands whose discharge water drains into Lake Erie either directly or through connections with other tributaries. Therefore, it is important to understand how various chemical and environmental conditions can affect the amount of phosphorus in drainage discharge. With this information, we will be able to better minimize both phosphorus loss and phosphorus concentration in the Great Lakes. The purpose of this paper is to investigate the relationship between reducing conditions and phosphorus concentration in subsurface drainage systems. To do this, water quality data will be collected using the YSI Exo2 sensor and then graphed against phosphorus concentration data to determine if a visual relationship exists. During periods where there is a clear visual relationship, the data will be further analyzed using correlation testing. This will show whether the relationship is statistically significant. It is anticipated that as the water becomes further reduced, the phosphorus concentration may increase.

EXTRACTION AND DETECTION OF SALMONELLA TYPHIMURIUM USING A NANO-BIOSENSOR
Presenter(s): Jeswin David (Michigan State University)
Biosystems & Agricultural Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 402
Mentor(s): Evangelyn Alocilja (Michigan State University)

With over 94 million gastroenteritis cases (of which 80 million are foodborne) and 155,000 deaths due to nontyphoidal Salmonella globally, the need for rapid and affordable detection methods is imperative. One type of nontyphoidal Salmonella species is: Salmonella enterica serovar Typhimurium. Current techniques, such as culture and polymerase chain reaction (PCR), involve expensive equipment and long diagnosis time. Utilizing a colorimetric nanoparticle-based DNA biosensor specific to Salmonella Typhimurium allows for faster etiological detection which results in quicker diagnosis and treatment. In this experiment, a specific probe conjugated to gold nanoparticles (GNP) differentiated between the target, Salmonella Typhimurium, from the non-target bacterial DNAs with a visual color change where red is positive, and gray/purple is negative. Target and non-target bacteria were isolated from foods, using magnetic nanoparticles (MNP). The DNAs were extracted and were subjected to the biosensing procedure. Detection in this manner is favorable in different environments worldwide in labs or the field especially in resource-poor communities. Overall, this technique does not require expensive lab equipment or technically skilled labor. In addition, implementing this detection method will assist in containing the spread of salmonellosis. Not only is it cost-efficient, but this biosensing test will be accessible to people in resource limited settings and has the potential to save lives and improve the quality of life.

EFFECTS OF BIN VS. MACHINE CARCASS COMPOSTS ON NUTRIENTS IN GROUNDWATER
Presenter(s): Sam Dougherty (Michigan State University)
Biosystems & Agricultural Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 403
Mentor(s): Steven Safferman (Michigan State University)

Farm carcass and litter compost is becoming increasingly popular for fertilizing farm crops. Precise amounts of phosphorous (P), nitrogen (N), and potassium (K) help to produce a greater yield. There are multiple ways to compost litter and carcasses; two of which are bin composting and machine/drum composting (in this case, the machine used was a BIOvatorTM. To test the differences in mobility and amounts of these nutrients, two columns of soil with a 1-centimeter layer of finished compost (bin compost and compost from a BIOvatorTM) from local turkey farms were set up with suction cup lysimeters and resin strips at depths of 26 inches and 8 inches to collect and test the effluent. Synthetic rainwater, in this case 0.01 M CaCl2, was distributed over the column, and the water collected from the lysimeters was tested for nutrients and pH. Conventional reagent test kits were used to test the effluent at each depth for ammonia, phosphorous, nitrate, nitrogen, and soluble-reactive phosphorous while the samples were sent to the MSU Soil and Plant Nutrient Lab to be tested for potassium and other micronutrients. Based on the results showing how much of each substance is present at each depth, steps may be taken by farmers to supplement their compost, reduce water input, increase litter

percentage, and so on. This project is yet to produce significant data. The expected outcome is that the compost from the machine/drums will produce nutrients that are more sedentary than those produced from the bin composting.

MEASURING THE PHOSPHORUS THAT CAN BE RECYCLED FROM CATTAILS USED FOR PHYTOREMEDIATION
Presenter(s): Arianna Fobbs (Michigan State University)
Biosystems & Agricultural Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 404
Mentor(s): Carley Allison (Michigan State University), Steven Safferman (Michigan State University)

In 80 years, humans are predicted to run out of all current known sources of mined phosphate rock. Phosphate rock is an essential ingredient in most of the world's fertilizers. The Green Farming revolution helped humans expand global produce production worldwide and feed billions more people. The green farming revolution was largely impacted by the ability to synthesize fertilizers. Phosphate from fertilizers applied to the land for farming often gets lost in runoff and can pollute the environment and cause unwanted algae growth on bodies of water. Cattails are excellent phytoremediators and remove multiple pollutants from our waters, particularly phosphorus. Cattails can grow from seeds or usually grow from ribosomes. Most cattail colonies you see in lakes, ponds, or rivers stem from only a couple plants. Cattail leaves naturally die back every year and every year they grow back. If cattails are cut above the water line, they will still grow back the next year. The experimental question that I am interested in pursuing is how much phosphorous can you receive back from the leaves of phytoremediating cattails? If humans can re-collect the extra phosphate that we apply to the soil, we could recycle our fertilizer more efficiently and keep runoff phosphorus from polluting the water sources in our environment.

FORMIC ACID BASED BIOLOGICAL HYDROGEN METHANATION OF CARBON DIOXIDE FOR RENEWABLE NATURAL GAS PRODUCTION
Presenter(s): John Grivins (Michigan State University)
Biosystems & Agricultural Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 405
Mentor(s): Sibel Uludag-Demirer (Michigan State University)

Anaerobic digestion is a growing, well-established method of producing biogas for fuel purposes. To continue increasing the viability of biogas as an energy source, it is necessary to upgrade the biogas to increase the percentage of methane produced. This project aims to investigate the upgrading of biogas via the addition of formic acid and bicarbonate to the feeding substrate as well as utilizing activated carbon membrane materials. The study investigates whether the combination of formic acid and bicarbonate in a continuous reactor treated with activated carbon will improve the biogas quality. This experiment ran ten semi-continuous reactor bottles under thermophilic conditions, and recoded the biogas production, biogas composition, soluble COD, pH, VFA composition, and DNA of the reactor cultures. The expected result is that the addition of formic acid in combination with bicarbonate in a reactor treated with activated carbon will improve biogas quality, increasing the percentage of methane relative to the carbon dioxide produced.

MICROBIAL COMMUNITY ANALYSIS OF CHITIN AMENDED SOIL IN POTATO FIELD TRIALS
Presenter(s): Sophia Lee (University of Michigan - Ann Arbor)
Biosystems & Agricultural Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 1202 STEM Facility
Presentation Number: 406
Mentor(s): Katherine McCullen (Michigan State University), Yan Liu (Michigan State University)

Soil amended with chitin has been shown to suppress plant pathogens, making it a useful agricultural management strategy to improve crop yield. Despite its widespread use, we have a limited understanding of how soil microbial communities respond to the addition of chitin and how these community shifts are linked to the reduction in plant pathogens. This study serves to investigate changes in the relative abundances of bacterial and fungal communities in chitin-amended potato fields over a six-week period. Chitinous fungal biomass was incorporated into the top layer of six plots within an experimental potato field at Michigan State University's Montcalm Research Farm in Lakeview, Michigan. Soil samples were taken every 15 days and compared against six untreated control plots for pH, moisture content, and microbial community analyses. Quantitative real-time PCR for pathogen presence focused on typical potato pathogens, Verticillium dahliae (Verticillium wilt) and Streptomyces scabies (potato scab), and was used to detect changes in the bacterial community at different bacterial phylum levels. These results will provide insight into the potential development of a natural soil amendment fertilizer for a broad range of pathogen infections in potato production.

OPTIMIZING ALGAE CULTIVATION FOR CARBON CAPTURE AND BIODIESEL PRODUCTION
Presenter(s): Lauren Merrill (Belmont University), Noah Lemmons (Oakland University)
Biosystems & Agricultural Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 411
Mentor(s): Sarah Beetham (Oakland University)

Climate change drives an increased need for renewable energy options. Microalgae can address this by both capturing carbon via photosynthesis and serving as a feedstock for sustainable energy. In contrast to other feedstocks, such as corn or lignocellulosic crops, microalgae can be cultivated in large quantities and grown on inarable land. In addition, microalgae is an ideal candidate for biodiesel due to its high production of lipids, which contain the energy required by fuels. Despite these advantages, increased efficiency is required to make algae-based energy economically viable. This study considers C. vulgaris, a microalgae strain that can grow autotrophically (via photosynthesis) and heterotrophically (by consuming organic carbon in the growth medium from sources such as glycol). Thus, a primary objective of this study is to assess algae growth and lipid production for a range of natural light exposures and variable glycol availability. This will be accomplished by varying light density and the concentration of glycol in the growth medium. Finally, these results will be used to develop a model predicting PBR efficiency based on light exposure and concentration of glycol. A secondary goal is to establish a protocol for using bomb calorimetry as an alternative to traditional gravimetric lipid analysis, making asssessment of algeal feedstock more acceessible to a wider range of investigators. This research may benefit wider applications of algae in addition to just biofuel, and with the help of this research, microalgae may be able to upscale to be an economically viable and efficient alternative carbon-neutral energy source.

SEED ACTIVITY IN ANAEROBIC DIGESTERS: A KINETIC STUDY BASED ON PERFORMANCE PARAMETERS AND MICROBIAL DYNAMICS IN BATCH REACTORS
Presenter(s): Sophia Liu (University of Michigan)
Biosystems & Agricultural Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 412
Mentor(s): Sibel Uludag-Demirer (Michigan State University)

Biogas is a renewable energy source produced by anaerobic digestion. Production of biogas is commonly assessed by the biomethane potential (BMP) test. However, methods and protocols of the BMP test are not standardized, therefore it is difficult to compare BMP results across literature. The current project is part of the ongoing effort to standardize the BMP method to improve the precision of the test results, focusing on two important factors for accurate BMP test results: the microbial diversity and population in the seed. These two factors are overlooked in the current BMP test protocol that uses the volatile solid (VS) concentration to adjust the seed to substrate ratio in the assay composition. The VS approach is prone to error, especially for seed samples with high organic content. To solve this problem, the present study compared various chemical and biological parameters in the BMP test. We hoped to find correlation

between these parameters in order to give us insight on how to standardize the BMP test more successfully. To test this, the BMP of the substrate cellulose was tested using two different seed samples, SCAD in MSU and WWTP in Delhi Township, which were then used in two states (fresh and purged). The seed samples and BMP assay solutions were analyzed over the 5 weeks incubation time to observe changes in chemical and biological parameters. The results from this work will be used towards further standardizing the BMP assay preparation, reducing the variations of BMP results across different labs.

UNDERSTANDING THE ENVIRONMENT IN A GREENHOUSE ECOSYSTEM TREATING CRAFT BEVERAGE WASTEWATER
Presenter(s): Kate Mann (Michigan State University)
Biosystems & Agricultural Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 413
Mentor(s): Steven Safferman (Michigan State University)

Michigan's wine, beer, and hard cider industries are all among the top 10 largest in the United States. The production of 1 liter of beer or wine results in 3-10 liters of wastewater. Traditional treatment methods are often difficult to utilize due to economic and geographical constraints. A greenhouse ecosystem may be a quality solution for onsite wastewater treatment. A laboratory scale greenhouse ecosystem will be designed and operated for the treatment of craft beverage wastewater. The goal of this study is to use measurements and analytical tests to develop a fundamental understanding of the environment in each tank of the greenhouse ecosystem. The parameters that will be measured include dissolved oxygen, pH, oxidation-reduction potential, biological oxygen demand, nitrogen, and phosphorus. The viable microbial population will also be quantified using flow cytometry. These measurements will also provide insight as to when the system reaches equilibrium, potentially leading to system optimization.

AFFORDABLE, ACCESSIBLE, AND SIMPLE DATA CAPTURE AND ANALYTICS USING GOLD NANOPARTICLE-BASED BIOSENSORS
Presenter(s): Thinh Nguyen (Michigan State University)
Biosystems & Agricultural Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 414
Mentor(s): Chelsie Boodoo (Michigan State University), Evangelyn Alocilja (Michigan State University)

Gold nanoparticles (GNPs) can be used as a reporter for colorimetric biosensors. However, a spectrophotometer is required to analyze the colorimetric data. Without a spectrophotometer, quantifying the data with the human eye is challenging because color perception is subjective and varies individually; an example is colorblindness. Despite the critical role of spectrophotometers, they are not accessible in resource-constrained locations due to high cost and maintenance. Therefore, an Android mobile application has been developed to reduce costs and increase accessibility to places that wish to use the GNP biosensors. The application uses the camera from smartphones to capture a picture of samples. The captured image is then analyzed using the RGB color model to produce data that can be interpreted within seconds. The conclusions from the data generated by the application have been correlated with the analyzed data from a NanoDrop? Spectrophotometer. Consequently, GNP-based biosensors can be deployed in resource-constrained locations if paired with this Android application.

USING IOT-BASED SENSOR TECHNOLOGY TO IMPROVE THE QUALITY AND PRODUCTION OF BLUEBERRIES AND TOMATOES
Presenter(s): Allison Smith (Michigan State University)
Biosystems & Agricultural Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 415
Mentor(s): Younsuk Dong (Michigan State University)

Improper irrigation management in agriculture can increase the risk of plant disease, which can negatively affect crop quality and production. Proper irrigation management can conserve water and energy, minimize plant disease risk, reduce fertilizer leaching, increase crop yield, and maximize return on investments. Sensor technology can be used to improve irrigation efficiency by monitoring for leaf wetness, soil moisture, and weather conditions. The project involves the use of LOCOMOS (IoT-based Sensor Monitoring System) stations that collect in-field soil and environmental conditions and send the data to a centralized web server. Demonstration fields are located in MSU Trevor Nichols Research Center (TNRC) and private farms in West Olive, MI and Hart, MI. The purpose of this project is to evaluate irrigation strategies, including timer, sensor- and weather-based irrigation scheduling methods, in tomato and blueberry fields to improve water use efficiency and crop production and quality. The expectation is that the use of IoT-based sensor technology will inform farmers to make better irrigation decisions, ultimately improving water use efficiency, decreasing disease, and increasing crop/fruit quality and yield.

NOVA-PRO: A DATABASE OF OXIDIZED LIPIDS CONTENT IN FOODS
Presenter(s): Yashasvi Vaidya (Michigan State University)
Biosystems & Agricultural Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 416
Mentor(s): Ilce Medina Meza (Michigan State University)

Dietary oxysterols (DOxS) or cholesterol oxidation products (COPs) are molecules derived from the oxidation of a parent compound (cholesterol and phytosterols), but with an additional hydroxyl, ketone, or epoxy group. They are known to exert pro-inflammatory, pro-oxidant, pro-fibrogenic, and pro-apoptotic toxic effects, leading to chronic diseases. They can be produced in the body or by food processing because of the reaction of reactive oxygen species (ROS) with cholesterol. DOxS are of major concern due to their prevalence in ultra-processed foods (UPFs), which are defined by the NOVA classification system as industrially manufactured, ready-to-eat meals with minimal whole foods. Analyzing DOxS' content in foods can provide insight into their fate across the food supply chain, the current need for changes in food processing methods, and the reevaluation of their presence in our diet. DOxS presence in tissues can also be used as biomarkers for chronic diseases such as osteoporosis, hypertension, and atherosclerosis, among others. Phytosterol oxidation products (POPs) are suspected to have a similar effect as DOxS due to the structural similarity of phytosterol and cholesterol. There is substantial data from several studies on the presence of DOxS and POPs in common food items, however, this data has not been uniformly presented. The NOVA-PRO database contains data from 100+ studies converted into uniform units with NOVA categorization of each food item. This will allow food industrialists and healthcare professionals to easily review DOxS and POP data to help reduce exposure, lowering their adverse health effects on human health.

DESIGN AND OPTIMIZATION OF A MOBILE WASTE-TO-ENERGY CONVERSION SYSTEM
Presenter(s): Jacob Willsea (Michigan State University)
Biosystems & Agricultural Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 417
Mentor(s): Wei Liao (Michigan State University), Yan Liu (Michigan State University)

More than 80% of Michigan's 47,000 farms are small to medium scale. Current waste-to-energy conversion technologies are neither technically sound nor economically viable for small-scale farm operations, so the large amount of organic waste generated from these farms represents an underutilized source of biomass for renewable energy production. This project seeks to develop a mobile waste-to-energy conversion unit that can be economically utilized by small and medium sized farms. The mobile waste conversion unit will include one small-scale high efficiency anerobic digester for biogas production from a variety of organic wastes (animal manure, food wastes, crop residues, and other organic wastes) and an external combustion engine for generation of electricity and heat from the biogas. Both units will be positioned on an 18 ft utility trailer, which can be transported to different locations to treat seasonal

wastes. The electricity generated from the system will be used for on-site applications or charging electric vehicle (EV) batteries. The treated nutrient-rich digestion effluent will be applied to crop land as a fertilizer. Upon completion of this unit, further research will be conducted to optimize the design and function of the system.

CELL BIOLOGY, GENETICS & GENOMICS

ENVIRONMENTAL IMPACT ON MLG CONTENT IN SORGHUM
Presenter(s): William Aufdemberge (Michigan State University)
Cell Biology, Genetics & Genomics
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 501
Mentor(s): Sang-Jin Kim (Michigan State University)

One of the most abundant hemicelluloses of the grass family is mixed β (1,3:1,4)-linkage glucan (MLG). Beta-glucans including MLG have been found to be advantageous for human health, being a dietary fiber, it is linked to lower risk of heart disease. MLG in grasses is an applicable biofuel feedstock as it has a homogenous composition and high water solubility, making it easily extractable. Therefore, engineering high levels of MLG in plants such as energy sorghum that have high biomass could improve the value of biofuel feedstock. To achieve this, we have generated an overexpression MLG synthase (cellulose synthase-like F6) in sorghum. From previous greenhouse and field trials, we have found that transgenic sorghum lines have a higher level of MLG compared to the control groups, and this has not had any adverse effects to growth. This growing season we have planted transgenic lines along negative controls in a new field to verify the performance of the transgenic sorghum in different soil types. From these plants we will investigate the level of gene expression, the amount of MLG accumulation, and type of MLG during sorghum development. Thus, we will have a better understanding of how growing sorghum in differing environments might affect the production of MLG and the plants overall biomass. The establishment of MLG overexpression lines can then be further engineered to further increase the level of MLG by controlling for other factors. In turn this will generate a more versatile crop for biofuel production.

GENERATING A CELL LINE THAT SECRETES HER2-TARGETING EXTRACELLULAR VESICLES
Presenter(s): Lillian Bieszke (Michigan State University)
Cell Biology, Genetics & Genomics
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 502
Mentor(s): Katherine Lauro (Michigan State University), Masako Harada (Michigan State University)

Extracellular vesicles (EVs) are lipid membrane-bound vesicles that are secreted by cells. They aid in communication between cells through the delivery of cargo such as proteins or RNA. HER2 peptides, found in normal cell growth, are normally expressed in cell membranes on epithelial cells, but they can be engineered to be secreted by EVs. The goal is to clone a HER2-scFv fragment into a donor plasmid for CRISPR-Cas9 mediated genome editing. The resulting cell line can naturally secrete HER2-targeting EVs. Polymerase chain reaction (PCR) was used to amplify the backbone plasmid and HER2-scFv insert. Seamless Ligation Cloning Extract (SLiCE), a new cloning technique that facilitates recombination using bacteria extracts, recombined the HER2-scFv insert with the backbone in order to create a plasmid containing the insert. This is the first step towards being able to generate a mammalian cell line. The backbone and insert have been successfully amplified using PCR. Next steps for this project include recombining the two fragments via SLiCE. Once the backbone and the insert are combined, they can be used to generate a cell line that can secrete HER2-targeting EVs. These cell-targeting EVs will have potential clinical use in delivering targeted therapeutics to HER2-positive breast cancer cells.

GLAMOUR: A RARE EARTH ELEMENT BINDING PROTEIN
Presenter(s): Katie Krell (Michigan State University)
Cell Biology, Genetics & Genomics

Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 503
Mentor(s): Assaf Gilad (Michigan State University)

Rare earth elements (REE's) are an essential part of many high-tech devices used in society today such as computer hard drives, radar service systems, and high power magnets. The rare earth element, Gadolinium, which is also a lanthanide, is most commonly used in MRI imaging. Gadolinium is used as a contrast agent, which is injected into patients before receiving an MRI scan in order to improve the sensitivity and specificity of diagnostic images. Most Gadolinium is excreted through urine within the first 24 hours, which in result causes release into water systems. However, Gadolinium can have adverse health effects on patients, as well as negative impacts on the environment. Lanmodulin is a highly selective lanthanide binding protein that can be used for the separation of REE's. Glamour, Green Lanmodulin Receptor, is a recombinant protein that binds to REE's while giving off a green light in the process. This can be used as a rapid onset detection method for the presence of rare earth elements, as well as be used for removal and recovery of REE's. In order to test the effectiveness of Glamour as a detection method, we will take minimal concentrations (10nM) of the Glamour protein and inject samples into a 96 well plate. Then, we will take initial UV/Vis readings of the plate in the 485-535 range. Then, we will inject 5uL lanthanide samples and rescan the plate. From there, we will analyze the data looking at the deltas of the RFU values. If our hypothesis is true, then there will be an increase in RFU in the wells with the Glamour after lanthanide injections. This increase in RFU will correlate to an increase in UV activation from the Glamour protein meaning there is binding occurring between the protein and lanthanides.

IDENTIFICATION OF MICROTUBULE-ASSOCIATED PROTEINS INVOLVED IN CHEMO-RESISTANCE IN OVARIAN CANCER CELLS
Presenter(s): Samuel Sanderson (Michigan State University)
Cell Biology, Genetics & Genomics
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 504
Mentor(s): Sachi Horibata (Michigan State University)

Ovarian cancer is the 5th most lethal cancer for women in the United States, accounting for 64.4% of the fractional death rate. Today, platinum-based chemotherapeutic drugs combined with paclitaxel are the most widely used treatments. However, ovarian cancer cells can develop a resistance to these drugs. There are several proposed resistance mechanisms but we wanted to test whether there are any unidentified resistance mechanisms causing chemoresistance in ovarian cancer. We recently identified through RNA-sequencing that microtubule polymerizing proteins are upregulated in cisplatin-resistant ovarian cancer cells. To investigate the effect of these factors, we overexpressed them in cisplatin-sensitive ovarian cancer cells. We were able to show using Cell Titer Glo cytotoxicity assays that overexpression of microtubule factors involved in microtubule polymerization promotes cell survival in ovarian cancer cells.

SEARCH FOR THE GENETIC CAUSE OF NORWICH TERRIER UPPER AIRWAY SYNDROME
Presenter(s): Emily Summers (Michigan State University)
Cell Biology, Genetics & Genomics
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 505
Mentor(s): Paige Smith (Michigan State University), Simon Petersen-Jones (Michigan State University)

Norwich terrier upper airway syndrome (NTUAS) is an inherited syndrome consisting of anatomic abnormalities that obstruct airflow through the pharynx, larynx and infraglottic opening. The condition appears unique to Norwich terriers and varies in severity. We hypothesize that there is a single, major genetic variant necessary for NTUAS. A genome sequencing-based approach was used to search for variants of interest. The whole genomes of 15 Norwich terriers, 4 controls and 11 affected, were

sequenced to a 30x depth of coverage. Sequences were aligned to the canine reference genome CanFam6. Variants unique to the affected dogs were further filtered using software to look at variant types and effects. Variants of interest were defined by presence in the coding region of genes predicted to have effects on collagen structure and formation within the upper respiratory system. Selected variants will be genotyped (PCR amplification and Sanger sequencing) to investigate segregation in an additional 93 NTUAS cases. Over 4.5 million variants from CanFam6 were identified per sample, and filtered down to 351 variants that differed between the controls and affected. Of these 351 variants, some variants of interest have been identified within the coding regions of potential candidate loci. These are being genotyped in NTUAS cases outside of the initial sample. Data mining of the whole genome sequencing data is also continuing. While identified variants of interest show promise due to their relation to the systems affected by NTUAS, more analysis is still required to identify the genetic cause.

NOVEL DETERMINANT OF CISPLATIN RESISTANCE IN OVARIAN CANCER CELLS
Presenter(s): Tam Vo Do Gia (Michigan State University)
Cell Biology, Genetics & Genomics
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 506
Mentor(s): Adriana Ponton Almodovar (Michigan State University), Sachi Horibata (Michigan State University)

Ovarian cancer is the 5th leading cause of cancer related death in women. Approximately, 70% of the ovarian patients will develop chemoresistance and there is a clinical need to understand why that happens. Recently, we identified through RNA-sequencing of cisplatin resistant ovarian cancer cells that tubulin polymerization promoting protein is highly upregulated in cisplatin resistant ovarian cancer cells compared to their sensitive counterparts. We hypothesize that this protein promotes cisplatin resistance in ovarian cancer. To test the effect of tubulin polymerizing promoting protein in chemoresistance, we overexpressed the protein in cisplatin-sensitive ovarian cancer cells. We performed soft agar colony formation assay on these cells along with non-targeting control cells and found that overexpression of our target protein promoted colony size enlargement and formation, potentially playing a role in chemoresistance in ovarian cancer cells.

DEVELOPMENT OF A STABLE CELL LINE THAT SECRETES PANCREATIC BETA CELL-TARGETING EXTRACELLULAR VESICLES
Presenter(s): Ryan Yao (University of Illinois Urbana - Champaign)
Cell Biology, Genetics & Genomics
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 507
Mentor(s): Masako Harada (Michigan State University)

Background: Extracellular vesicles (EVs) are cell-secreted communication tools currently being studied for many purposes, including the targeted delivery of therapeutics through modification of their surface molecules. One such surface molecule is the lactadherin protein. We previously found that substitution of the EGF-like domain in lactadherin with a pancreatic β-cell targeting?peptide, p88, to create p88-displaying EVs (p88-EVs) led to increased EV accumulation in β-cells compared to control EVs. However, the transient transfection method applied is not optimal for clinical applications. Methods: To address this issue, we will use CRISPR-Cas9-mediated genome editing to replace the EGF-like domain of lactadherin with the p88 peptide sequence in a human embryonic kidney cell line. This will change the genomic DNA of the cells, allowing for consistent p88-EV production indefinitely. Results: The cells were selected using an antibiotic resistance gene accompanying the p88 sequence. We observed colonies in the CRISPR-modified group but none in the control, implying that the CRISPR-Cas9 editing was successful. We will next use Cre-Lox recombination to remove the antibiotic resistance gene since it interferes with the protein product. Finally, EV characterization tests will be conducted to verify successful p88-EV production. Applications: With a continuous supply of p88-EVs, our group can more easily conduct subsequent research on their applications as therapeutic delivery vehicles that target pancreatic β-cells to potentially treat diseases like Diabetes Mellitus. Additionally, the methodology can be replicated to

generate stable cell lines that produce various EVs with different targeting domains for an array of clinical research and therapeutic applications.

MANIPULATING TRANSLATIONAL CONTROL OF UPSTREAM OPEN READING FRAMES BY CRISPR-CAS9 GENE EDITING IN ARABIDOPSIS
Presenter(s): Elber Lopez-Hernandez (The State University of New York - Oneonta)
Cell Biology, Genetics & Genomics
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 508
Mentor(s): Ella Soeun Kim (Michigan State University)

Upstream open reading frames (uORFs) are widespread in many organisms and have been known to reduce mRNA stability and repress main open reading frame (mORFs) translation. The aim of this study is to generate Arabidposis Thaliana plants with mutated uORFs to increase proteins of interest using CRISPR-Cas9 gene editing. We will focus on minimal uORFs and overlapping uORFs in genes related to plant development, stress responses, and metabolic process. By performing T7 Endonuclease 1 assay and Sanger sequencing, we have identified a mutation in a gene related to stress response in one T2 heterozygous plant. We will identify homozygous progenies of this mutant plant in the next generation and further characterize their growth phenotype. Our study will not only help to understand the role of uORFs in translational regulation in a model plant but also could be applied to improve crop performance in the future.

CHEMICAL ENGINEERING & MATERIALS SCIENCE

STABILITY ANALYSIS OF NON-AQUEOUS REDOX FLOW BATTERY ACTIVE MATERIALS
Presenter(s): Brett Cesar (Michigan State University)
Chemical Engineering & Materials Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 601
Mentor(s): Thomas Guarr (Michigan State University)

Redox flow batteries offer the benefit of being safer and more scalable than traditional lithium-ion batteries. However, most redox flow batteries make use of aqueous solvents that limit the cell voltage and employ relatively rare metals that increase the cost and environmental impact of the cell. Non-aqueous redox flow batteries have been explored to reduce these costs while increasing cell voltage and energy density. One method of achieving these goals includes the use of linked active materials in symmetric, non-aqueous redox flow batteries. The stability of several linked compounds prepared in our lab was analyzed through spectroelectrochemistry and bulk electrolysis.

DESIGN AND STUDY OF A PACKED ABSORPTION COLUMN FOR CO2 SCRUBBING
Presenter(s): Alexis Chuong (Michigan State University)
Chemical Engineering & Materials Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 602
Mentor(s): Maddalena Fanelli (Michigan State University)

Absorption is one of the most widely used industrial methods for purification of high-volume gas streams. A two-floor absorption column in MSU's Chemical Engineering Unit Operations teaching lab is regularly used to absorb carbon dioxide from an air stream with a dilute sodium hydroxide solution. To expand our processing window and study a wider range of flow rates and concentration, we designed a smaller-scale model to operate side by side with the two-floor tower for a direct performance comparison. In the process of scaling down the column, there is more to consider than simply shrinking the dimensions. Poor distribution through a packed column can cause channeling or flooding. Channeling decreases the effectiveness of the packing and the contacting between gas and liquid flows, leading to less absorption;

flooding halts the flow altogether. To address these issues in the small-scale column, the packing support, liquid outlet valve, and liquid flow distributor were carefully selected and tested. Results were compared to those of the larger-scale column. Future use of the column in lab experiments could link LabVIEW to the flow controllers and concentration sensor on the column to continuously monitor and record data. With this in mind, the LabVIEW programs of existing test stands were modified to improve functionality and used as a basis for understanding the automation process.

HYDROGEL SWELLING: AN INVESTIGATION INTO THE CONDITIONS THAT LEAD TO INSTABILITY
Presenter(s): Karolina Colon Rivera (University of Puerto Rico - Mayaguez)
Chemical Engineering & Materials Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 603
Mentor(s): Caroline Szczepanski (Michigan State University)

Hydrogels are three-dimensional cross-linked polymer networks that can imbibe (swell) up to five times their mass of a compatible solvent without dissolving. Since hydrogels have tunable properties (i.e., shape, stiffness, diffusivity, and solute transport) and an ability to respond to environmental changes, they are of interest for a wide range of emerging applications, from tissue engineering and drug delivery to regenerative medicine and wastewater treatment. Despite these advantages, a common challenge with the use of hydrogels stems from their brittle behavior and associated tendency to fail under certain mechanical conditions and loadings, causing cracks and in some cases catastrophic rupture. Here we show new methods that allow us to probe the swelling rate and diffusion of solvents in hydrogels in a more dynamic fashion, e.g., as a function of space and time. We believe that these experiments will inform strategies to tune the rate of swelling, and thus allow us to further understand the breaking and swelling dynamics of hydrogels. This will lead to the possible control or limitation of fracture and crack propagation in the material to obtain the desired properties for emerging applications.

SYNTHESIS AND ELECTROCHEMICAL ANALYSIS OF PHOTOCYCLIZED PYRIDINIUM SALTS
Presenter(s): Lucas Cooper (Alma College)
Chemical Engineering & Materials Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 604
Mentor(s): Thomas Guarr (Michigan State University)

Pyridinium salts have many uses, including playing a key role in reaching drug targets, food preservatives, and electrolytes for energy storage. Photocyclized pyridinium salts haven't been explored as thoroughly, but may keep their electrochemical properties while also having other useful qualities. Analyzing the polymerization of these compounds at high voltages may show activity previously unseen in pyridiniums. The compounds were synthesized from a pyrylium intermediate, followed by a condensation, and exposure to oxygen and ultraviolet light. The compounds were examined using mass spectrometry, and cyclic voltammetry. The expected characteristics are yet to be seen in the preliminary stages of testing.

LINKED DONOR-ACCEPTOR COMPOUNDS FOR USE IN SYMMETRIC NON-AQUEOUS REDOX FLOW BATTERIES
Presenter(s): Kendra Hagey (University of Michigan)
Chemical Engineering & Materials Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 605
Mentor(s): Thomas Guarr (Michigan State University)

As the need for renewable energy grows, inexpensive and reliable grid storage is necessary to meet the energy demand and stabilize the grid against the intermittency of renewable energy sources like wind and

solar. Non-aqueous redox flow batteries offer a higher cell voltage than aqueous flow batteries, as the latter are limited by the narrow potential window of water. However, non-aqueous redox flow batteries face other challenges such as reduced conductivity, higher electrolyte cost, and low solubility. Linking the anolyte and the catholyte together in a symmetric system eliminates the need for a costly ion selective membrane and enables the use of a simple porous membrane to facilitate ion transfer. Various donor-acceptor compounds have been synthesized and characterized using mass spectrometry and cyclic voltammetry. Preliminary tests were conducted to determine electrochemical properties, stability, and solubility.

SYNTHESIS AND STRUCTURAL ANALYSIS OF TWO-DIMENSIONAL (2D) LAYERED ORGANIC-INORGANIC HYBRID PEROVSKITE CRYSTALS
Presenter(s): Yarielis López Román (University of Puerto Rico - Arecibo)
Chemical Engineering & Materials Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 606
Mentor(s): Pushpender Yadav (Michigan State University), Seokhyoung Kim (Michigan State University)

Lead halide perovskite (LHP) is a new class of semiconductor that exhibits highly promising properties for optoelectronic technologies. One of the concerns for LHP is insufficient long-term stability of the material when incorporated into devices. A solution has been proposed that when LHP is made in the form of layered crystals, also termed as '2D organic-inorganic layered LHPs'. These layered materials exhibit enhanced stability as well as unique functional properties, such as high yield of photo- and electroluminescence, and excellent photoconductivity. Changing the organic cation plays a very important role in tuning the dimensionality and optical properties of the layered perovskite. When LHP is changed into a layered structure, the chemical formula changes from APbX3 to A2PbX4, where A, Pb, X are organic cation, lead, and halide ion, respectively. In this research, a solution-phase synthesis is used for producing 2D organic-inorganic layered LHP's followed by characterization of their crystal structures using various analytical tools. One starts with (butylammonium)2PbBr4, in short BA2PbBr4. Time, temperature, and concentration of organic cations are varied to optimize the synthesis. Changes in the crystal morphology are analyzed by optical microscopy, scanning electron microscopy (SEM), and transmission electron microscopy (TEM). X-ray diffraction (XRD) measurement is used to further confirm the crystal structures and the crystallinity of these perovskites by comparing the results with known values from the literature and simulations. The elemental compositions are confirmed by energy-dispersive X-Ray spectroscopy (EDS) and X-ray photoelectron spectroscopy (XPS). Lastly, we study absorption and photoluminescence of BA2PbBr4, which show a sharp absorption peak at 400nm and strong photoluminescence at 410 nm. The strong violet emission from the BA2PbBr4 microcrystals indicates potential to be utilized for advanced optoelectronic devices.

NOVEL LINKED FERROCENE DONOR-ACCEPTOR COMPOUNDS FOR USE IN SYMMETRIC NON-AQUEOUS REDOX FLOW BATTERIES.
Presenter(s): Taylor Opolka (Davenport University)
Chemical Engineering & Materials Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 607
Mentor(s): Thomas Guarr (Michigan State University)

Traditional aqueous redox flow batteries are common vessels used in energy storage, but they are limited by the potential window of water, therefore shifting to non-aqueous cells provides a larger potential window. Additionally, employing bifunctional molecules helps mitigate the cost and environmental impact of such cells. Novel linked ferrocene donor-acceptor compounds show great promise for use in these non-aqueous cells based on their potential for good stability, solubility, and a wide cell voltage. Two phenyl-linked ferrocene-pyrylium compounds have been synthesized and characterized via mass spectroscopy, nuclear magnetic resonance, and cyclic voltammetry, and have exhibited favorable outcomes in these areas of interest.

SYNTHESIS OF NOVEL PYRIDINIUM PORPHYRINS FOR ELECTROCHEMICAL ENERGY STORAGE

Presenter(s): Evelyn Widmaier (University of Michigan)
Chemical Engineering & Materials Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 1202 STEM Facility
Presentation Number: 608
Mentor(s): Thomas Guarr (Michigan State University)

Porphyrins have applications in nonaqueous redox flow batteries (RBFs) as bipolar redox-active materials and in solar photovoltaic cells as light absorbers and transfer agents. Use of porphyrins in RBFs has been limited by poor reversibility in the second electron redox reaction and low solubility. Pyridinium porphyrins have the potential to improve on these limitations for RBFs. Pyridinium porphyrins may also be viable for photochemical electron cascade in solar photovoltaic cells due to their increased electron-hole pair separation. Zinc-metalated and free base pyridinium porphyrins were obtained by reaction of aminophenyl porphyrin with pyrylium in a multistep synthesis. Redox potentials were characterized by cyclic voltammetry. Here, we present a synthetic pathway for pyridinium porphyrins and ongoing analysis of pyridinium porphyrin usefulness in electrochemical energy storage.

LIQUID SULFUR NUCLEATION
Presenter(s): Arthur Raber (Oakland University), Jason Corona (Oakland University)
Chemical Engineering & Materials Science
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 611
Mentor(s): Ankun Yang (Oakland University)

Liquid sulfur is a new material system discovered in lithium-sulfur (Li-S) electrochemistry. Understanding the electrodeposition of liquid sulfur will allow for consistent prediction and control of liquid sulfur for use in advanced lithium-sulfur batteries. Here we use nanoelectrodes and cyclic voltammetry (CV) to determine the nucleation behavior of liquid sulfur droplets. Nanoelectrodes with varying radii are fabricated by electrochemically etching platinum (Pt) wires that are sealed within glass capillaries. A MOSFET continuity circuit is built to monitor the radii of the exposed Pt nanoelectrodes during the sanding process. The Pt nanoelectrodes and a piece of lithium, used as the cathode and anode respectively, are connected to a potentiostat with lithium polysulfide as the catholyte, where a CV scan is performed to display the oxidation and reduction reaction peaks. As the exposed nanoelectrode radii decrease, we observe a sharp decrease of current in the oxidation peak of the cyclic voltammetry, due to the blocking of the nanoelectrode by the sulfur droplet, which informs the critical nucleus size of the sulfur droplets.

EXPOSURE TO QUATERNARY AMMONIA COMPOUNDS
Presenter(s): Rebecca Rabideau (Michigan State University)
Chemical Engineering & Materials Science
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 612
Mentor(s): Courtney Carignan (Michigan State University)

Quaternary ammonia compounds (quats) are chemicals that are widely used in household cleaning products, cosmetics, and pesticides. Their use has increased during the pandemic due to the sanitation and cleaning requirements being more stringent. Quats can be dermally absorbed, ingested through dust and breastmilk, and inhaled during application. Studies have observed decreased fertility in rodents and human exposure is associated with skin irritation, asthma, and chronic obstructive pulmonary disease. However, more investigation on the safety of these chemicals is needed, especially for pregnant and lactating women working in the healthcare or food service industry. We investigated the exposure via ingestion and inhalation for lactating women and infants. A literature review was conducted to quantify quats on surfaces, dust, breastmilk, and the air in their local environment. One study found breast milk

concentration of .33 to 7.4 ng/ml. Elevated concentration of quats was present in breastmilk when mothers used spray disinfectant versus wipes, indicating that inhalation is a more prevalent exposure pathway. Similarly, dust was used to predict the daily intake of quats in toddlers and adults. For toddlers in a home with more cleaning, ingestion rates were 615 ng/kg bw/day as compared to adults (52.7 ng/kg bw/day). Our findings indicate that lactating women and infants have higher rates of exposure to quats and will be more likely to be negatively impacted by these chemicals. Future studies should investigate frequency and routes of repeated exposure for infant and early childhood health outcomes.

GRAIN-BOUNDARY OXIDES IN TIN SELENIDE
Presenter(s): Rolland Shupp (Michigan Technological University)
Chemical Engineering & Materials Science
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 613
Mentor(s): Alexandra Zevalkink (Michigan State University), Eleonora Isotta (Michigan State University)

Tin selenide is a promising thermoelectric material as a single crystal. However, contrary to the expectations, polycrystalline samples are reported possessing a higher thermal conductivity thus a worse thermoelectric performance. This has led to the idea that removing grain boundary oxides would make it significantly better as a thermoelectric. This was published in a paper showing the results. The main focus of my research is to assist in looking at the thermal conductivity of tin oxides along grain boundaries in tin selenide and their overall affect on the thermal conductivity of the entire sample. To do this we need to purify tin precursors to remove the oxides, and compare the resulting samples to those obtained with non-purified precursors. We will then test their thermal properties and look at their surface with a scanning electron microscope. This will give us a better idea of the amount of oxides to infer their contribution to thermal conductivity. What we are looking at is an explanation for literature results, as the removal of such small amounts of oxides is expected to not have as big of an impact as was found. We are using literature methods for purifying the tin, synthesis, and result collection. These results could lead to an increase in the thermoelectric viability of this promising material.

TRACKING BIODEGRADATION AND CO2 ACCUMULATION OVER TIME OF PHVB THROUGH POTENTIOMETRIC TITRATION
Presenter(s): Olga Stathis (Michigan State University)
Chemical Engineering & Materials Science
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 614
Mentor(s): Badal Lodaya (Michigan State University), Ramani Narayan (Michigan State University)

Polymers are large molecules consisting of repeating subunits, monomers, bonded together. They range from proteins and DNA in the human body to plastics. Synthetic polymers/plastics, such as polyethylene, are used for various daily applications due to being inexpensive to produce and possessing strong chemical structures and thus durability. From their daily use and improper waste management, there is an accumulation of them in nature. Due to their strength however, they degrade at an extremely slow rate. This ultimately harms wildlife, habitats, and humans. An alternative to such non-degradable synthetic polymers are bio-based polymers, made of renewable resources and are biodegradable. PHVB (Poly(3-hydroxybutyrate-co-3-hydroxyvalerate)), is an example. Sample collection of the aerobic biodegradation (simulates biodegradation in the ocean) of PHVB over time can be used for potentiometric titration to yield CO2 accumulation. Through a series of calculations and utilization of kinetics and collision theory, percent biodegraded, remaining carbon, and rate constant can be found. The results and equations found will be graphed for over time. In theory, the results are expected to show the excellence of the degradation of PHVB and can be used to predict how long it would take for them to degrade in nature if used in products. Further studies to strengthen PHVB, as well as with other bio-based polymers, replace synthetic polymers/plastics in application can aid in lowering of waste within the environment and carbon dioxide emissions.

POLYMERIZATION OF THREE-ARM POLY (E-CAPROLACTONE) VIA REACTIVE EXTRUSION
Presenter(s): Ryan Stearns (Michigan State University)
Chemical Engineering & Materials Science
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 615
Mentor(s): Badal Lodaya (Michigan State University)

In recent years, humanity has turned an increasing amount of attention toward eco-friendlier products, specifically plastics. This comes from growing concerns of carbon emissions and general pollution, as plastic can take up to 450 years to decompose naturally. One of these eco-friendly, biodegradable plastics is Polycaprolactone (PCL), which finds most of its uses in the production of polyurethanes, such as varnishes, coatings, and adhesives. It is prepared by ring opening polymerization of ?-caprolactone using a catalyst. PCL is currently made in a batch process, which is costly to producers, as it incurs wasted time and cost with every batch made. The focus of this research is the process of synthesizing Poly (e-Caprolactone) via reactive extrusion. The reason for this is that reactive extrusion is a scalable, continuous process, and can be adapted to all process models, thus having the potential to shorten production times and quality of material for companies of all size. In addition, the constant high temperature profile of an extruder has the potential to improve the mechanical properties of PCL by increasing the molecular weight of the polymer. The extrusion will take place in a Leistritz 27mm Co-Rotating Extruder, where products will be subject to three methods of identification. A differential scanning calorimeter (DSC) will determine the temperature of glass transition and melt. A thermal gravimetric analyzer will determine the degradation temperature of the polymer. Intrinsic Viscosity experiments will help determine molecular weight. This will allow the polymer to be characterized as PCL.

POLYMER ENGINEERING OF ANTI-DRUG VACCINES FOR TREATMENT OF SUBSTANCE USE DISORDER
Presenter(s): Netsanet Waal (Calvin University)
Chemical Engineering & Materials Science
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 616
Mentor(s): Robert Ferrier (Michigan State University)

This project focuses on the development of haptenated poly(ethylene glycol) (hap-PEG) conjugates for use in anti-drug vaccines to treat substance use disorder (SUD). PEG is a common biocompatible polymer that can be modified with hapten moieties to form hap-PEGs. Haptens are compounds that are chemically similar to the target drug but produce none of the drug's effects. However, when attached to an immune active protein, an immune response to the hapten is generated in the body, thereby producing anti-bodies to the target drug. Structural variations in hap-PEG design, including hydrophobicity and conformation, will affect the way in which the antigen is processed in the body, making the structure-property relationship crucial for precise vaccine design. To mimic traditional hapten-protein conjugation strategies, an N- hydroxysuccinimide ester dimethyl aluminum initiator (NHS-Al) was synthesized and used to make polymers with an NHS end group allowing for conjugation to immune active carrier proteins. Polymerization kinetics were studied via 1H NMR spectroscopy in PEG-derivative homopolymers, poly(epichlorohydrin) (PECH), and poly(allyl glycidyl ether) (PAGE), at various molecular weights. Methyl ethyl glycidyl ether (MEGE) and an epoxidized maleimide monomer were synthesized and used to form copolymerizations with varying hydrophilicity that can easily be modified with haptens using traditional maleimide linking chemistry. Kinetic studies were done to define the copolymer system and to further our understanding of the structure of the hap-PEGs. All polymerizations were performed neat, and aluminum is a cheap, accessible material, increasing the project's sustainability. Further work on these polymerizations will lead to the pharmaceutical development of an anti-drug vaccine.

ENGINEERING OF NANOCERIA VALENCE STATE AND ITS EFFECTS ON ANTI-INFLAMMATORY EFFICACY
Presenter(s): Ian Carley (Michigan State University)
Chemical Engineering & Materials Science

Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 621
Mentor(s): Taeho Kim (Michigan State University)

Cerium oxide nanoparticles (<5 nm) with mixed-valence states (Ce3+ and Ce4+) are attractive biological redox-active agents (Xu et al. NPG Asia Materials 2014, 6, 90). Albumin-nanoceria, composed of cerium oxide coated in albumin proteins, when administered into the rheumatoid arthritis animals, exhibited strong anti-inflammatory effects (Kalashnikova et al. Theranostics 2020, 10, 11863). These nanoparticles exhibit enzymatic behavior mimicking SOD, catalase, and peroxidase, which allows them to remove O2- and OH- associated with inflammatory response and cell death (Soh et al. Angew. Chem. Int. Ed. 2017, 51, 11039). The ROS scavenging particles demonstrated reduced pro-inflammatory M1 and increased anti-inflammatory M2 macrophages (Zeng et al. Angew. Chem. Int. Ed. 2018, 57, 5808). In this study, we intend to elucidate Ce3+/Ce4+ ratios of nanoceria on alteration of phagocytes polarization. Albumin-nanoceria were synthesized via in situ bio-mineralization method with attendance of hydrogen peroxide and ammonium hydroxide. Transmission electron microscopy (TEM) revealed uniform small-sized crystalline nanoceria. The particles' surface oxygen vacancy was determined by using X-ray photoelectron spectroscopy (XPS). Using flow cytometry, we were able to quantify the anti-inflammatory effects of the particles by measuring the amount of CD80 and CD206 present on the surface of the cells, which mark pro-inflammatory M1 and anti-inflammatory M2 macrophages, respectively. We found that the phenotype change of M1 and M2 macrophages were affected by the particles' ratio of Ce3+/Ce4+. Cells treated with nanoceria with elevated Ce3+/Ce4+ exhibited enhanced anti-inflammatory efficacy.

CORROSION RESISTANCE AND BIOCOMPATIBILITY OF MGZNCA ALLOYS
Presenter(s): Emily England (Michigan State University)
Chemical Engineering & Materials Science
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 622
Mentor(s): Carl Boehlert (Michigan State University)

This project investigates biodegradable magnesium alloys containing zinc and calcium for uses in biomedical applications. Three alloys with differing concentrations of zinc and calcium will be studied for their corrosion resistance and biocompatibility. Plasma Electrolytic Oxidation (PEO) will be used to generate an oxide coating that can be characterized with scanning electron microscopy. This oxide coating should help to combat the rapid corrosion of magnesium, and this improved corrosion resistance will be tested in simulated body fluid (SBF). Bioactivity will be assessed using human osteoblast cells to generate a complete picture of the viability of MgZnCa alloys in biomedical applications.

SOYBEAN-DERIVED PHOTOPOLYMER RESINS: CHARACTERIZATION OF SURFACE AND BULK PROPERTIES
Presenter(s): Allison Huckins (Michigan State University)
Chemical Engineering & Materials Science
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 623
Mentor(s): Caroline Szczepanski (Michigan State University), Sabrina Curley (Michigan State University)

Bio-sourced and biobased polymers are of interest for the development of sustainable materials. Currently, petroleum-based polymers are employed in many materials applications. However, environmental concerns associated with their degradation or incineration, potential cross-contamination during recycling, as well as consumer toxicity risks are problematic. Bio-sourced polymers may reduce these risks and be an alternative platform to address these challenges. Soybean-derived polymers, made from acrylated soybean oil, are one example of bio-sourced alternatives to explore for emerging applications. However, due to their complexity and the long hydrocarbon tail on the repeat unit, the impact of integrating soy-bean derived polymers with other entities is not yet fully understood. In this work we show the impact of integrating soybean-derived monomers into photopolymer resins. Using Fourier-

transform Infrared Spectroscopy (FTIR) we characterized the kinetics of polymerization of the soybean derived photopolymer resins. We also investigated thermochemical behavior via dynamic mechanical analysis (DMA) and determined contact angle and surface properties using a goniometer. With these analyses we aim to better understand the properties of acrylated soybean oil polymer systems formed via photopolymerizations. Similar platforms are used in many coating applications, so identifying how we could introduce bio-sourced materials would have a major impact as polymers derived from soybean oil are more abundant, stable, and sustainable. Future and ongoing work is looking at further understanding how acrylated soybean oil can function as a polymer platform, with the overarching goal of integrating these materials into high-use applications.

COMPARISON OF THE SHELF-LIFE OF TOMATOES WITH CLAMSHELL, PLA, AND PLA/OPP PACKAGES
Presenter(s): Isabela Tatem (Roosevelt University)
Chemical Engineering & Materials Science
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 624
Mentor(s): Eva Almenar Rosaleny (Michigan State University)

There are many innovations in reference to packaging and extending the shelf-life of perishable products consumers purchase and use daily. Plastic containers are the most well-known package material but is not beneficial for the environment because plastic is not biodegradable and can harm humans, animals, and plants. The purpose of this evaluation is to test the shelf-life of three packages of tomatoes, which were tested to improve the quality and marketability. The packages observed are clamshell, polylactic acid (PLA), and polylactic acid/orange peel (PLA/OPP). The clamshell container is a one-piece plastic receptacle that comes together with a hinge in two out of four corners and is used in your average grocery store. A PLA tray with a microperforated peelable opening is available in different sizes and is used for transporting and consumer goods. The PLA/OPP is a package made from orange peels powder trays and has an outer shell that is also peelable like the PLA container. There are a total of 22 packages; this will consist of 3 groups with 9 samples containing 11 tomatoes each. The length of the experiment is 12 days with a frequency of tests on day 0, 4, 8, and 12. On days 0 the data recorded will be weight, aroma, firmness, color, titration. On days 4,8, and 12 the aroma, color, titration, TSS, package headspace, firmness, and weight loss will have data results. On all days not listed there will not be tests and all trays will be validated for use of packaging.

CIVIL & ENVIRONMENTAL ENGINEERING

DEVELOPMENT OF A NEW DISTRESS INDEX FOR PAVEMENTS MANAGED BY MDOT
Presenter(s): Zachary Ahmed (Michigan State University)
Civil & Environmental Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 701
Mentor(s): Muhammed Kutay (Michigan State University)

Unsatisfactory pavement health directly impacts the everyday life of members in a community where such roads are located. State-led Department of Transportations across the nation have allocated resources to produce a pavement network system that allows for collection of data and an oversight of pavement health. The pavement network system has resulted in decades of data that have tracked the different distress parameters of pavements. Using this, transportation agencies and researchers have attempted to create an equation with the potential to predict the health of their pavement over time as well as classify the overall rating of pavement health into one quantifiable index. Similarly, the goal of this research project is to create and help coordinate the implementation of a new, unique index that will quantify the health of pavements managed specifically by the Michigan Department of Transportation. The researchers have completed the new index and are currently exploring pavement distress characteristics

to acquire a model that will most accurately predict the health of Michigan pavements. Results from the proposed model will be validated by calculating predicted service life values and comparing results with available pavement data.

UNINTENDED CONSEQUENCES: ADAPTATIONS IN DRIVING BEHAVIOR WITH AUTOMATION
Presenter(s): Cass Conrad (Mercer University), Ryan Rodriguez (Georgia Institute of Technology)
Civil & Environmental Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 702
Mentor(s): Josh Siegel (Michigan State University), Peter Savolainen (Michigan State University), Timothy Gates (Michigan State University)

Autonomous vehicles (AVs) are a disruptive technology which will have far-reaching impacts on the nature of travel. However, these impacts will be influenced by the receptiveness of the driving public to such automation. It is essential to understand the factors which affect driver behavior in and around AVs as well as individual perception of AVs to predict adoption at the consumer level. These predictions will help guide public policy surrounding AVs in order to facilitate equitable adoption of the technology, as well as support future public opinion studies. This study uses data from the 2021 Michigan State of the State Survey (SOSS) to draw connections from individual characteristics (e.g. age, gender, political affiliation) to driver behavior and perception of AVs. This study capitalizes on the ordered nature of the responses and used ordinal regression to discern how these characteristics relate to driving behavior from several perspectives. We conclude that there are strong relationships between certain background features of an individual and their favorability towards AVs.

CLIMATE CHANGE AND EXTREME WEATHER EVENTS EFFECT ON HYDROLOGY AND DAM INFRASTRUCTURE IN THE GREAT LAKES REGION
Presenter(s): Phyllis Feldpausch (Michigan State University)
Civil & Environmental Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 703
Mentor(s): Yadu Pokhrel (Michigan State University)

Climate change and extreme weather events will have severe consequences for humans in terms of water quantity, quality and availability. Previous investigations have found that floods will occur more frequently during wet seasons, whereas droughts will occur more frequently during dry seasons, also causing water demand to increase. Rapid fluctuation between discharge and demand will erode infrastructure, increasing the frequency of dam failures. Currently, there are more than 2,287 dams in the Great Lakes region, up to 78-97% of which are classified as high hazard potential. Such dams can cause adverse consequences, including significant economic losses, environmental damage or even deaths in the event of failure or mis-operation. The purpose of this study is to understand how and why streamflow has changed, and to investigate the impact of dams on streamflow within the region. By analyzing river discharge data, we calculate long-term- mean, minimum, maximum, and deviation for rivers in the region, and use these to examine long-term spatial and temporal trends in streamflow. Lastly, we use these calculations to feed the HEC-RAS and CaMa-Flood models to predict the effects of floods throughout the region. Dam information including location, size, purpose and year constructed comes from the US Army Corps of Engineers' National Inventory of Dams. Elevation data comes from US Geological Survey Elevation Query Service. River discharge data comes from USGS Water Watch gauging station database. The results of this study should be carefully considered when examining existing infrastructure for upgrades or repairs, and designing and building new infrastructure.

IN SILICO IDENTIFICATION OF THE MICROORGANISMS RESPONSIBLE FOR THE BIODEGRADATION OF 1,4-DIOXANE AND THE CHLORINATED SOLVENTS IN DIVERSE MICROBIAL COMMUNITIES
Presenter(s): Allison Kelly (Michigan State University)
Civil & Environmental Engineering

Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 704
Mentor(s): Alison Cupples (Michigan State University)

1,4-dioxane and the chlorinated solvents are problematic contaminants found in numerous groundwater sites throughout the world. They are probable human carcinogens which necessitates removal from the environment. As traditional remediation methods, such as pump and treat, are expensive and time consuming, efforts often focus on the use of bacteria for site cleanup. This research involves exploring three microbial communities to assess the abundance and diversity of genera previously associated with their biodegradation. The communities involve those from 1) groundwater upstream and downstream of a biobarrier and sediment from different depths, 2) aerobic soils and 3) methanogenic microcosms. These communities were selected to represent a range of redox conditions and therefore a range of microbial consortia. In previous work, DNA was extracted from these communities and the current work will involve a re-analysis of those communities. Specifically, the abundance of a group of known biodegraders will be determined. The approach involves using Mothur, followed by data manipulation and statistical analysis using various R programming packages, such as phyloseq and microbiome. Preliminary analysis indicates Pseudomonas, Rhodococcus and Ralstonia are dominant genera in the groundwater and sediment samples.

ENVIRONMENTAL IMPACTS OF AUTONOMOUS VEHICLES
Presenter(s): Alexia Martinez (Universidad de Monterrey), Nash Rougvie (Cornell University)
Civil & Environmental Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 705
Mentor(s): Ali Zockaie (Michigan State University), Annick Anctil (Michigan State University), Mehrnaz Ghamami (Michigan State University)

The introduction of autonomous vehicles (AVs) is expected to affect users' travel patterns and may increase vehicle miles traveled (VMT). The increase in vehicle miles traveled is expected to reduce the vehicle lifetime and may cause higher environmental impacts than traditional vehicles. Electric AVs (EAV) have a higher carbon and energy footprint than regular electric vehicles due to increased power consumption, weight, drag, and data transmission. However, when considering the change in driving conditions from the AVs such as eco-driving, platooning, and intersection connectivity, the net results are negative. The current environmental assessments have not considered the change in travel patterns that would impact the vehicles' VMT and lifetime. For this project, there will be a focus on the first two factors affecting VMT to evaluate how AVs could affect the residence location choice and the potential increase of AV users compared to current drivers. Travel patterns will be modeled based on simulation and feedback from drivers, and a life-cycle assessment will be used to compare environmental impacts of EVs and EAVs.

WATER SUSTAINABILITY IN THE AMERICAN SOUTHWEST
Presenter(s): Katherine Miller (Michigan State University)
Civil & Environmental Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 706
Mentor(s): Ahmed Elkouk (Michigan State University), Yadu Pokhrel (Michigan State University)

There is a current growing trend of fear of water availability in the southwestern US. With the changing landscape of water availability there is emerging evidence that these changes will have detrimental impacts on the water supply, agriculture, power generation, and river-dependent ecosystems that surround the Colorado river basin. There are two main causes for these sustainability issues: (1) global climate change that is causing increased aridity in the region, and (2) water management practices and increasing water uses that directly alter hydrologic systems and impose additionalstresses on dwindling resources. There is high confidence in the projected runoff decline and associated increase in water

scarcity. However, with large uncertainties remaining regarding the extent of the projected declines we need to study the naturalized flow more closely to evaluate the long-term trends, flow variability, flow persistence, as well as naturalizing flow in other stations. These results will help to better understand the true issue that is at hand and if not then to figure out alternative approaches to achieving sustainability.

CEMENTOUS COMPOSITES DEVELOPMENT FOR 3D PRINTING CONSTRUCTION USING LUNAR AND MARTIAN REGOLITH
Presenter(s): Luke Naughton (Michigan State University)
Civil & Environmental Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 707
Mentor(s): Qingxu Jin (Michigan State University)

Ever since the NASA's apollo missions, humankind has been dreaming of colonizing the moon and even the other planets of this solar system. This task comes with several major issues, one of which being extraterrestrial construction. Using locally available resources to build habitable structures was considered as an efficient way of construction on the lunar or Martian surface. One goal of these investments is to identify and utilize the available resources on the Moon and Mars to develop an ultra-resilient and durable cementitious composite for the extreme conditions such as large temperature differentials, the presence of a vacuum, and the exposure to the radiation environment on the surface of the moon and Mars. This study develops a systematic and effective tailoring of the material by controlling the composite matrix (i.e., the component made by lunar cement materials), the fiber, and the fiber/matrix interface. Investigation will be conducted on the composite's mechanical properties such as compressive strength, tensile strength, and tensile ductility. With the successful development of this lunar-cement materials-based composite, the future research will focus on assessing the composite's 3D printability and examining the enhanced resilience and durability of the printed structure to extreme environment conditions, which in turn meets NASA's strategic interests.

LIFE CYCLE ASSESSMENT OF BATTERY RECYCLING
Presenter(s): Calvin Somers (Michigan State University), Francis Hanna (Michigan State University)
Civil & Environmental Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 708
Mentor(s): Annick Anctil (Michigan State University), Francis Hanna (Michigan State University)

Electric vehicles (EVs) will be mass produced in the next decade to reduce fossil fuel emissions in the transportation sector. This will increase batteries demand, consequently increasing the demand for critical raw materials. On one hand, battery materials are environmentally harmful to mine, which establishes the goal of reducing the production of metals from virgin sources. On the other hand, there should be an end of life management plan for future battery waste. Both problems can be addressed by recycling spent LIBs to retain their valuable components. In this paper, the environmental impact of hydrometallurgical recycling will be assessed using a life cycle assessment (LCA) approach. LCA is a methodology which entails accounting for all inputs, outputs, and externalities of a product across its lifetime-from raw materials to disposal. In this LCA, the scope spanned from the disposal of spent LIBs to the production of cathode materials, with a functional unit of 1 ton of spent batteries. From discharging to new cathode material, several physical and chemical processes are applied to spent LIBs to precipitate key elements. The substance/energy consumption and waste at each step will be documented, and a LCA model on SimaPro will be used to quantify net lifetime impacts.

EVOLUTION OF SURFACE ENERGY OF PVDF MEMBRANES IN RESPONSE TO INTERMITTENT EXPOSURE TO FOULANTS AND CLEANING AGENTS
Presenter(s): Paola Urbina Ramos (University of Puerto Rico - Mayaguez)
Civil & Environmental Engineering
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility

Presentation Number: 709
Mentor(s): Volodymyr Tarabara (Michigan State University), Xunhao Wang (Michigan State University)

This study explores changes that occur in polyvinylidene difluoride (PVDF) membranes as a result of multiple consecutive fouling/cleaning cycles. Membrane fouling refers to the accumulation of rejected on the membrane surfaces resulting in a decline in membrane performance over time. The study employs porous PVDF membranes with pore size in the ultrafiltration range (2nm - 100nm), which are commonly used for water treatment and reuse applications. Because of its efficiency in eliminating organic and biological foulants at a low cost and its market availability, sodium hypochlorite (NaOCl), an oxidant, is commonly used to clean membranes. However, in addition to removing foulants from the membrane, NaOCl can interact with the membrane, potentially causing changes in membrane characteristics and consequent performance, as well as reducing membrane longevity. Contact angle measurements were performed with four probe liquids to determine the surface energy, dG, of the membrane as it evolves in response to the membrane's intermittent exposure to a model foulant (humic acid) and a cleaning agent (hypochlorite). Surface energy of the membrane is shown to "toggle" between a lower value after each cleaning stage and a higher value after each fouling stage. The transition reflects changes in membrane hydrophilicity during fouling (when the relatively hydrophilic foulant coats the relatively hydrophobic membrane) and cleaning (when the fouling is partly removed). The amplitude of the difference between the two values of dG decreases with each consecutive fouling-cleaning cycle and appears to converge to an intermediate value. The asymptotic value corresponds to the chemically irreversible layer of foulants that is conditioned by consecutive exposures to foulants and NaOCl, and is comprised by the adsorbed foulant fraction that is hard to oxidize further.

COMPUTER SCIENCE & ENGINEERING

SYNERGISTIC INFORMATION PROCESSING IN FEEDFORWARD NEURAL NETWORKS
Presenter(s): Karina Munoz (Albion College), Shannon Barba (Albion College)
Computer Science & Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 801
Mentor(s): Demian Cho (Albion College)

In the brain, there is a network of neurons that send and receive signals composed of chemicals and electricity from surrounding neurons. The purpose of this project is to learn how the strength of signals that neurons receive affects signal processing in surrounding neurons, and how the network works as a whole.

ANOMALY DETECTION ON SMART AIRPORT EDGE PLATFORMS
Presenter(s): Jesse Blaine (Oakland University)
Computer Science & Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 803
Mentor(s): Amartya Sen (Oakland University)

The cloud computing platform, over the last decade, has become the well-established solution to host and execute a diverse array of applications. However, artificial intelligence-based application domains, such as smart healthcare and self-driving cars, have real-time decision-making requirements, from a functional and a security standpoint. Hosting services on the cloud cannot meet these requirements, as they suffer from the limitations of high latency, and at times unreliable network connectivity, to communicate with cloud-hosted services. The solution to these challenges has been proposed via the paradigm shift known as edge computing. In this work, we will research the aspect of anomaly detection on an edge platform by analyzing it through the use-case scenario of a smart airport application. Smart airports incorporate IoT devices to improve passengers' experiences by implementing fast self check-in systems, foot traffic control, and others. While they provide additional physical security measures, this also increases the

attack surfaces and allows bad actors to compromise the entire airport system. Hence, a solution lies in being able to detect any abnormal activities and take countermeasures to prevent further escalation. However, due to the resource-constrained nature of the IoT devices, one cannot incorporate traditionally-hardened security measures. Furthermore, traditional anomaly detection services are hosted in the cloud, and thus face the aforementioned challenges. Therefore, our objective is to research and propose an anomaly detection service that can be hosted on edge platforms addressing the challenges of latency without compromising the effectiveness of traditional anomaly detection solutions.

AUTOMATING MRI DATA ANALYSES
Presenter(s): Garrett Collier (Hendrix College)
Computer Science & Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 804
Mentor(s): Andrew Bender (Michigan State University)

Magnetic resonance imaging (MRI) provides valuable clinical methods for diagnosis and prognosis of neurological disease. In addition, newer MRI methods may be more sensitive to early disease, but their clinical translation is limited by the lack of computational methods for parallel, high throughput screening of candidate imaging measures. This research project seeks to develop new computational methods to facilitate the automation of MRI data analysis for large cohort neuroimaging studies, and application to different neurological disorders including Alzheimer's disease and related dementias. This automation of labor-intensive steps to set up the necessary inputs facilitates high throughput imaging analysis without requiring extensive knowledge of computational neuroimaging methods. First, we sought to expand upon existing BASH scripts through translation into Python and added library modules for increased user-side functionality. Enhancements included error checking, increased capacity to run multiple analyses, improved usability, and summarized reporting. The revised and improved code from this work will permit further extension to other data types and neurological disorders outside of Alzheimer's disease or dementia. Thus, this project has the capacity to dramatically improve screening of computational neuroimaging biomarkers. This research is the beginning for automating high throughput MRI data analyses. It allows us to not only raise the ceiling for the potential questions we can answer about disease diagnosis and prognosis, but also aids in identifying regions of the brain for subsequent analyses.

CREATING A 3D MODEL OF A NUCLEAR PHYSICS EXPERIMENT IN THREE.JS
Presenter(s): Poulomi Dey (Michigan State University)
Computer Science & Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 805
Mentor(s): Man-Yee Tsang (Michigan State University)

Nuclear physics is vital to the understanding of astronomy, but its experimental setups are often difficult to visualize for people not familiar with the field. Three.js, a JavaScript library that is used to create 3D graphics, can be used to create 3D models that help people grasp nuclear physics. These models can be used to educate the public during outreach programs and spark an interest in physics in younger kids. Three.js has benefits over other software alternatives, such as Geant4, to build simple visualizations because it is easier to program in and offers an option to view the model in VR. In this project, Three.js was used to create an animated 3D model of a nuclear physics experimental setup to help users visualize and understand it. It can be displayed on a website and can also be viewed in VR with a WebXR-compatible device and a cardboard VR headset for an immersive experience, allowing users to look around and get a first-hand view of the experiment.

DESIGN OF A DATABASE ARCHITECTURE TO INCREASE SOCIAL AWARENESS IN REAL TIME DURING GROUP MEETINGS
Presenter(s): Gabby Lovett (Michigan State University), Sean Elworth (Michigan State University)
Computer Science & Engineering
Section: 1

Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 806
Mentor(s): Andrew Mason (Michigan State University)

Every social interaction, both verbal and non-verbal, has a direct impact on its participants' health and wellbeing. This impact can be felt positively or negatively, and in either case often leaves a lasting impression. A real-time human behavior monitoring system with a feedback mechanism was proposed to reach the goal of monitoring and recognizing aspects of human behavior which could be negatively impacting the quality of social interactions. This work presents the design of a structured query language (SQL) database to use for data management and transportation for the aforementioned human behavior monitoring system. Information gathered from sensor units was transported and processed into related nonverbal communication patterns, such as talk time and dyadic coordination. That information was then utilized in a graphical user interface as real-time feedback for users within a meeting. The SQL database was implemented using mySQL software and was designed so multiple users can send and receive large volumes of data to a central server for processing and redistribution, all in real time. As online meetings are increasingly prevalent in today's technological culture, this human behavior monitoring system will increase social awareness in real time during group meetings.

DESIGN OF A GRAPHICAL USER INTERFACE TO INCREASE SOCIAL AWARENESS IN REAL TIME DURING GROUP MEETINGS
Presenter(s): Gabby Lovett (Michigan State University), Sean Elworth (Michigan State University)
Computer Science & Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 807
Mentor(s): Andrew Mason (Michigan State University)

Social interactions are the sum of human behaviors and the ways in which people communicate with one another, verbally and non-verbally. The quality of the social interactions a person experiences is known to influence both their mental and physical health. A real-time human behavior monitoring system with a feedback mechanism was proposed to reach the goal of monitoring and recognizing aspects of human behavior which could be negatively impacting the quality of social interactions. This work presents the design of a graphical user interface (GUI) which was used as a visual feedback mechanism for the aforementioned human behavior monitoring system. Information related to nonverbal communication patterns, such as talk time and dyadic coordination, was displayed within the GUI with respect to the participants of the social interaction that was monitored. The GUI was implemented using Python, HTML, and CSS programming languages. An iterative methodology, which includes redesigning aspects of the GUI based on user feedback, was used to design the GUI. The display featured accessibility options for every-day and commercial use as online meetings are increasingly prevalent in today's technological culture.

TRACKING AND MACHINE LEARNING
Presenter(s): Jayden Devaull (Michigan State University)
Computer Science & Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 808
Mentor(s): Shivam Bajaj (Michigan State University)

Tasked with exploring the capabilities of a 6-axis robotic arm. In the beginning phases of this the project slowly turned into an intricate problem-solving trial. With so little support the robotic arm's vast capabilities have to be completely traversed. This is in order to find limitations that lead to the actual research. The robotic arm was manufactured by Ninyo and is the Ned Version, this includes auto calibration, visual capabilities, armed with RGB color and shape differentiation (circle and square shaped) along with grabber tools of varying sizes and abilities such as magnetic or vacuum. How much can be turned "automatic"? Can the robot be taught to predict movements of objects in constant motion (on a conveyer belt)? Can the machine really "learn"? Many questions come into focus even in the beginning stages of

robot capability exploration. Some of which can be easily answered through research online and others which truly need expertise on the subject to be able to reach limitation. No answers are expected, the only plan is to learn.

CAGE-FREE FLOOR EGG DETECTION FROM A CEILING-MOUNTED CAMERA
Presenter(s): Emma Fountain (Michigan State University)
Computer Science & Engineering
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 811
Mentor(s): Daniel Morris (Michigan State University)

Labeling video data for animal research can be time consuming and costly. One proposed solution is to leverage the power of machine learning through the use of a Convolutional Neural Network (CNN). This paper evaluates the feasibility of detecting individual eggs in video footage of a hen enclosure taken from a ceiling mounted camera. This detection task presents a number of unique challenges. Primarily, the distance of the camera from the floor presents the challenge of small-object detection, which led to the use of image tiling during training. Along with this, the dataset presents the problem of imbalanced classification as the background class is far more prevalent than the egg class, leading to the use of downweighting the background class in the loss function. Results suggest that the proposed model is effective at detecting eggs in various simulated litter environments and provides promising results for egg detection in an active cage-free hen enclosure.

THIN FILM EQUATION GRAPHICAL MODEL AND DISTORTION VARIABLE
Presenter(s): Anne Ginzburg (Michigan State University)
Computer Science & Engineering
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 812
Mentor(s): Shalin Patil (Michigan State University), Shicheng Chen (Michigan State University)

Thin films are a crucial medium in our modern world for packaging, construction and many other uses. The fourth-order Thin Film Equation that dictates the behavior of the stepped initial profile has had many well-documented solutions proposed, with the primary difficulty occurring because of the different behaviors of the initial step. The model that this experiment meant to simulate would include the deformation variable, which if modeled correctly could lead to advances in thin film mechanics. Coding the model began with encoding the general solution of the Thin Film Equation, which involved deriving the height which in this model is given as a list of tangent values. Using this derived list of values, the next step is to implement two Fourier transformations, one of which initializes the tangent values into the stepped profile given in the code and the next damps the values, making sure the model is able to accurately predict the values. The final result is a graphical model that can imitate the step of the tin film at any arbitrarily small time interval. Once the graphical model is generated, the omega deformation variable is applied. As the deformation variable is also an integral with respect to time, applying the integral to the deformation graph is reasonable and could be considered representative of the behavior of the thin films over different time intervals.

MMWAVE SENSER DETECT LEAF WETNESS
Presenter(s): Yimeng Liu (Virginia Tech)
Computer Science & Engineering
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 813
Mentor(s): Zhichao Cao (Michigan State University)

mmWave signals operate at frequencies of 20GHz or higher. With a bandwidth of up to GHz, mmWave transmissions can enable finer-grained sensing than widely utilized Wi-Fi and RFID signals. We intend to use mmWave sensing in agriculture. We propose to specifically monitor leaf moisture, which is an

important indicator of plant health. The commercial sensor, on the other hand, has two limitations. First, the price is around $150 per unit, whereas mmWave radar is approximately $69 per unit. Second, because of the indirect measurement method and low sensitivity, the accuracy is limited. As a result, we intend to provide a mmWave radar-based leaf moisture sensor. Wireless signal processing and machine learning are among the techniques used. We will assess its performance in both controlled and real-world settings.

MACHINE LEARNING CLASSIFICATION OF ACADEMIC PUBLICATIONS
Presenter(s): Bangjing Lu (Michigan State University)
Computer Science & Engineering
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 815
Mentor(s): Vicente Amado (Michigan State University), Wolfgang Kerzendorf (Michigan State University)

Interdisciplinary scientists are faced with a unique challenge: papers relevant to their research are spread across many journals in different disciplines, thus multiplying the number of works that need to be surveyed. Nuclear Astrophysics is a major interdisciplinary research field at MSU where scientists are confronted with 40 journals from the astrophysics and nuclear physics disciplines. Only a tenth of the publications in these journals are pertinent to nuclear astrophysicists. MSU's Joint Institute for Nuclear Astrophysics - Center for the Evolution of the Elements (JINA-CEE) has addressed this issue by creating its own virtual journal for the community. However, sorting through ~500 papers per week extracts valuable time from JINA-CEE researchers. In efforts to increase the efficiency of the process, we have developed a machine learning tool that uses abstracts to automate the identification of papers relevant to the virtual journal. The tool converts the text of a publication's abstract into a numerical representation (TFIDF) and then uses a suitable machine learning algorithm (SVM) to determine if the paper belongs in the virtual journal. We trained our tool on 50,000 papers that had previously been manually sorted by JINA-CEE scientists. The tool was then tested on an independent set of 20,000 papers and achieved an accuracy of 83%. The sorting of a single paper by the tool takes significantly less time (18.5 ms) than a JINA-CEE scientist. We are working with JINA-CEE scientists to integrate our tool by the end of the summer.

PLANETESIMAL SYSTEM FORMATION
Presenter(s): Luka Ludden (University of Minnesota)
Computer Science & Engineering
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 816
Mentor(s): Jackson Barnes (Michigan State University), Seth Jacobson (Michigan State University)

In the early Solar System a swirling nebula of gas and sub-mm dust was transformed into the planets and smaller bodies observed today. During this period of transformation, growth via pairwise collisions is no longer effective when objects reach approximately cm-sized pebbles due to a number of growth barriers. Instead, growth to planetesimal sizes (>km) occurred via the gravitational collapse of pebble clouds aggregated by interactions between the solid pebbles and the gas disk, such as the streaming instability. Here, we use an astrophysical N-body integrator with a soft-sphere discrete element method, which models contact forces between N-body particles, to conduct numerical experiments to understand how properties of the collapsing pebble cloud affect the resulting accreted planetesimal system. We are experimenting with the consequences of oblate and prolate clouds, in contrast to published models that used only idealized spherical clouds (Nesvorny et al. 2011, Robinson et al. 2019). We are also varying the strength of the initial random velocity field imposed on top of the organized motion within the cloud to account for the influence of turbulent mixing in the protoplanetary disk. In each case, we are examining how these independent variables affect the efficiency of planetesimal accretion including both the final mass converted into planetesimals, the number of accreted planetesimals, and the multiplicity of planetesimal systems (binary, ternary, etc.). Specifically, we are interested in the properties of binary systems because comparison to observations of Kuiper belt binary objects are a direct means to verify our numerical models.

A COMPUTATIONAL STUDY OF THE EFFECTS OF DIFFERENT LEFT VENTRICULAR ASSIST DEVICE CONFIGURATIONS ON HEART FUNCTIONS
Presenter(s): Firekunmi Ojo (University of Maryland, Baltimore County)
Computer Science & Engineering
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 821
Mentor(s): Lei Fan (Michigan State University), Lik-Chuan Lee (Michigan State University)

Mechanical circulatory support using left ventricular assist devices (LVADs) have been increasingly used to improve left ventricular (LV) functions in patients with end-stage heart failure (HF). Although all LVADs are configured to return blood to the arterial system, they differ with respect to the site from which they draw blood from. Two different types of LVADs are commonly used in the clinics, namely, one where LVAD draws blood from the left atrium (LA) and the other where LVAD draws blood from the LV. The effects of two different LVADs on the LV function vary and remain unclear. To address this issue, we developed a lumped parameter modeling framework of the systemic and pulmonary circulations that are coupled with these two types of LVADs. The biventricular pressure-volume relationship is simulated first using time-varying elastance models and then simulated using a finite element model. After model calibration based on clinical measurements from a HF patient, we apply the model to compare the effects of two types of LVADs on the heart function in HF patients. We also estimate the optimal pump speed for best improving LV functions while preserving right ventricular functions using these two types of LVAD. The findings in this study can allow us to better understand the effects of these two types of LVADs in improving heart functions, which can be applied in the clinic to determine the best LVAD for treatment in HF patients.

FACEER: RECOGNIZING MASKED FACIAL EXPRESSION USING ULTRASOUND ON SMARTPHONES
Presenter(s): Shane Patrarungrong (Michigan State University)
Computer Science & Engineering
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 822
Mentor(s): Qiben Yan (Michigan State University)

Facial expression recognition is a promising way to obtain users' feedback on the recommended contents. Cameras and wearable sensors are used previously. However, they expose privacy concerns and bring extra device burden. In this work, we propose an active inaudible acoustic sensing system FaceER using ultrasound on smartphones. FaceER obtains facial expression features by modeling echoes of emitted ultrasound, which are generated between 3D facial contour and the earpiece speaker. It works when the user is wearing a face mask. FaceER is designed to operate in various scenarios with diverse bursting noise, various user expression features, and deficient training data in a continual learning way. It needs only normal smartphones. A set of experiments with 30 volunteers show that our system can recognize 6 common facial expressions with more than 90% accuracy, outperforming state-of-the-art approaches by 10% in various real-life scenarios. The FaceER provides a more robust and generalizable solution to understand masked users' expressions in an unobtrusive and privacy-preserving way.

COMPUTATIONAL METHODS DEVELOPMENT FOR COMPARATIVE GENOMICS AND PHYLOGENOMICS
Presenter(s): Tejas Singhal (Michigan State University)
Computer Science & Engineering
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 823
Mentor(s): Kevin Liu (Michigan State University), Rei Doko (Michigan State University)

Phylogenetics is a field of study that enriches the understanding of how genes, genomes, species (and molecular sequences more generally) evolve. Phylogenetics, gives information about how the sequences

came to be the way they are today and general principles that enable the prediction of how they will change in the future. This is not only of fundamental importance but also extremely useful for numerous applications. The research project creates new computational methodologies for efficient and accurate comparative genomic analyses - especially in the context of complex evolutionary scenarios - and then connect the resulting insights to phenotype and function. Numerous computational methods have been employed in the process including INDELible to generate phylogenetic trees and FastTree to estimate a maximum likelihood gene tree under the Jukes-Cantor model. The end goal was to generate hypotheses that result in new biological and biomedical discoveries.

RISK MANAGEMENT IN FINANCIAL INSTITUTIONS: ASSET VULNERABILITIES & COUNTERMEASURES
Presenter(s): Kiana Yin (Illinois State University), Shelnesha Taylor (Oakland University)
Computer Science & Engineering
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 824
Mentor(s): Huirong Fu (Oakland University)

Financial technology (or FinTech) is an expansive field that is seeking to improve and automate the ways we approach financial systems and technologies. This is especially true for financial institutions that want to incorporate these FinTech software and applications into their broader systems. Financial institutions' systems host a multitude of assets that need to be protected, these institutions must mitigate the threats to their assets as much as possible while also having a plan in place if their security is compromised. We identify assets in financial institutions and categorize them into the various layers of data, for example: financial, physical, operating, fixed, etc. The process of identifying, assessing, and controlling these threats to assets is called risk management. The financial institution's risk management system comprises its policies, processes, personnel, and control systems. It is imperative that all financial institutions incorporate a sound risk management system and plan in case of a security breach. A sound risk management system identifies measures, monitors, and controls risks. Since market conditions and company structures vary, no single risk management system works for all banks. The sophistication of the risk management system should be commensurate with the financial institution's size, complexity, and risk profile. In this project, we focus on identifying the already existing assets in financial systems and map the vulnerabilities and threats associated with financial institutions, their intellectual property, and their customers. Finally, we will provide the corresponding controls and countermeasures by applying cybersecurity defense principles in depth.

USING MACHINE LEARNING TO IMPROVE TEAMWORK
Presenter(s): Chang Xu (Massachusetts Institute of Technology)
Computer Science & Engineering
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 825
Mentor(s): Hanzhe Zhang (Michigan State University)

When working in a team, proper teamwork and communication can have a major impact a team's success and efficiency in reaching a goal. In this research project, we are following the progress of multiple construction and student teams. Using transcripts of their team meetings and recorded meeting minutes, we are using machine learning techniques such as topic modelling to identify common patterns in team interactions. Using this data, we will create interventions for some of these teams designed to improve their teamwork and communication. These interventions are in the form of email nudges, or group activities. We then continue to monitor the teams and use machine learning to compare team interactions from before and after the interventions, with the hope that team performance shows improvement following the intervention. If we can identify specific actions that can enhance team performance, this information will be valuable to teams everywhere.

ANALYSIS OF SAFETY AND SECURITY CONCERNS IN AUTONOMOUS VEHICLES
Presenter(s): Jessica Yang (University of Michigan)

Computer Science & Engineering
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 1202 STEM Facility
Presentation Number: 826
Mentor(s): Amartya Sen (Oakland University), Damilola Alao (Oakland University), Victorine WAKAM (Oakland University)

The domain for fully Autonomous Vehicles (AVs) is an area that is growing rapidly. Currently, AV technology incorporates the ability to sense their surroundings using hardware such as cameras, Light Detection and Ranging sensors, and Electronic Component Units to perform various required functions like accelerating and turning to navigate roads safely. These vehicles rely on interconnected networks to be able to communicate with infrastructure, nearby vehicles, and road signs. Thus, for a fully AV, the presence of a driver might be unnecessary during operation in the near future. Technological advancements may help reduce accidents and improve traffic conditions, but from a user-centric perspective it also raises concerns about safety and security. To embrace the fully AV technology and address the user-centric skepticism, users should be able to comprehend and trust the decisions made by the intelligent systems within the AVs. To address this challenge, the objectives of this project are three-fold. First, to understand the users' concerns about the safety and security of AVs through a comprehensive social media analysis. Second, to analyze the publicly available policy documents released by governing bodies to assess the focus of these policies in this sector. Third, to compare and contrast the output of the previous objectives to identify the gaps and overlaps between the current government regulations and various users' concerns and explain how these concerns are being acknowledged or need to be addressed with the use of software or hardware to harbor public trust in adopting the technology of fully AVs.

GENERALIZED TIME-REVERSIBLE MODEL PERFORMANCE A COMPARISON
Presenter(s): Aramis Matos (University of Puerto Rico)
Computer Science & Engineering
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 831
Mentor(s): Kevin Liu (Michigan State University)

Many approaches have been developed to estimate the relatedness of organisms. Relatedness is measured as the genetic distance between two species. Analysis of genetic distance is rather complicated and labor intensive. As such, computational models have been developed to automate the process and reduce human error. However, there are a variety of models to tackle this conundrum and the earlier ones make assumptions about the mutation rates of individual nucleotides. Models such as the Generalized Time-Reversible Model (GTR) allow for mutation rates to be tailored to a particular nucleotide and it was created as a response to better align with the reality that some base pairs mutate faster than others. This research aims to measure performance of GTR under varying mutation rates to demonstrate if there is a significant difference in runtime as mutation rates change. The phylogenies that will be used in the runtime analysis are randomly generated. RAxML was used to compare a variety of mutation rates and the runtime for each run was measured. We hypothesize an overall increase in runtime as the mutation rates become larger or exceedingly marginal. This is probably due to as mutation rates become larger or marginal, performance is sacrificed for the sake of accuracy. On this basis, it is recommended that future research measures how much error is tolerable if performance is a serious concern. Further research is necessary to gauge if these findings are reproducible on other datasets.

DEEP LEARNING FOR STREAMLINING STANDARDIZED CURVES OF MAGNETIC PARTICLE IMAGING (MPI)
Presenter(s): Te'Ahrian Tyler (Virginia Union University)
Computer Science & Engineering
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 832
Mentor(s): Hanaan Hayat (Michigan State University)

Current approaches to the quantification of magnetic particle imaging (MPI) for cell-based therapy are thwarted by the lack of reliable, standardized methods of segmenting the signal from background in images. This calls for the development of artificial intelligence (AI) systems for MPI analysis. We've already accomplished the first part of our journey to establish a standardized method of segmenting signal backgrounds in images. The next step us to make an algorithm that can analyze given data and result in a standard curve.The goal of this research is to find a uniform way to analyze MPI's. The specific part of the algorithm we will be involved with is the detection array for our algorithm range. The "detection array" refers to the ideal range for detection of MPI cell-based therapy. This will be done until we can find the optimal range for the detection of iron oxide in the MPI's.Our work will be added to an already built deep learning algorithm. The previous algorithm improves the resolution of MPI's and with the addition of our deep think algorithm we will be able to simply upload files to the new algorithm and it will output a standard curve. A standard curve represents the relationship between two quantities. In this research the standard curve displays the severity of cell-based therapy to a radiologist. This would streamline the process of MPI analysis resulting in a faster and more efficient evaluation of patients.

USING BLOCKCHAIN FOR EDUCATIONAL SERVICES
Presenter(s): Grant Ireland-Holt (Oakland University), Micah Brody (Bradley University)
Computer Science & Engineering
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 833
Mentor(s): Huirong Fu (Oakland University)

The purpose of this study is to look into the efficacy of using blockchain for educational services. Blockchains have the ability to share information that will be more secure and the information will be more trustworthy. There is an inherent property of blockchains which make them more transparent and they have the ability to trace data across the network. This could also bring a reduced load and cost of computers for an institution. It would also be quite easy for institutions to implement a blockchain system into current infrastructure. The design of the system would have the best security practices in mind as well as ease of use for the users so it is easier to adopt. But blockchains shouldn't be used for all information after some evaluation such as sensitive data that may be accessed easily in future time. Blockchain could be used for better accessibility to specific educational information that could be made public whether that be grades, registration or time sheets.

CANVAS-BASED WEBSITE DESIGN AND IMPLEMENTATION FOR GENCYBER LESSON PLANS
Presenter(s): Mousumi Das (Oakland University)
Computer Science & Engineering
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 834
Mentor(s): Huirong Fu (Oakland University)

People lacking adequate cybersecurity knowledge are more likely to become victims of various cyber attacks. Therefore, to educate students and teachers from various levels, the National Science Foundation (NSF) and Nation Security Agency (NSA) funded the development of a set of lessons. These lessons include cyber ethics, confidentiality, integrity, cryptography etc. which are available at https://gencyber.com and are providing guidelines to cyber security educators. However, users often find it difficult to identify lessons from this website. Therefore, the objective of this project is to create a redesigned version of the gen-cyber lessons website. The redesign would be inspired from popular learning management systems such as Canvas and Moodle. This website will allow identifying lessons based on categories and grade level using a tile based layout.

AN EXAMINATION OF IDENTITY IN A COMPUTATIONAL SCIENCE COURSE
Presenter(s): Paige Tourangeau (Michigan State University)
Computer Science & Engineering
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 835
Mentor(s): Paul Hamerski (Michigan State University)

The development of a student's identity in the classroom is often a nuanced process. The way a student views themselves may directly impact their performance not only in academics but also the further opportunities they choose to pursue. By considering how a student comes to identify with a particular field or subject we can encourage students who may not typically pursue a certain discipline to do so. To better understand the process of students assuming an identity, data was gathered from an introductory computational science class through multiple sets of pre-semester and post-semester semi-structured interviews with students. Specifically, the role of identity resources were noted in the data and which was then used to characterize each student's identity. These characterizations were then used to build an understanding of what computational science identity can look like in this setting.

EDUCATION

STUDENTS PERCEPTIONS OF CLICKERS IN AN INTRODUCTORY BIOLOGY CLASS
Presenter(s): Seanice Beard (University of Detroit Mercy)
Education
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1001
Mentor(s): Eva Nyutu (University of Detroit Mercy)

Introductory lecture courses are a standard component of undergraduate science programs and are historically taught using direct instruction. Previous studies have shown that classroom response systems (clickers) have several benefits, such as promoting active learning, which in turn is associated with improved exam scores and decreased failure rates for students in introductory courses. The purpose of this study was to evaluate students' perceptions of clickers as an instructional tool to promote active learning in an introductory General Biology lecture class. During the final class of the semester, 51 students at a private Midwestern university in the USA in an introductory biology class responded to an online clicker survey. The findings of the study suggest that students had positive perceptions of clickers in the classroom and that the clicker system did help them effectively learn material. The mean of the results lye within 3.9 to 4, suggesting that students appreciated the clicker system. With 5 being strongly agree, 4 agree, 3 neutral, 2 disagree and 1 strongly disagree. The students reported technology difficulties such as the top hat app not recording their answers and even not giving them credit for correctly answered questions. These problems are the result of an in-app glitch that could be fixed by the app creator. The results demonstrated that, when implemented effectively, clickers contribute to greater understanding of material and an opportunity for instructors to enact best practices in higher education pedagogy. This study points to the importance of effective pedagogy in making clickers worthwhile.

CREATING A WELCOMING ENVIRONMENT: WHAT WORKS FOR YOUTH IN A COMMUNITY-BASED YPAR INITIATIVE?
Presenter(s): Audriyana Jaber (Michigan State University)
Education
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1002
Mentor(s): Joanne Marciano (Michigan State University)

The Youth Voices Project is a Youth Participatory Action Research project that partners youth participating in a community-based college readiness program with college students and university

researchers as youth explore issues of equity in the subsidized housing community where they live. This presentation will examine whether and how youth participants experience the culturally relevant and sustaining practice of a welcoming and affirming environment during weekly two-hour-long after-school sessions. Implications for community-based researchers and teachers will be discussed.

CATEGORIZING OPEN-ENDED ESM RESPONSES TO SUPPORT ANALYSIS OF COURSE LEVEL SELF-EFFICACY
Presenter(s): Benjamin Maves (Michigan State University)
Education
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1004
Mentor(s): Carissa Myers (Michigan State University), Rachel Henderson (Michigan State University), Vashti Sawtelle (Michigan State University)

Generally, we're exploring how to best automate a complex data collection process of a mixed methods research design. Within this design, we utilize the Experience Sampling Method (ESM) to collect student responses from a survey on self-efficacy (SE) - an individual's belief in their capability to complete tasks. The quantitative data collection from the ESM survey informs the qualitative data collection through supporting the writing of personalized journal prompts on course-level SE. My project focuses on the quantitative data collection piece specifically looking to incorporate specific course identifications on the plots which are utilized in our data collection from the SE surveys. Students were asked if their reported task was course related, and if so, they were then asked to state the course title. Responses to this second question were used to identify and label the courses on plots of the task-level SE responses. This novel automated approach will be used and implemented in a Fall 2022 study.

UNDERSTANDING THE IMPACTS OF THE DREW SCHOLARS PROGRAM
Presenter(s): Hady Omar (Michigan State University)
Education
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1005
Mentor(s): Vashti Sawtelle (Michigan State University)

Nationally, there have been a number of programs that are designed to better support students from historically underrepresented racial and ethnic communities and economically disadvantaged students (NASE&M, 2016). Yet, the underrepresentation continues. Education researchers have turned to ask questions about which programs work, why they work, and who they best work for (Estrada, Eppig, Flores, 2019). The Charles Drew Science Scholars is one such program. The Drew program produces results and our research supports the documentation of these results. With an increased GPA, graduation rate, and academic success, the Drew program is doing something right. In this presentation, we will outline the core elements of the Drew Scholars program and describe the outcomes on student success, particularly for students from historically underrepresented communities. We will also outline the implications of this work for future work to support STEM students.

A RETROSPECTIVE: WHAT SKILLS AND EXPERIENCES DO FELLOWS IN AN EDUCATION RESEARCH COHORT PROGRAM VALUE YEARS LATER?
Presenter(s): Allie Swartz (Michigan State University)
Education
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1006
Mentor(s): Rachel Barnard (Michigan State University)

There is a lack of career preparation in doctoral education for the breadth of roles that faculty hold: teacher, mentor, scholar, colleague, and human with a life outside of work. Through their participation in the "Scholarship of Undergraduate Teaching and Learning" (SUTL) program at Michigan State University,

Fellows are mentored in both a collaborative education research project and professional development activities as a part of a cohort. Fellows were current doctoral students in a STEM, STEM education, History, Philosophy, or Sociology (HPS), or HPS education field. To explore the SUTL alumni's experiences and the career impacts of those experiences, we conducted semi-structured interviews with alumni from the first four cohorts. Emergent themes from the interviews will be presented.

ENVIRONMENTAL SCIENCE & NATURAL RESOURCES

IDENTIFICATION OF NATURAL POLLINATORS OF NATIVE WILD APPLE, MALUS CORONARIA
Presenter(s): Anna Davies (Michigan State University)
Environmental Science & Natural Resources
Section: 1
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1201
Mentor(s): Steven Vannocker (Michigan State University)

Commercial apple production typically requires the use of non-native, captive pollinators. However, this practice is becoming unsustainable due to rapidly declining commercial bee populations. Although efficient pollinators may exist in the natural environment, they have not been incorporated into apple production systems. The objective of this study is to identify insect species that may be efficient pollinators of the native Michigan apple species, Malus coronaria. To begin this process, I used herbarium records and crowdsourcing to identify potential extant individuals within the state of Michigan. Based on aerial images and site visits, I found that nearly all of the individuals recorded within the past ~50 years are now likely gone due to habitat loss, mostly associated with development. However, living individuals were identified at four of the sites. For these, insect visitation to flowers was recorded during the natural period of bloom in May 2022, through videography and direct collection. The number and diversity of pollinators will be presented. Pollen was removed for future efforts to identify co-pollinated plant species through DNA sequencing.

MOVEMENT BETWEEN TECTONIC PLATES IN THE CARRIBEAN/SOUTH AMERICA
Presenter(s): Crystal Garcia (Illinois State University)
Environmental Science & Natural Resources
Section: 1
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1202
Mentor(s): Jeffrey Freymueller (Michigan State University)

The earth is made up of different tectonic plates that are constantly moving on earth. Through the use of the Global Navigation Satellite System(GNSS) it has been possible for us to measure the rate at which those plates are moving. The GNSS receiver receives and records data measuring the movement of its antenna along the longitude and latitude of the earth, and the height at which it was originally placed. These measurements are then used to estimate the rate at which that plate is moving over long periods of time. However this data that is being collected has to be revised in order to find any external factors that could have affected the data. In the Caribbean and South American plates getting this data as accurate as possible is crucial not just to measure the motion of these plates, but this data can be used in the future to measure the strain within plate boundary zones, measure the slip rate within active faults like the San Andreas Fault, or even to better understand earthquakes and be more perceptive of them.

IMPACT OF HYDROTHERMAL VENTS ON THE MASS IODINE BALANCE IN THE OCEAN
Presenter(s): Imelda Romero (Northern Illinois University)
Environmental Science & Natural Resources
Section: 1
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1203
Mentor(s): Dalton Hardisty (Michigan State University)

Iodine speciation at the sea surface is a major contributor to the destruction of tropospheric ozone; however, controls on the source and mechanisms driving marine iodine variability remain poorly constrained. Hydrothermal vents are a poorly understood mechanism of iodine input that has been demonstrated to be an important control on the distribution of other redox-sensitive elements (e.g., Fe, Mn). In this study, we analyzed high-temperature hydrothermal vent fluid and the overlying seawater samples from the mid-ocean ridge at East Pacific Rise at 9N. Samples were analyzed using ion chromotography to extract and measure iodine concentrations with inductively coupled plasma-mass spectrometry (ICP-MS). Due to the highly reducing conditions of hydrothermal vent fluids, it is expected that iodine will primarily be in the form of reduced iodide (I-), but this will be the first study to test this hypothesis measuring both iodide and the oxidized iodate. Given a diversity of vents analyzed at 9N (e.g., black smokers, diffuse flow) Our work will quantify the role hydrothermal vents have in the global iodine cycle and sources of variability contributing to interactions with oxygen and other element cycles.

EFFECT OF THE COVID-19 PANDEMIC ON THE MINERALOGY CLASSROOM ENVIRONMENT
Presenter(s): Naomi Singleton (Northeastern Illinois University)
Environmental Science & Natural Resources
Section: 1
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1204
Mentor(s): Susannah Dorfman (Michigan State University)

The shift to online learning due to the ongoing COVID-19 pandemic affected the learning of students in lab-based courses. While students had access to videos and simulations, they lost the opportunity to work hands-on with classmates on lab experiences. For geoscience courses, particular challenges include losing access to hands-on activities for practicing 3D reasoning, opportunities to learn and practice lab skills, and access to learning in a natural environment. As part of a larger study of student experiences in a mineralogy course, we analyzed mid-semester anonymous feedback surveys collected between 2018-2021 and pre-semester well-being surveys collected 2020-2021. These surveys probed student challenges and learning goals as well as suggestions for course improvement. We carried out thematic analysis of the survey responses from students. Common words and ideas were identified and generalized to themes. In 2018 and 2019 (before COVID-19), students mostly focused on what subject they were struggling with in Mineralogy. In 2020 and 2021 (during COVID-19), students' responses shifted to a more personal aspect. Students mentioned more often personal challenges such as stress, lack of motivation, and emotional highs and lows. We will discuss the common concerns students had from 2018 to 2021 and how this research can be helpful to educators. This research shows the students' raw emotions and struggles during COVID-19. Students suggested flexibility and structure in deadlines as a potential change and the instructor was able to adjust the course. Instructors should keep asking students about their struggles with course content and personal spaces.

USING DRAWINGS TO EVALUATE CLIMATE CHANGES BEHAVIORS
Presenter(s): Marcos Soria (Michigan State University)
Environmental Science & Natural Resources
Section: 1
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1205
Mentor(s): Julie Libarkin (Michigan State University)

Climate change impacts our everyday lives in every way. People's behaviors can impact climate change, limiting climate change or helping people adapt to it. Understanding behaviors is a window to how people really feel about this subject and what they believe could make a change for the environment. In this study we investigated how people depicted climate change mitigating behavior. Participants (n=104) were asked to "Draw a picture containing up to TEN (10) actions you are likely to engage in to reduce climate impacts." Each drawing was coded by thematic analysis of specific actions that were drawn. In all, 287 separate actions were identified and sorted into overarching themes. Interrater reliability of themes was established by discussion of themes identified by one coder, refinement of themes until agreement, and co-coding of a subset of drawings into themes. This work lets us see how people might limit or adapt to climate change as well as actions that, while potentially useful, are unlikely to occur.

LEAD EXPOSURE FROM LEADED AVGAS IN MICHIGAN COMMUNITIES
Presenter(s): Matthias Tedros (The Ohio State University)
Environmental Science & Natural Resources
Section: 1
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1206
Mentor(s): Masako Morishita (Michigan State University)

Exposure to lead (Pb) is linked to adverse effects including memory impairment, lower IQ, and developmental disabilities especially in children. Additionally, the mutagenic properties of Pb can increase cancer risk. To minimize Pb exposure nationwide, major anthropogenic sources of Pb must be identified. For example, while the use of leaded fuel was banned in cars and commercial airplanes in 1995, many general aviation aircraft still utilize leaded aviation gasoline (avgas), which remains the largest Pb source in the air in the United States. Alternatives exist, but many pilots choose avgas due to its beneficial effects in general aviation aircraft engines. The high octane avgas reduces engine knock and allows for greater longevity of the high compression piston engines used in these aircraft. The main goal of this project is to assess the impact of avgas emissions on residential communities adjacent to general aviation airports in Michigan. Soil samples were collected at various distances from the center of two local general aviation airports. Samples were then analyzed for Pb using acid digestion and trace metal analysis by inductively coupled plasma mass spectrometry. Results were compared to a background environment (the Michigan State University campus) as well as previously published studies that have linked avgas emissions to elevated blood lead levels in people who live near general aviation airports.

SOLAR PANELS AND HYDROLOGY: USING MODELS TO HELP UNDERSTAND HOW SOLAR ARRAYS CHANGE THE HYDROLOGIC CYCLE
Presenter(s): Boyang Zhao (Michigan State University)
Environmental Science & Natural Resources
Section: 1
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1207
Mentor(s): Anthony Kendall (Michigan State University), Jake Stid (Michigan State University)

In our research, we are going to explore the relationship between solar arrays and local hydrology. Previous work has indicated that the solar array could enhance soil moisture, infiltration, recharge, water use efficiency of sub-panel crops, and reduce evapotranspiration. These studies have mostly relied on computer modeling of the hydrologic effects. In this work, we plan to use both models and field data collection to better understand solar panel impacts on hydrology. We will use aerial imagery to identify hydrologic zones that will form model boundaries beneath and between solar panels. Specifically, we are going to delineate morning and afternoon sun panel-edge models, a sub-panel model, an out-of array model, and an inter-panel model all of which have unique water and energy budgets. In addition, we hope to collect field data to validate these models. These hydrological models will provide model outputs that can help inform future solar placement legislation that emphasizes water security. In particular, we expect the models to show that solar panels increase the efficiency of water utilized and reduce the evaporation from the soil moisture. Understanding how solar installations impact local hydrology will help us improve our future energy landscape for farmers, and everyone using the water.

MICROARTHROPOD RESPONSES TO LITTER IN THE PRESENCE OR ABSENCE OF FUNGI
Presenter(s): Qianyu Zhu (Davidson College)
Environmental Science & Natural Resources
Section: 1
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1208
Mentor(s): Ali Zahorec (Michigan State University)

Microarthropods, tiny soil dwelling arthropods including springtails and mites, are important components of soil ecosystems, and consequently make large contributions to a variety of ecosystem function.

Microarthropods contribute to the decomposition and movement of organic material, and nutrient cycling for promoting plant growth. Springtails and oribatid mites have been interacting with litter by altering litter quality and quantity through feeding, as well as grazing on other soil microbes living on the litter. However, it is still unclear if they feed on plant litter as a preference or the by-product of decomposer microbe consumption. In this study, we aimed to see how selected microarthropods interact and survive plant litter, with or without the presence of decomposer microbes. We designed microcosms where microarthropods were given switchgrass or energy sorghum litter, either sterile or inoculated with basidiomycete fungi. We will measure the microarthropods' survival rate over five weeks, as well as litter mass change by the end of five weeks to determine their consumption and preference of litter and fungi.

PRIORITIZING UNREGULATED DRINKING WATER CONTAMINANT RISKS
Presenter(s): Stephanie Nomoto (Michigan State University)
Environmental Science & Natural Resources
Section: 1
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1209
Mentor(s): Jade Mitchell (Michigan State University)

Drinking water follows a process from source water to treatment plants and distribution systems before reaching the point of use and many aspects of this basic process are regulated to reduce human health risks from contamination. The United States Environmental Protection Agency (EPA) chooses which contaminants to regulate through three standards determined by the Safety Drinking Water Act (SDWA), which is used as a guide by the EPA to analyze and recognize said contaminants. The EPA determines whether or not such contaminants should be regulated by looking into how often the contaminant is found in public water systems, the effects it can have on human health, and how big the depletion of human health risk is by applying such regulations. Since current regulatory policies are not comprehensive, water may contain contaminants that are potentially dangerous and not regulated, meaning that monitoring strategies cannot confirm drinking water safety at all points of use. Contaminants which are not regulated, can usually be described as Contaminants of Emerging Concern (CEC), which with this lack of monitoring can lead to population consumption of CECs. In order to support drinking water utilities in the Great Lakes region, we will be researching and developing a framework to identify possible contaminants that need to be analyzed for further study and potentially treatment against them in treatment plants. The framework will be based on an evaluation of site specific risks and a comprehensive literature review.

A THREE-DIMENSIONAL APPROACH TO BETTER UNDERSTAND THE FLINT, MICHIGAN FOOD SYSTEM
Presenter(s): Chloe Rivas (University of Southern California)
Environmental Science & Natural Resources
Section: 2
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1211
Mentor(s): Chelsea Wentworth (Michigan State University)

Improving the food system in Flint, Michigan, is a priority given the history of disenfranchisement and environmental injustice. The city gained attention for the Flint Water Crisis when residents began receiving contaminated water. As a result, residents are now experiencing high blood levels. Access to healthy and affordable foods is crucial, as some have lead mitigating properties. The Flint food system is not meeting residents' physical and health needs. Therefore, the Flint Leverage Points Project (FLPP) aims to map the Flint food system and identify leverage points for positive change. One component of previous research used qualitative workshops with residents to identify 29 stores they access for food. This study will triangulate data from qualitative workshops, public transportation data, and new data from a Nutrition Environment Measures Survey in Stores (NEMS-S) survey conducted from April to June 2022. This research aims to evaluate these stores using NEMS-S, which assesses food availability, price, and quality. In 2018, researchers gathered NEMS-S data for all food retailers in Flint. However, this project will give updated data for the 29 stores identified by residents and transportation data to evaluate their accessibility. This comparison also allows us to document changes that may have happened due to the COVID-19 Pandemic. We hypothesize that the NEMS-S results will show that most disadvantaged

socioeconomic neighborhoods have lower access to healthy food. Whereas the highest NEMS-S scoring stores will have easy transportation access. This research will help inform food access and transportation planning to increase access to healthy foods.

INVESTIGATING HYENA-REPTILE INTERACTIONS
Presenter(s): Megan Krawczyk (Michigan State University)
Environmental Science & Natural Resources
Section: 2
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1213
Mentor(s): Kay Holekamp (Michigan State University), Olivia Spagnuolo (Michigan State University), Sabrina Salome (Michigan State University)

There is abundant literature about the relationships among carnivores but a prevalent gap in knowledge regarding the interactions between mammalian carnivores and reptiles. We explored the close interactions between spotted hyenas (Crocuta crocuta) and reptiles, and aimed to inform about the nature of, specifically, trophic interactions between the two. To better understand these two taxonomic groups' relationships, we examined any interactions between spotted hyenas, an abundant large carnivore in East Africa, and reptiles that reside in the same geographic area. We extracted data from field observations of hyena-reptile interactions in Kenya's Maasai Mara National Reserve from 1988 to 2021. We analyzed the data focused on predation and scavenging behavior between hyenas and reptiles. This work is important as it bridges a gap in our ecological knowledge and contributes to our understanding of the relationship between two common African taxa.

MSU ENVIRONMENTAL STUDIES (ESS) STUDENTS' RELATIONSHIPS WITH SUSTAINABILITY AND CLOTHING PURCHASING HABITS
Presenter(s): Taylor Schellmat (Michigan State University)
Environmental Science & Natural Resources
Section: 2
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1215
Mentor(s): John Kerr (Michigan State University)

This study aimed to see trends and relationships when it came to Michigan State's Environmental Studies and Sustainability student's sustainability views and clothing purchasing habits. Participants were sent a voluntary survey and first were given statements relating to sustainability, to which they chose a number on a scale of 1-5 for how much they agreed to it. The next section were statements about clothing purchasing habits, and the participants were asked to rate from 1-5 how often they participated in those habits. The results were then analyzed in Excel and were prepared to be presented.

USING PREDICTIVE SOFTWARE MODELING TO ESTIMATE FUTURE CONDITIONS OF PHOSPHORUS CONTRIBUTED TO LAKE ERIE FROM OHIO?S NORTHERN TRIBUTARIES
Presenter(s): Michelle Stevens (Beloit College)
Environmental Science & Natural Resources
Section: 2
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1216
Mentor(s): Tamanna Kabir (Michigan State University), Yadu Pokhrel (Michigan State University)

Nutrients that flow into lakes and rivers are contributed from various point, a single identifiable source, and various nonpoint sources. Residential, urban, forested areas, and agricultural grounds all promote tributaries that direct the flow of nutrients into major water bodies. Agricultural surface runoff and tile drainage acting as particularly large contributors since farmers apply fertilizers, manure, and certain landscape practices to their land. Nutrient loading intake by local water bodies ultimately accumulates to a watershed. Environmental degradation due to eutrophication exists as a major obstacle to farmers' profits and maintaining proper ecosystems (as well as their services). Since the conception of the Great Lakes Water Quality Agreement in 1972, the phosphorus nutrient pollution issue has shifted from

particulates and their point sources, to the nutrient dissolved form, orthophosphate, largely contributed by non-point sources. A readily available bio-nutrient for algae. This paper will explore ways to use predictive modeling tools, as well as other mapping sources, to forecast future nutrient pollution derived from selected farmlands in Ohio. The study is noble as this will not be displaying archived data only, rather predicted nutrient transport rate and possible changes based on historical and some simulated data. The study also aims to include key parameters that control nutrient transport rates and pollution parameter relationships. As expected however, nutrient transport, deposition rates, and concentration may later evolve, in response to changing climate, land use practices, crop types, fertilizer application rate. This study could incentivize farmers to shift their 'traditional' landscape practices to conservation outcomes that contribute less pollution into fresh water bodies, allowing ecological services and profits to continue without the currently observed negative impacts.

RESEARCH ON TRUCK AERODYNAMICS
Presenter(s): Zachary Bastian (Dillard University)
Environmental Science & Natural Resources
Section: 2
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1217
Mentor(s): Farhad Jaberi (Michigan State University)

Aerodynamic and hydrodynamic Analysis of flow around ground, air and water vehicles is important for different reasons. One reason is the overall attempt to reduce the drag and power consumption. For ground vehicles like trucks, operating most of the time at cruise speeds on flat roads, the aerodynamic loss could be the main source of power/fuel consumption and consequently the cost and emission. The flow around such vehicles is very complicated and turbulent due to relatively high velocity and complicated components like rotating wheels etc. This project is focused on the aerodynamic analysis of a model truck after identifying the significant effect that a sensible drag reduction will have on the range and overall energy/fuel consumption in the United States. The goal is to find strategies for reducing the power/fuel usage that are not marginal and could potentially have significant impact on the overall fuel/power consumption and emission. Another goal is to show to the transportation experts, policy makers and general public that it is possible to develop new designs for ground vehicles in general and truck in particular to with considerably less energy/fuel/emission which has great impact on the environment and economy. To this end, we will consider a model truck and variations to its aerodynamic configuration. We will study the flow over the model with the Fluent Computational Fluid Dynamics (CFD) software for a range of flow conditions and summarize our findings, conclusions, and suggestions for future studies in our final report.

DETECTION OF HUMAN IMPACTS IN THE GROUNDWATER MICROBIOME
Presenter(s): Elizabeth Abila (Michigan State University)
Environmental Science & Natural Resources
Section: 2
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1218
Mentor(s): Matthew Schrenk (Michigan State University)

Most of the groundwater we use for drinking, industry, and agriculture is "young" (<75 yo) and relatively susceptible to contamination. Microbes found in this groundwater likely respond to human impact, such as the introduction of contaminants, antibiotic resistance genes, metals, plastics, and pharmaceutical compounds. so many more. The genetic information found in microbial populations is an immensely rich resource of information, as they show how microbes respond and adapt to environmental conditions. In this study, we evaluated whether the genetic information (genomes) in microorganisms in Michigan groundwater contains a record of human impacts. The study employed a dataset of environmental DNA sequences obtained from agriculturally impacted and pristine groundwater near Traverse City, MI. Genes for the metabolic pathways of denitrification and dissimilatory nitrate reduction (DNRA) were identified within metagenome assembled genomes (MAGs) using the online software GhostKOALA which compares predicted proteins to the KEGG database. Using this approach, we found that the agriculturally impacted sites (Wells G7 and B2) harbored MAGs with more genes for nitrogen cycling overall, with the

process of denitrification being especially prevalent. whereas the more isolated site (Well B1) had relatively few. These differences are important as excess nitrate can contribute to the nutrient load of water resources and impact aquatic species. Denitrification in particular, can convert nitrate to nitrous oxide, a potent greenhouse gas, that contributes to global warming. Additionally, understanding how the nitrogen cycle works in groundwater microbial ecosystems can serve as a proxy for other processes related to environmental health including the proliferation of organic chemicals and antibiotic resistance genes. In the future, the effect of these contaminants will be evaluated using similar methods.

HEALTH SCIENCES

OLDER AGE AT MENARCHE IS ASSOCIATED WITH A FAVORABLE METABOLIC STATUS IN PREGNANCY
Presenter(s): Luca Jolly (Michigan State University)
Health Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1311
Mentor(s): Diana Pacyga (Michigan State University), Rita Strakovsky (Michigan State University)

Younger age at menarche (first menstrual cycle) is an important predictor of a woman's cardiometabolic status in adulthood, but the impact of age at menarche on metabolic status in pregnancy is not fully understood. To evaluate associations of age at menarche with pregnancy metabolic status, Illinois pregnant women (n=453) self-reported their pre-pregnancy weight and height, which we used to calculate pre-pregnancy body mass index (BMI). We also used a measuring tape or bioelectrical impedance analysis to measure first-trimester anthropometrics, such as waist circumference, hip circumference, weight, BMI, visceral fat level, body fat percentage, and skeletal muscle percentage. Women also provided second trimester fasting blood samples, in which we analyzed serum levels of glucose, insulin, C-peptide, leptin, cholesterol, triglycerides, free fatty acids, and adiponectin. We evaluated associations of age at menarche with pregnancy metabolic parameters using linear regression models that accounted for current age, race/ethnicity, education, employment status, household income, diet quality, fertility problems, and smoking status. Overall, later age at menarche was associated with lower pre- and early-pregnancy weight and BMI, as well as lower waist circumference, hip circumference, waist/height ratio, visceral fat level, body fat percentage, and body fat/muscle ratio, but higher skeletal muscle percentage ($P < 0.05$). Later age at menarche was also associated with lower serum levels of C-peptide, leptin, and IGF-1 ($P < 0.05$). Later age at menarche was associated with a favorable metabolic status in early and mid-pregnancy, highlighting the importance of women's reproductive history for pregnancy health.

IMPACT OF COVID ON THE ACADEMIC AND PROFESSIONAL PLANS OF PRE-HEALTH PROFESSIONAL STUDENTS: A SURVEY STUDY
Presenter(s): Taylor Hall (Michigan State University)
Health Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1312
Mentor(s): John Zubek (Michigan State University)

Previous research has measured the impact of the COVID pandemic on general student performance and wellbeing. However, what has not been studied are the many individualized experiences and potential career impact COVID has had on pre-healthcare students. This study aims to measure the extent to which this pandemic has impacted the students educational and professional path. 366 undergraduate upper level STEM students consented to this project. This survey was conducted using the Qualtrics survey platform including yes/no, likert scale, and free text questions. Free text themes were extracted, categorized and analyzed for frequency. There was a statistically significant difference between males and females on the impact that Covid had on ultimate career plans ($p=0.014$). Males indicated they were more impacted on their future career plans than females. There was also a significant difference in current status at the time of the survey on how COVID impacted ultimate career plans.

Juniors and Seniors were more likely to be impacted than sophomores (p=0.017). While 92% of students indicated that the COVID-19 pandemic impacted their personal lives, only 46% claimed that COVID-19 impacted their intended professional goals. While a largely prominent negative impact was measured from these challenges, some surprising themes emerged in the form of great adaptation and self discovery. This information may be useful for future admissions advisors and educators on how students can be better resourced to best handle these challenges while maintaining a high academic standard necessary for goal attainment.

VALIDATION OF THE EYETELEMED IOPVET INDENTATION TONOMETER FOR USE IN DOGS
Presenter(s): Lydia Kapeller (Michigan State University)
Health Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1313
Mentor(s): Andras Komaromy (Michigan State University)

To assess accuracy of intraocular pressure (IOP) readings from the eyeTelemed IOPvet indentation tonometer. 54 eyes from 28 beagle dogs were used in conducting this study - 23 ADAMTS10-mutant beagle dogs with open-angle glaucoma (ADAMTS10-OAG) and five normal controls. For each dog, IOP readings of both eyes were first measured in mmHg with the Reichert Tono-Vera® rebound tonometer; an average of three measurements were taken with the assistance of the instrument's alignment system. The data were taken and recorded by Person 1, who concealed the results from Person 2. Subsequently, proparacaine HCl 0.5% ophthalmic solution was administered for ocular surface anesthesia, and Person 2 then estimated the IOP using the eyeTelemed IOPvet device. Instead of numbers, this instrument provided the results as green (normal; ?20 mmHg according to the manufacturer), yellow (elevated; 21-30 mmHg), or red (high; >30 mmHg). Sensitivity, specificity, and positive and negative predictive values to identify IOPs below and above 30 mmHg were calculated. 265 IOP measurements were taken with both the IOPvet and Tono-Vera® tonometers, respectively. The IOPvet was safe, well-tolerated, and easy to use with dogs. The instrument had a high specificity (99%) and positive predictive value (94%). Sensitivity (13%) and negative predictive value (50%) were low. Because of its affordability, the IOPvet may allow wider availability of IOP estimates for veterinary patients. Our very low-sensitivity results demonstrate that the instrument requires species-specific calibration to identify dogs with IOP >30 mmHg. Supported by NIH grant R01-EY025752.

SEXUAL MISCONDUCT PERPETRATED BY HEALTH PROFESSIONALS EMPLOYED WITHIN UNIVERSITY SETTINGS
Presenter(s): Mariam Khalaf (University of North Florida)
Health Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1314
Mentor(s): Julie Libarkin (Michigan State University)

Sexual misconduct is a physical and psychological war for victims with long-term consequences that not only harm them but institutions and society. Authoritative figures in academia are meant to be trusted but dangerous power dynamics can erode that trust. In this study, I analyzed 128 cases of sexual misconduct perpetrated by university health professionals. This analysis involved coding media reports for (1) positions and genders of victims and perpetrators, (2) consequences for perpetrators, and (3) the type of setting in which the misconduct occurred. These media reports consist of university newspapers, lawsuits, and local news stations from 1982 till 2022, with cases still ongoing. I found that sexual misconduct occurs in multiple settings. Overwhelmingly, sexual misconduct is perpetrated by men against women. While the vast majority of victims are women, a few cases include the victimization of men. Documented sexual misconduct ranges from verbal assault to physical assault to potential grooming tactics toward women at a significant power disadvantage. While there is a power imbalance in a typical classroom setting, there is an added clinical power differential that must be considered when training the next generation of health professionals.

DETERMINING THE EFFECTS OF CIRCADIAN RHYTHM-MODULATING DRUGS IN THE PLACENTA THROUGHOUT PREGNANCY IN THE MOUSE
Presenter(s): Jessica Lee (Loyola Stritch School of Medicine)
Health Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1315
Mentor(s): Hanne Hoffmann (Michigan State University)

Preeclampsia, one of the leading causes of maternal, fetal, and neonatal morbidity and mortality, is a placental disease that complicates 4% of pregnancies in the US. We recently identified genes generating 24-hour circadian rhythms of the Period family (PER1/2/3) as deregulated in the preeclamptic placenta; however, the role of placental circadian rhythms remains unknown. Understanding the deregulation of PER1/2/3 in the placenta raises the possibility of novel treatments for preeclampsia. From gestation day (GD)10 to GD20 (birth), the mouse placenta develops a maternal-fetal interface, composed of the maternal-derived decidua, fetal-derived labyrinth, and mixed maternal-fetal junctional zone. To understand how placental circadian rhythms adapt to pregnancy and respond to drugs modulating circadian rhythms, we established an organotypic preparation of the mouse placenta, allowing pharmacological treatment of distinct maternal-fetal regions. To study circadian rhythms, we are using the validated PER2::LUC reporter in GD10, GD14, and GD18 placental explants. With the goal to restore abnormal circadian rhythms in preeclampsia, we are evaluating the capacity of PF670462, which upregulates PER1/2/3, to modulate PER2::LUC; in addition to epidermal growth-factor (EGF), a peptide deregulated in preeclampsia and a potential PER1/2/3 regulator. We hypothesize that EGF and PF670462 will increase PER2::LUC rhythms in all placental zones, in a gestational age-specific manner. This project will identify the role of PF670462 and EGF in regulating circadian rhythms in the placenta. It will establish which placental layers are sensitive to changes in circadian rhythms and be the basis for future rescue experiments in the preeclamptic placenta.

DEVELOPMENT OF AN INTERVENTION TO INCREASE KNOWLEDGE ON THE BENEFITS AND USE OF PEDIATRIC TELEHEALTH AMONG CAREGIVERS
Presenter(s): Taylor Culinski (University of MIchiga - Flint)
Health Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1316
Mentor(s): Gergana Kodjebacheva (University of Michigan-Flint)

Telehealth provides alternative access to healthcare services, including virtual appointments, phone visits, and e-mail/text reminders. To meet the demand for alternative healthcare options due to COVID-19 stay-at-home orders, social distancing guidelines, and individual preferences for in-person versus virtual settings, telehealth use has increased. Parental challenges with the use of telehealth include less comfort with virtual than in-person appointments and mistrust of confidentiality during telehealth appointments. A randomized controlled trial will assess the effectiveness of an online educational course on caregivers' knowledge of and attitudes towards telehealth use. The online course will consist of videos on parental experiences using telehealth, presentations and scientific articles on the benefits of using telehealth, and a discussion of privacy guidelines during virtual appointments. The control group will receive the intervention strategies after the end of the intervention strategies. Caregivers with at least 1 child under the age of 18 will be recruited at physician offices, farmer's markets, and universities in Genesee County, MI. Knowledge and attitudes will be assessed through surveys at the beginning and end of the intervention in the intervention and control groups. The lessons learned during the intervention can be used for future larger interventions in health care organizations.

OXYTOCIN AND MELATONIN IN TIMING OF LABOR
Presenter(s): Rachel Eck (Michigan State University)
Health Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility

Presentation Number: 1317
Mentor(s): Hanne Hoffmann (Michigan State University), Thu Duong (Michigan State University)

Pre-and-post-term labor is a health risk to both mothers and babies. As there is little known about what influences the timing of labor, there are few treatments available to reduce risks of pre- and posterm labor onset. Of those we do have, their efficacy remains low. Labor is usually induced through the administration of hormones; most commonly, a synthetic version of oxytocin, a hormone promoting uterine contractions and labor onset. Yet, 20% of inductions using oxytocin fail. One potential reason for the lack of labor induction success could be that labor induction occurs during a time of day where the uterus is less sensitive to oxytocin. In humans, natural labor peaks at night while inductions are performed during the daytime. Additionally, during the night, a second hormone modulating uterine contractions is released called melatonin. My goal is to understand the significance of time-of-day vs oxytocin ± melatonin on uterine contractions using the pregnant mouse as a model. We found two treatment types - oxytocin alone and the combination of oxytocin and melatonin - increased contraction force (area under the curve) when compared to melatonin alone regardless of time of day. Continued research may advance our understanding of how to efficiently increase uterine contractions, successfully promoting labor onset and birth. This study provides the foundation to further understanding biological mechanisms in drug efficacy as well as timing of labor onset.

PROBING THE IMPACT OF ADVERSE CHILDHOOD EXPERIENCES ON MATERNAL-INFANT DYADIC INTERACTIONS.
Presenter(s): Penelope Hurtado-Stuart (The University of Arizona)
Health Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1318
Mentor(s): Barbara Thompson (Michigan State University)

Early exposure to adverse experiences in infancy impacts neurodevelopment and social and emotional development throughout childhood and into adulthood. In this study, we recruited moms and their infant child to participate in a study examining the longitudinal effects of early life events. A population-based sample of mother-infant dyads from low-income backgrounds (n = 113) was recruited between 2016-2018 from primary care clinics in Boston, Massachusetts and Los Angeles, California. Dyads were recruited as part of a broader longitudinal study when the infants were less than 2 months old. We gathered videos of the dyad engaging in a free play session and coded these videos using the Coding Interactive Behavior (CIB) rating scheme. The CIB is a global rating scheme for coding interactions between two individuals, and includes 43 behavior codes (22 for parent behavior, 16 for infant behavior, and 5 for dyadic behavior). Data already analyzed from the LA dyads indicate relationships between demographic factors and CIB codes, and our current study examines whether those same relationships exist for the participating dyads in Boston. Additionally, analyses will combine the two sites to examine which demographic and maternal mental health factors correlate with the CIB. Monitoring free-play interactions is an easy task and can help to reveal nuanced behaviors which may not be reflected by responses to surveys and questionnaires. As such, analysis of these kinds of interactions could prove invaluable to clinical research in early childhood health, development, and resiliency to stress.

A MULTI-YEAR QUANTITATIVE ANALYSIS OF DUODENAL PAPILLA RELATIONSHIPS
Presenter(s): Andrew Michaels (University of Detroit Mercy), Kathleen Clark (University of Detroit Mercy)
Health Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1321
Mentor(s): Mary Tracy-Bee (University of Detroit Mercy)

The duodenum, the first part of the small intestine, aids the human body in digestion and the breakdown of food. The duodenum is located distal to the pyloric sphincter and stomach; and contains the major and minor papilla, through which secretions from nearby organs are deposited. Our research aimed to measure the distance from the pylorus to the major papilla and from the minor papilla to the major papilla.

These measurements can be used for future medical studies in medicine and allow for a better understanding of anatomical variations within the small intestine.

USING SIMPLEX-ALPHA (AN ONLINE WRITING TOOL) TO ASSIST STUDENTS WHEN SIMPLIFYING COMPLEX IDEAS FOR VARIOUS AUDIENCES: A PILOT PROJECT
Presenter(s): Gokul Murali (Michigan State University)
Health Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1322
Mentor(s): John Zubek (Michigan State University)

Recent studies by both physiology instructors and students of STEM place a high importance on professional skills development as well as effective communication of scientific information to a variety of audiences. Although it can be difficult for students to articulate technical jargon to ensure a clear message, Simplex is an online writing tool designed to offer assistance in the breaking down of complex knowledge. The goal of this pilot project was to evaluate 129 undergraduate science majors from Michigan State University, split them into three groups, and provide the same scientific abstract in which they had to rewrite. Group A utilized the Simplex online tool, Group B was provided minimal feedback, and Group C was given no feedback. A post-study "knowledge" assessment was given, as well as questions about the effectiveness of their peers' abstracts. Our findings suggest that Group B simplified the abstract at a 10th grade level or below more frequently than those in Group A or C. There was a statistically significant difference in the effectiveness scores between the groups as Group B outperformed Groups C and A respectively ($P>0.004$). Upon completing a knowledge assessment, our results highlighting "effectiveness" indicates that it is not known whether the tool itself or the time spent attempting to simplify writing can be of greatest benefit. Students using Simplex did not achieve as favorable outcomes as those participants receiving only minimal or no feedback, therefore further attenuation of the methods may need to be evaluated.

THE ASSOCIATIONS OF MIDLIFE URINARY PHTHALATE METABOLITE CONCENTRATIONS AND OVARIAN VOLUME MODIFIED BY BMI
Presenter(s): Jennae Whitted (Trinity Washington University)
Health Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1323
Mentor(s): Maria Kloboves (Michigan State University), Rita Strakovsky (Michigan State University)

Phthalates are endocrine disrupting chemicals with ubiquitous exposure via personal care products, cosmetics, and food packaging. Women entering menopause experience hormonal shifts due to ovarian follicle growth cessation (folliculogenesis). Adipose tissue is a hormonally active organ with implications for ovarian function, thus having obesity may impact a woman's susceptibility to phthalate exposures. Therefore, we evaluated associations of phthalates with ovarian volume (a marker of folliculogenesis) in midlife women and considered differences by change in body mass index (BMI) since age 18 (BMI18). Women from Baltimore (n=614; 45-54 years old) had a transvaginal ultrasound to measure right/left ovary dimensions to calculate ovarian volume. Phthalates were quantified from 2-4 urine samples pooled across one menstrual cycle. BMI18 was calculated as the difference between midlife BMI and BMI at age 18. Multivariable linear regression models controlled for important lifestyle and health demographic factors to evaluate associations of phthalate concentrations with average ovarian volume, with the addition of a multiplicative interaction term to consider differences by BMI18. Overall, mono(3-carboxypropyl) (MCPP) and monobenzyl (MBzP) phthalates were positively associated with ovarian volume, which differed by BMI18. For example, in all women, a 1% increase in MCPP and MBzP were associated with 0.44% ($P=0.06$) and 0.63% ($P=0.04$) increases in ovarian volume, respectively. However, in women who had overweight or obesity at both age 18 and midlife, a 1% increase in MCPP was associated with -1.27% ($P=0.07$) decreased ovarian volume. In conclusion, phthalates are associated with ovarian volume, but lifetime weight status may alter susceptibility to phthalate exposure.

ASSOCIATIONS BETWEEN MATERNAL MITOCHONDRIAL DNA COPY NUMBER AND GESTATIONAL WEIGHT GAIN
Presenter(s): Megan Nicol (Michigan State University)
Health Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1324
Mentor(s): Maria Kloboves (Michigan State University), Rita Strakovsky (Michigan State University), Zheng Zhou (Michigan State University)

Gestational weight gain (GWG) is a critical marker of pregnancy health that requires strict metabolic regulation. Numerous key metabolic processes take place in mitochondria, and mitochondrial DNA copy number (mtDNAcn) is a marker of mitochondrial function. Despite the role of mitochondria in metabolic adaptations, the relationship between mtDNAcn and GWG has not been previously investigated. To address this gap in knowledge, women with a singleton pregnancy (n=395) from the Archives for Research on Child Health (ARCH), a prospective pregnancy cohort in Michigan, provided sociodemographic information and blood spots at their first prenatal appointment. We extracted DNA from the blood spots and measured mtDNAcn using real-time quantitative PCR. We calculated GWG using women's pre-pregnancy weight and their weight at delivery. Accounting for important lifestyle and demographic characteristics, we used linear regression models to evaluate associations between ln-transformed mtDNAcn and GWG. We additionally considered if associations differed based on maternal pre-pregnancy BMI (under-/normal-/overweight (BMI<30 kg/m2) compared to obese (BMI?30 kg/m2)). In all women, we observed no meaningful associations between mtDNAcn and GWG. However, associations did differ by maternal pre-pregnancy BMI category. Specifically, women with obesity gained -0.62 (95%CI: -1.2, 0.0) fewer pounds for every 10% increase in mtDNAcn. In contrast, we did not observe any associations between mtDNAcn and GWG in women without obesity. In conclusion, mitochondrial function may be an important determinant of GWG, but only in women with obesity. Future prospective studies are needed to corroborate our findings and consider consequences of these findings for maternal and child health.

SLEEP TIME AND RISK TAKING BEHAVIOUR IN NIGHT SHIFT-WORKERS
Presenter(s): Anushree Ravi (Michigan State University)
Health Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1325
Mentor(s): Philip Cheng (Michigan State University)

Night shift-workers are integral in a multitude of industries. Many night shift-workers experience sleep loss, which may impact their risk taking behaviour. This study aimed to identify the correlation between total sleep time (TST) and shift-workers' engagement in risk-taking behavior. 53 night shift-workers participated in the experiment. Polysomnography was conducted to determine the TST of shift-workers prior to completing a task that measured risk taking behaviour. This task simulated a driving scenario in which participants must decide whether or not to proceed at a yellow traffic light. Participants were not informed of the duration of the yellow light, which varied unpredictably in duration. The task consisted of 16 trials, and participants earned points that translated to a cash incentive (25 points = 25 cents). Participants either earned or lost 25 points depending on the success of each trial. Failure was defined as running a red light. Those who proceeded at every trial were categorized as insensitive to risk. The data revealed that those insensitive to risk had a significantly lower TST value. Those insensitive to risk had a lower mean sleep time (374 minutes, SD=75) compared to those sensitive to risk (415 minutes, SD= 42), p =.01 (Cohen's d=0.67). Sleep time is associated with risk-taking behavior in night shift-workers. This study offers insight into the amplification of risk taking behaviours within night shift-workers posed by sleep loss, possibly leading to errors and injuries in the workplace. This association may also suggest that implementation of measures to increase sleep for night shift-workers could decrease risk-taking behaviours.

VALIDATION OF THE LKC RETEVAL ELECTRORETINOGRAPHY DEVICE FOR EARLY DIAGNOSIS AND STAGING OF CANINE GLAUCOMA
Presenter(s): Lydia Kapeller (Michigan State University)
Health Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1326
Mentor(s): Andras Komaromy (Michigan State University)

Glaucoma is a leading cause of irreversible vision loss in humans and dogs. The disease is characterized by an increase in intraocular pressure (IOP), resulting in progressive damage of the retina and the optic nerve. There is no cure for glaucoma, but if diagnosed early, IOP-lowering medical and surgical treatment options can delay the progression of vision loss. The company LKC recently began marketing the new, handheld electroretinography device RETeval which allows convenient testing of retinal and optic nerve function in human and animal patients. We hypothesize that this device enables early diagnosis of glaucoma in humans and dogs. We hypothesize that the RETeval will allow accurate assessment of glaucoma staging in dogs with ADAMTS10-OAG when compared to previously established disease outcome measures. Examinations will be performed on >30 purpose-bred beagle dogs using a mix of glaucoma affected and non-affected. Electroretinograms will be recorded from both eye of each dogs with the RETeval. The recordings with the handheld RETeval do not require general anesthesia and pupil dilation like other similar methods. RETeval recordings will be compared to previously established outcome measures of glaucoma that had be recorded under general anesthesia: full-field electroretinograms and high-resolution imaging of the retina and optic nerve by optical coherence tomography (OCT). We expect that the RETeval allows convenient and reliable detection of retinal function loss due to glaucoma. These findings could be directly implemented in canine glaucoma diagnostics, both in research and clinical setting.

INTERCELLULAR COMMUNICATION VIA GAP JUNCTIONS INFLUENCES CELL SURVIVAL DURING HYPOXIA
Presenter(s): Lauren Harmon (Grand Valley State University)
Health Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1327
Mentor(s): David Geenen (Grand Valley State University)

Stem cell therapy can be used to treat hypoxia post myocardial infarction (MI). This treatment has become increasingly common, however it has inexplicable deficits. When bone marrow derived mesenchymal stem cells (BM-MSCs) are injected into the heart, we see a large percentage of cells undergoing apoptosis. This results in a decrease of the long-term benefits offered from stem cell therapy. We hypothesize that the loss of these BM-MSCs is regulated by gap junctions (GJs). While these channels are vital for coupling between cells, we predict that they are communicating apoptotic signals from nearby hypoxic cardiomyocytes. Our research aims to attenuate these GJs by temporarily "knocking down" Connexin-43 which is a protein that greatly contributes to the formation of GJs. Doing so is predicted to increase retention of BM-MSCs during stem cell therapy. We have utilized fluorescent dyes to model communication between BM-MSCs through gap junctions. The preliminary data reveals some cells that have effectively coupled to transfer dye while other cells that have not. Furthering this data will allow us to reveal a time course for the gap junction communication and understand the dynamics of this transfer. Our later experiments will include transfecting siRNA that will interfere with the Connexin-43 that makes up gap junctions. Doing so will allow us to transiently downregulate Connexin-43 and measure the change in the amount of fluorescent dye transferred through its gap junctions.

SKIN TONE AS A BARRIER TO PRENATAL CARE UTILIZATION AMONG BLACK WOMEN
Presenter(s): Camryne Adams (Bennett College)
Health Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online

Presentation Number: 1331
Mentor(s): Dawn Misra (Michigan State University)

Racism has long been recognized as harming the health of Black women, the impact of colorism has been understudied especially for dark skin toned women. While there has been progress to end racial discrimination, rates of maternal and infant morbidity and mortality for African Americans remain higher than for whites. Studies have repeatedly found that late and/or inadequate prenatal care is associated with higher rates of maternal and infant morbidity and mortality. Research on the barriers faced by Black women in utilizing this care has been limited and generally focused on their sociodemographic factors or behaviors. This study examines skin tone as it relates to prenatal care. Specifically investigating whether pregnant Black women of darker skin tones are more likely to report not being able to initiate prenatal care as early as they wanted than those of lighter skin tones. Data was collected from the BIBB questionnaire and analyzed in SPSS. Participants are African American women receiving prenatal care in Detroit, MI or Columbus, OH. Descriptive analyses will be used to compare initiation of prenatal care by skin tone and discrimination by skin tone. Logistic regression will be used to assess the association between skin tone and prenatal care and skin tone and discrimination. Results will expand understanding of barriers leading to delayed or no prenatal care beyond sociodemographic factors and mother's behavior. The study will also inform healthcare professionals on how their differential treatment of women of darker skin tones, whether or not conscious, can sway prenatal care utilization.

THE RELATIONSHIP BETWEEN TREATMENT FOR HUMAN PAPILLOMAVIRUS IN CONNECTION TO PRETERM BIRTH
Presenter(s): Leslie Reyes (Roosevelt University)
Health Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1332
Mentor(s): Danielle Gartner (Michigan State University)

According to the previous study, the prevalence of preterm birth among Black Women is alarmingly high, at approximately 15%, and these births take a toll on these women's emotional and physical health. An explanation for these births can be connected to a mother’s treatment for Human papillomavirus, which Black Women are 1.5 times more likely to test positive for. Using data from the Life Influences on Fetal Environments (LIFE) study, a retrospective cohort study of Detroit-based Black Women carried out from 2009 through 2011, my project will study the relationship between treatment for Human papillomavirus, including surgically invasive cervical procedures, and preterm birth. To date, studies on this subject identify HPV’s pathophysiological effects on preterm birth and do not consider that another factor lie with treatment for the condition itself. Treatments include colposcopy, LEEP, and surgical removal of parts of the cervix. Using multivariable regression analysis we look to determine if there is an association between surgical treatment of HPV and preterm birth. We anticipate that the impact of cervical surgical treatment for HPV will associate with an increase in preterm birth. This relationship is important to study because there may be unintended birth-related consequences of the commonly used HPV treatments. Previous studies link preterm birth and HPV, but not the invasive procedures specifically.

Presenter(s): Alexandria Morgan (Tougaloo College)
Health Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1333
Mentor(s): Gustavo de los Campos (Michigan State University)

The NOVA classification system groups all foods according to the nature, extent and purposes of the industrial processes they undergo. We are primarily interested on testing the association between the consumption of ultra-processed foods (UPFs) and health biomarkers. UPFs are made chiefly from substances extracted from foods, such as fats, starches, added sugars, and hydrogenated fats. This food category is highly prevalent in the Western diet which has been associated with many chronic conditions, including obesity and metabolic syndrome. We will use data from the UK Biobank (~500,000 participants)

to test for the association between the consumption of UPFs and health biomarkers, including Body Mass Index, the blood levels of cholesterol, triglycerides, and glucose, and serum creatinine, and blood glucose. Predictors will include the consumption of each of the NOVA categories and potential confounders such as sex, age, and ethnicity. We hypothesize that a high consumption of UPFs will be independently associated with obesity and comorbidities that are characteristic of metabolic syndrome.

THE IMPACT OF COVID-19 ON A MICHIGAN COHORT OF MOTHERS WITH INFANTS FROM 0.5 TO 12 MONTHS OF AGE
Presenter(s): Nikita Nel (Michigan State University)
Health Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1334
Mentor(s): Sarah Comstock (Michigan State University)

As research emerges about the long-term impacts of the COVID-19 pandemic, it's important that researchers understand the prevalence and effects of COVID-19 on mothers and their infants. This analysis aims to report rates of COVID-19 diagnosis, symptoms, and effects among a Michigan cohort of mothers with infants between the ages of 0.5 to 12 months old. This was a longitudinal cohort study where mothers (n=29) were asked to report background information relating to the COVID-19 pandemic. To assemble results, participants with responses at multiple timepoints were each compiled into singular participant profiles. Participants reported whether they were previously diagnosed or had symptoms of COVID-19, as well as reporting common behaviors and activities in which they had participated. In the cohort, 28% (n=8) women had previously been told by a healthcare provider that they may have COVID-19 while 66% (n=19) had experienced symptoms of COVID-19. Women who were told they may have COVID-19 were most likely to report the symptom of a runny nose (88%), while women without COVID-19 were most likely to report a headache (67%). For most women in the cohort, the greatest source of stress from the COVID-19 pandemic was the impact on family members (66%) and the most common method of coping with stress was talking with friends and family (86%). Information on the physical and mental effects of COVID-19 on mothers provides physicians additional context as they care for their patients. Patients without close friends or family may need additional support from health care professionals.

IS THE PRESENCE OF A DOULA A MITIGATOR FOR THE IMPACT OF IMPLICIT BIAS ON MATERNAL MORBIDITY AND MORTALITY FOR AFRICAN AMERICAN WOMEN
Presenter(s): Olivia LaHote (Denison University)
Health Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1335
Mentor(s): Jean Kerver (Michigan State University)

Rates of maternal morbidity and mortality for African American (AA) women in the United States are over three times than those of White women. This racial disparity is largely due to implicit bias and systemic racism in health care systems Currently, we are focused on the question of “Does the presence of a doula help mitigate the impact of implicit bias on maternal morbidity and mortality for AA women?”. As the presence of a doula has been known to improve health outcomes for AA women throughout pregnancy and delivery, we hypothesize that doulas will help mitigate the impact of implicit bias on maternal morbidity and mortality for AA women in health care systems. Participants, including health care providers and African American mothers, were part of the Environmental Influences on Child Health Outcomes, ECHO, cohort ‘Michigan Archive for Research in Child Health’ recruited in Detroit, Michigan. Transcripts from interviews with four doulas from the Detroit ECHO cohort will be qualitatively analyzed using MAXQDA software. The goal of this study is to find strategies for AA women to implement, and empower AA women, to mitigate the impact of implicit bias in health care settings to reduce the risk of maternal morbidity and mortality for AA women. Using the experiences of AA women and their health care providers we aim to contribute to the larger conversion promoting equitable, respectful health care for AA women.

THE ROLE THAT PETS PLAY ON THE WELLBEING OF MINORITIES IN THE WORKPLACE
Presenter(s): Yahyla Perez (Florida A&M University)
Health Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1337
Mentor(s): Angela Hall (Michigan State University), Kirk Munoz (Michigan State University)

With the ever-growing issues of stress on well-being, especially during the COVID-19 pandemic, where individuals are pushed towards a work from home lifestyle and social confinement, it becomes increasingly important to study factors that are beneficial in pressing past poor mental health and overall stressful lifestyles. To combat the strain stress poses on humans, researchers have studied the human-animal interaction bond (HAIB) and how this connection promotes health and wellbeing. Previous studies that investigated this relationship describe the positive benefits of the HAIB, especially in the workplace, where labor can become strenuous. However, these studies looked at a broad demographic which left a gap in understanding whether minority status attenuates the positive outcomes associated with pet-worker interactions. It is essential to identify how the interactions with animals benefit humans as they play a vital role in our everyday lives, from health to development. With the lack of research focused on HAIB in minority populations, we hypothesize that there will be a reduced amount of stress-buffering outcomes associated with employee-pet interactions by minority individuals than that of non minority individuals. Through detailed survey measures using Amazon's Mechanical Turk, we expect our research to exemplify the self-buffering effects of pets on minority workers. With this survey, we can obtain measures that evaluate well-being, job stress, pet attachment, job satisfaction, feelings on pets at work, and demographics. The data obtained will be analyzed using ANOVA. With this research, our team will create a stepping stone in HAIB research with an interest in minority demographics.

THE COVID-19 PANDEMIC AND MORAL DISTRESS IN NURSING
Presenter(s): Oyinloluwa Akande (Dillard University)
Health Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1341
Mentor(s): Linda Keilman (Michigan State University)

The COVID-19 pandemic magnified foundational issues within the United States (US) healthcare system. Issues the current US health system was woefully unprepared to handle. Nurses, in particular, bore the brunt of the pandemic's impact, providing round-the-clock care to patients, without the necessary equipment to protect themselves. As a result reports of symptoms of Moral Distress (MD) increased. The term moral distress is defined as distress caused by the inability to take ethically correct action. MD comes in both internal and external forms and profoundly affects an individual's core values. It is possible for these feelings to manifest themselves as physical, emotional, psychological, or spiritual distress symptoms. This project seeks to understand the relationship between the current pandemic and MD in nursing, using the Moral Distress Thermometer, a 0-10 scale. This study utilizes a mixed-method approach to the research.15 nursing professionals across CA, LA, TX, MI, and MD were virtually interviewed and asked to complete the MDT. We hypothesize that increased proximity to Covid-19 patients will report higher levels of MD. A qualitative study was conducted with statistical analysis to isolate language commonly used during the interviews. The results of this study could be used for advocacy in the healthcare system such as adopting preventative strategies to assist nurses mentally and emotionally. Furthermore, this study could cause healthcare reform and policy changes, including the creation of PPE stockpiles, emergency ventilator stores, and earmarked funds for undersupplied hospitals.

VARIATIONS AMONG UNDERGRADUATE AND GRADUATE STUDENTS FOR DENTAL CLEANINGS: A CALL FOR ACTION
Presenter(s): Jenan Shareef (Michigan State University)
Health Sciences

Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1342
Mentor(s): Sarah Shareef (Michigan State University)

The National College Health Assessment (NCHA) enables institutions to gather data significant to identify areas to support student health. Interestingly, the NCHA includes information on undergraduate and graduate students who reported dental cleanings in the last 12 months. Since dental cleanings support the health and wellness of individuals beyond their teeth this project was conducted to assess the differences between undergraduate and graduate students who received dental cleanings in the past 12 months. Data available from the American College Health Assessment-National College Health Assessment graduate and undergraduate Reference Group Executive Summary from Fall 2019-Fall 2022 was analyzed. The question examined was: "have you had a dental cleaning in the last 12 months?" listed as question 57. Percent that answered "yes" that they had a dental cleaning in the last 12 months was noted and student status. A t-test was conducted to assess statistical significance between undergraduates and graduate/professional students. A total of 125,797 undergraduates students and 31,839 graduate/professional students responded Fall 2019-Fall 2021 to question 57. Interestingly, undergraduates had a higher percentage of respondents that had a teeth cleaning in the past 12 months when compared to graduate students from Fall 2019-Fall 2021. When assessed for statistical significance with a student's t-test, this variation was statistically significant ($p<0.01$). This identified a delineation between undergraduates and graduate students in access to regular dental care. Further research is necessary to identify barriers to dental cleanings among undergraduate and graduate students is important to support student health.

THE RELATIONSHIP BETWEEN SKIN TONE OF THE FATHER OF THE BABY AND HIS EXPERIENCES OF DISCRIMINATION
Presenter(s): Nylani Powell (Temple University)
Health Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1343
Mentor(s): Dawn Misra (Michigan State University)

Health disparities can have negative consequences, for African-American maternal health, due to racism that may persist throughout their prenatal and perinatal care. Research has linked racial discrimination experienced by Black women with an increased risk of adverse birth outcomes. The father of the baby (FOB) may also experience racial discrimination that may then also impact those birth outcomes. Beyond race, the color of one's skin can be a prime determinant in how an individual is treated. The Fathers Matter study is collecting data on multiple ways in which fathers' experiences and characteristics may affect birth outcomes in Black families. I hypothesize that fathers with a darker skin tone will face more lifetime discrimination, especially within the health system. Data collected in the pre-COVID wave of the Fathers Matter study (2018-2020) will be used to test the hypothesis. Skin tone is a categorical variable ranging from very dark to very light. Discrimination is measured as ever experiencing unfair treatment due to race/ethnicity/color in nine domains, including medical care. We will conduct descriptive analyses of the predictor and outcome variables and then test the hypothesis using a t-test, chi square test, and finally regression analyses accounting for confounding. Further research is needed to explore the causes of preterm birth risks and the role that fathers may play. In the future, we hope to explore how discrimination, if any, that the father faces based on his skin tone results in preterm birth risks for the Black mother.

PHEROMONES OR FOOD: DEVELOPING A RODENT DECISION-MAKING TASK
Presenter(s): Dorothy Zhao (Michigan State University)
Health Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1344
Mentor(s): Alexander Johnson (Michigan State University), Lauren Raycraft (Michigan State University)

Brain regions often coordinate multiple diverse-and sometimes competing-behaviors. For example, the lateral hypothalamus (LH) is a brain region known to regulate both food intake and locomotor activity. Melanin concentrating hormone (MCH) is a neuropeptide produced in the LH that promotes food intake. In addition, MCH also interacts with gonadal hormones, which vary across the estrous cycle in females. Work in our laboratory has previously shown that excitation of MCH cells in the LH increases or decreases motivation for palatable food depending on estrous cycle stage. This pilot study will examine whether fluctuating gonadal hormones influence preferences for competing reinforcers (e.g., palatable frosting or the scent of a male rat) across the estrous cycle stage in female rats by using a conditioned place preference paradigm. Estrous cycles were tracked every day, and initially rats were allowed to freely explore the place preference conditioning chamber, in which each stimulus (high fat diet and male bedding) was separately paired with a specific contextual environment (light and dark chamber). On test days, the frequency and time each rat spent in the contextual environment of either stimulus was observed. These results were subsequently compared with the data of their correlated estrous cycle stage. These findings will be the first set of tests run in order to determine whether LH MCH neurons influence preference for feeding and/or competing reinforcers across the estrous cycle stage.

ADENOSINE RECEPTOR ANTAGONIST, ISTRADEFYLLINE, REDUCES CHEMOTHERAPY SIDE EFFECTS IN MICE SUCH AS CISPLATIN-INDUCED KIDNEY TOXICITY AND PAINFUL NEUROPATHY
Presenter(s): Hari Ramakrishnan (Michigan State University)
Health Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1345
Mentor(s): Geoffroy Laumet (Michigan State University), Jaewon Sim (Michigan State University)

Cisplatin is an incredibly powerful chemotherapy drug used to treat a variety of cancers. However, its side-effects such as kidney toxicity and painful neuropathy may result in dose reduction or termination of treatment increasing patient mortality. Physicians must closely monitor patient's kidney function during chemotherapy, due to high risk of kidney failure, and the patient's sensitivity, due to severe pain from peripheral neuropathy. Therefore, there is an urgent medical need for novel therapeutics that limit cisplatin's side-effects. Adenosine receptors are involved in several kidney diseases and neuropathic pain pathophysiology. We hypothesize that blocking adenosine receptors (AR) using Istradefylline, an FDA-approved AR antagonist, will alleviate kidney toxicity and pain from cisplatin. To test this, we treated mice with cisplatin (3 mg/kg for 5 days) and found that they developed pain hypersensitivity, measured through the von Frey method, and kidney toxicity, measured by high gene-expression of kidney injury marker (KIM-1). Since pain and kidney toxicity are often associated with inflammation, we also collected tissue samples from the spinal cord, peripheral nervous ganglion, and kidney to measure the gene-expression of inflammatory cytokines through quantitative PCR. Mice treated with cisplatin had higher levels of expression of these inflammatory mediators in all tissues compared to mice treated with saline (control). We found administration of Istradefylline reduces both the pain hypersensitivity and kidney toxicity induced by cisplatin as well as the associated inflammation. Since Istradefylline is already approved by the FDA for the treatment of Parkinson's disease, it can be quickly clinically applied to cancer therapy.

INTEGRATIVE & ORGANISMAL BIOLOGY

CHARACTERIZATION OF A METALLOTHIONEIN GENE MTNF IN DROSOPHILA MELANOGASTER
Presenter(s): Loren Campbell (Michigan State University)
Integrative & Organismal Biology
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1401
Mentor(s): Henry Chung (Michigan State University), Zinan Wang (Michigan State University)

Heavy metals such as zinc are essential to the development and reproduction of insects, while high concentrations of zinc can be harmful. One family of proteins, the metallothioneins, play important roles in detoxifying other heavy metals such as copper and cadmium. However, it is unclear whether insects also use metallothioneins to regulate the concentration of zinc. A recent bioinformatics study by our lab reported a new metallothionein gene, MtnF, which is present in many insect taxa including the model insect Drosophila melanogaster, and is hypothesized to be a zinc-specific metallothionein. In our current study, we will characterize the function of MtnF in D. melanogaster. Using transgenic strains of D. melanogaster along with the GAL4-UAS system to overexpress MtnF in the digestive system, we will investigate the ability of MtnF in the detoxification of high levels of zinc in artificial diets. In addition, we will use a GFP-reporter assay to identify the expression patterns of MtnF in different life stages of D. melanogaster. Determining the biochemical function of MtnF and the expression patterns of this gene will allow insights into how insects can regulate heavy metal concentration in development and reproduction.

GAP JUNCTION INTERCELLULAR COMMUNICATION EFFECTED BY ENVIRONMENTAL PESTICIDES
Presenter(s): Shania Davis (Michigan State University)
Integrative & Organismal Biology
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1402
Mentor(s): Brad Upham (Michigan State University)

Cells and their intracellular structures (gap junctions) are essential in cell communication. With current research using in vitro models, it is known that certain environmental contaminants that are used in everyday life, such as pesticides, are able to essentially close these gap junctions, potentially shutting off cell communication, hence affecting nearby tissue. One pesticide that was studied in particular is very well known used for banana cropping in the West Indies, often referred to as chlordecone or kepone. To test this pesticide, the very well recognized scrapload-dye transfer assay to determine the time & dosage required for chlordecone to inhibit intercellular communication. Both the dose and time response used WB liver cells to determine how this pesticide could affect the liver itself. Lucifer yellow was also used to be able to see with the naked eye the communication between these gap junctions and how the communication was affected depending on the time and the dose. My results show how detrimental chlordecone is and how detrimental it can be in the future as well. Research was supported by the Research Education Program to Increase Diversity in Health Researchers (REPID*) who is funded by the National Institutes of Health-National Lung, Heart, and Blood Institute (NIH-NHLBI).

EFFECTS OF LIVESTOCK GRAZING INTENSITY ON CARNIVORE TRENDS IN KENYA
Presenter(s): Rebecca Fisher (Michigan State University)
Integrative & Organismal Biology
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1403
Mentor(s): Olivia Spagnuolo (Michigan State University)

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 determined species-specific distance from the park boundary across varying degree of livestock intensity. This study is important for the conservation of large carnivores by contributing to the understanding of anthropogenic effects on behavior in three 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.

CHARACTERIZATION OF A FEMALE SPECIFIC REDUCTASE IN CUTICULAR HYDROCARBON SYNTHESIS IN D. MELANOGASTER
Presenter(s): Taylor Hori (Michigan State University)
Integrative & Organismal Biology
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1404
Mentor(s): Henry Chung (Michigan State University), Zinan Wang (Michigan State University)

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.

DIRT TRACK RACING ROLLOVERS: WHY ARE MIDGETS AND NON-WINGED SPRINT CARS MORE PRONE TO ROLLOVERS?
Presenter(s): Aidan Davis (Michigan State University), Paul Alex (Lincoln Memorial University), Sara Xhaja (Michigan State University)
Kinesiology & Nutrition
Section: 1
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1501
Mentor(s): David Ferguson (Michigan State University)

Automobile racing is an expensive sport but a cost-effective form of motor racing is "Dirt Track Racing", where drivers compete on a dirt surface instead of asphalt or concrete. In addition to the cost-effective surface and car, there is less money spent on safety regulations. Consequently, it is a particularly dangerous form of motor racing. In order to improve safety in the sport commonalities in crashes must be established. To fill this gap in the literature a retrospective analysis of dirt track crashes was performed by searching for news articles regarding dirt track racing accidents. All crashes were included in a database and coded for type of crash, injuries sustained, and race car construction. A database consisting of 38 accidents was created. An ANOVA then compared the types of crashes and it was determined that the "midget" and "non-winged" sprint cars resulted in more severe injuries to the drivers when a crash occurred ($P<0.05$). The low levels of aerodynamic downforce, relatively higher centers of gravity in midget and non-winged cars when compared to other types of race cars, increased oversteer in turns and rollovers. When a car rolls over, the roll cage protects the driver from crush injuries; yet the Center for Advanced Product Evaluation from Westfield, Indiana concluded that sprint car roll cages are not able to withstand forces endured during racing accidents. Therefore, stronger roll cages should be implemented in midget and non-winged sprint cars.

KINESIOLOGY & NUTRITION

EXAMINING THE ASSOCIATION BETWEEN PHYSICAL ACTIVITY GUIDELINES AND MENTAL HEALTH DISORDER DIAGNOSES.
Presenter(s): Kaitlyn StBernard (Eastern Michigan University)
Kinesiology & Nutrition
Section: 1
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1503
Mentor(s): Catherine Gammon (Eastern Michigan University)

Research indicates that mental health disorders are relatively common among college students. Studies also report that engaging in regular physical activity (PA) can prevent the development of mental health disorders. As such, there is value in exploring the association between PA and mental health disorders among college students. This study examined the relationship between compliance with national aerobic and strength training PA guidelines and mental health disorder diagnoses. In 2019, 757 college students completed the American College Health Association's National College Health Assessment. Participants reported their weekly engagement in aerobic PA and strength training and were classified as: meeting (or not meeting) aerobic PA guidelines (>150 minutes of moderate-intensity PA or >75 minutes of vigorous-intensity PA per week) and meeting (or not meeting) strength training guidelines (strength training >2 days per week). Participants also reported whether they had ever been diagnosed with an anxiety and depressive disorder. Chi-square tests were used to examine the association between PA guideline compliance and mental health disorder diagnoses (alpha=.05). Compared to students who did not meet the aerobic PA guidelines, a lower proportion of students who met the aerobic PA guidelines reported a previous depressive disorder diagnosis ($p<.05$). No such association was observed between anxiety disorder diagnoses and meeting aerobic PA guidelines. There was a trend ($p<0.1$) for compliance with strength training guidelines to be associated with fewer depressive and anxiety disorder diagnoses. The findings encourage further examination of the relationship between different types of exercise and mental health disorders, particularly depressive disorders.

PHYSICAL ACTIVITY DISCREPANCIES OF UNIVERSITY STUDENTS ACROSS DEMOGRAPHICS
Presenter(s): Laura Borchers (Eastern Michigan University)
Kinesiology & Nutrition
Section: 1
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 1504
Mentor(s): Catherine Gammon (Eastern Michigan University)

Compliance with national physical activity (PA) guidelines improves physical health and quality of life. Yet research indicates that less than 50% of college students meet PA guidelines. It is important to improve our understanding of PA engagement among college students; limited research has examined PA engagement across diverse college student groups. The purpose of this study was to examine whether compliance with the aerobic and strength training PA guidelines differs by demographic characteristics among college students. During the Fall of 2019, 757 college students took part in the American College Health Association's National College Health Assessment. The sample was 71.4% female with an average age of 24.8 years. Frequencies and percentages were used to examine aerobic activity and strength training guideline compliance across different categories of demographic variables. Participants responded to questions about PA engagement and demographic variables (grade level, gender, enrollment status, race). Participants were classified as meeting or not meeting aerobic PA guidelines (?150 minutes of moderate-intensity PA or ?75 minutes of vigorous-intensity PA per week) and strength training guidelines (strength-training ?2 days per week). Multiracial students were most likely to meet the aerobic guidelines (64.3%) while Asian participants were most likely to meet strength guidelines (54.5%). A greater proportion of males (50.5%) than females (41.8%) met the strength training guidelines. The findings suggest that gender identity and most minority statuses were influential in meeting PA guidelines. The findings of this study indicate that females and some ethnic minorities should be targeted in future PA interventions on campus.

MECHANICAL ENGINEERING

MULTI-AGENT DECISION MAKING VIA DATA-DRIVEN METHODS
Presenter(s): Ishwari Kapale (Michigan State University), Sandeep Banik (Michigan State University)
Mechanical Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1601
Mentor(s): Sandeep Banik (Michigan State University)

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. Open-loop trajectories lack the impact of reactions from other agents especially when the agents are human driven. We aim to bridge the gap to account for possible deviations from manually established trajectories of the adversary and the corresponding control signals required for the autonomous vehicles in a pre-defined, familiar environment.

DEVELOPMENT OF AN NMR SPECTROMETER FOR USE WITHIN A CLASSROOM SETTING
Presenter(s): Tim Kramer (Michigan State University)
Mechanical Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1602
Mentor(s): Shannon Nicley (Michigan State University)

Nuclear magnetic resonance (NMR) spectrometers are used to identify the physical, chemical, and biological attributes of a sample by observing the spin-spin relaxation time or T2. The T2 time is the period in which it takes the nuclei spins to return to equilibrium with an externally applied magnetic field after being polarized along an orthogonal axis. NMR spectrometers can be prohibitively expensive for undergraduate laboratory courses due to the significant costs associated with the typically strong magnetic fields and consequentially the high-speed electronics to read out the signals. Alternatively, if high resolution is not required, then a lower magnetic field can be employed, which then allows for lower frequency polarization and readout, such that the sample can be excited with a radio frequency pulse sequence. This configuration allows for commonly used electrical components, along with PVC pipes, and an Arduino microcontroller to be used to design a low-budget Earth's field NMR spectrometer [1]. The purpose of this project is to prototype and test a working spectrometer that is straightforward to build and operate; for use in an undergraduate-level quantum laboratory course. This includes updating and streamlining the procedures for downloading and installing software that controls the device as well as designing the accompanying PCB boards to simplify the implementation of the electronic circuits. Overall, the project enables the usage of NMR spectroscopy as a learning aid for undergraduate students, overcoming the prohibitive cost of typical spectrometers by sacrificing resolution.

DESIGN OF EXPERIMENT TO INVESTIGATE CO2 LASER BONDING OF POLYSTYRENE TO POLYSTYRENE
Presenter(s): Qasem Alobaydan (Michigan State University)
Mechanical Engineering
Section: 1

Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1603
Mentor(s): Brian Johnson (Michigan State University), Jacob Reynolds (Michigan State University)

The bonding of thermoplastics is of interest to various industries, including the expanding world of microfluidic devices. Rapid prototyping, using digital manufacturing tools including 3D printing, laser cutting, and CNC machining, has greatly increased the capacity to create customized fit-for-purpose parts and speed up iterative device development. Developing techniques to bond multiple components together could significantly increase the utility of rapidly prototyped parts. Here, we are experimenting with adapting a standard laser cutter to bond polystyrene sheets to machined 3D polystyrene parts for cell culture use. Currently, we solvent bond polystyrene (PS) sheet to the bottom of machined microtiter plates containing different microfluidic devices using acetonitrile and heat. This bonding procedure is neither precise, repeatable, nor suited for all devices. Bonding variations cause bonding problems, including device leakage and etching, which can compromise optical quality and make imaging difficult or impossible. We addressed these problems by investigating CO2 laser welding for PS-PS bonding. Plastic laser welding can provide flexible seam modeling, low heat input, mechanical stress, and consistent weld quality. Laser power, speed, and laser intensity (PPI) were chosen as input parameters. They will be utilized to develop a design of experiment (DOE) to analyze the effect of each parameter on bonding and their interactions. The DOE will be created in Minitab, and experiments will be conducted using a 60W 10.6um CO2 laser. Hopefully, this DOE will illuminate the relationships between the selected parameters and lead to the selection of optimal parameters of PS-PS bonding of microfluidic plate-based devices.

COMPARISON OF LEFT VENTRICULAR REGIONAL CONTRACTILITY ESTIMATED FROM 3D ECHOCARDIOGRAPHIC AND MAGNETIC RESONANCE IMAGES USING AN INVERSE FINITE ELEMENT MODELING FRAMEWORK
Presenter(s): Chenghan Cai (Michigan State University)
Mechanical Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1604
Mentor(s): Lik-Chuan Lee (Michigan State University)

Three-dimensional (3D) echocardiographic (ECHO) and magnetic resonance imaging (MRI) are two noninvasive techniques frequently used to evaluate of heart functions. Although both imaging techniques are commonly used in the clinics, MRI is widely regarded as the gold standard that can accurately capture fine anatomical details of the heart while 3D ECHO images are easier to acquire. It has been reported that left ventricular (LV) geometry, volume and ejection fraction measured using these two imaging techniques can be different. Correspondingly, contractile function of the heart quantified using these two imaging techniques may be different. On the other hand, it is impossible to measure contractility directly from cardiac images. In this study, we develop an inverse finite element modeling framework based on animal-specific LV geometries and volumes from 3D ECHO and MRI images acquired from normal swine models to investigate difference in regional contractility estimated using these 2 imaging techniques. The findings in this study can provide a better understanding of the differences in contractility estimated using two imaging techniques, which can be used to develop a correlation of clinical indices between 3D ECHO and MRI.

ASSESSMENT TOOLS FOR PERCEIVED SOUND QUALITY ENHANCEMENTS
Presenter(s): Elaysa Deaver (Oakland University), Emily Carr (Oakland University)
Mechanical Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1605
Mentor(s): Ryan Monroe (Oakland University)

As automotive manufacturers move towards electrifying their vehicle fleets, vehicle sounds are fundamentally changing. These trends are driving a need for new design objectives for interior vehicle acoustics to create a sound experience (and brand image) which continues to meet, or more preferably,

exceeds customer demand. Therefore, the field of psychoacoustics, which is the study of human perception to sound, is finding broad application here. Our perception of a sound depends nonlinearly on a sound signal's amplitude, frequency, and phase characteristics. In fact, the perceived quality of a sound signal is primarily influenced by three psychoacoustic indicators, which include loudness, sharpness and roughness. The perceived loudness reflects the strength or weakness of a sound, and is based on the sound pressure level across each 1/3 octave band. The perceived sharpness is based upon a sound's loudness, with additional weighting of its higher frequency components. Sound roughness quantifies the human ear's perception of signal fluctuations or modulation, which results from narrow frequency spacing between tones including their relative amplitudes and phases. The primary goal of this project is to develop an acoustics tool in MATLAB using the audio toolbox to enable psychoacoustic processing and optimization during the design phase of development. This tool will specifically enable a vehicle engineer to process sound pressure data from simulation or experimentation across the entire engine operating envelope to broadly characterize the loudness, sharpness, and roughness of a given vehicle design.

EVALUATING THE ACCESSIBILITY NEEDS FOR AUTONOMOUS VEHICLE PICK UP/DROP OFF ZONES
Presenter(s): Micah D'Arcangelo (Valparaiso University)
Mechanical Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1606
Mentor(s): Justin Scott (Michigan State University), Michele Grimm (Michigan State University), Tamara Bush (Michigan State University)

Autonomous vehicle (AV) technology has substantial potential to enhance human mobility. To ensure equitable distribution of these benefits, we need to anticipate AVs' introduction with infrastructure design that accounts for the needs of all populations. Currently, persons with disabilities (PWD), and those assisting them, encounter unique obstacles when using all forms of transportation. If implemented correctly, AVs have potential to decrease these discrepancies in travel difficulties. This study assumes a model in which a centralized fleet of AVs engage in stop to stop rather than door to door service, requiring pick up drop off (PUDO) zones analogous to bus stops. We aim to understand the current areas associated with transportation regions such as buses and paratransit and the challenges associated with these regions from the user perspective as well as that from the transit driver. To accomplish this, we are conducting a literature review of accessibility, reviewing standards associated with this area and conducting a small set of interviews with PWDs of all types. We are also interviewing local stakeholders in AVs and representatives from public and paratransit companies that serve the region. The interviews will be analyzed qualitatively to decipher which difficulties are most pressing. Employing the fundamentals of needs based and empathetic design, we will then propose design ideas for an AV PUDO zone that solves or mitigates as many issues with current transportation systems as possible.

BIOINSPIRED GLOVE WITH FORCE FEEDBACK AND ASSISTED MOVEMENT FOR USE IN STROKE REHABILITATION
Presenter(s): Matthew Russell (Michigan State University)
Mechanical Engineering
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1607
Mentor(s): Xiaobo Tan (Michigan State University)

Assisted movement has been documented to help in stroke rehabilitation where hand movements must be relearned. To see if novel movements can be learned in the same way, a similar process of assisted and restrictive actuation will be used. This will be tested with a cable-driven glove that provides assisted and restrictive actuation to the index, middle, ring, and pinky fingers. Materials for this are important for mechanical reasons - they must be strong but must still allow freedom of movement. The glove has embedded pulleys, this to mimic the pulley mechanisms in the human hand. The lines are made with a Kevlar cord, since it has good abrasion-resistant qualities as well as high strength while remaining thin. Linear actuators are used to mimic forearm musculature. It is the hope that with this more about how

humans learn motions can be discovered. We have also implemented a force feedback system to greater understand the forces that are being applied to the hand. This information could be of use to people working in rehabilitation as it would let us understate at a greater depth how muscle memory is learned and gained.

NON-LINEAR VIBRATION ABSORBER FOR OCEAN WAVE ENERGY CONVERSION
Presenter(s): Van Duong (Michigan State University)
Mechanical Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1611
Mentor(s): Wei-Che Tai (Michigan State University)

Ocean waves contain tremendous amount of energy. It is estimated that the annual energy potential of waves off the coasts of the United States is as much as 2.64 trillion kilowatt-hours, or around 64% of the energy the U.S. generated in 2021. Therefore, there have been multiple attempts to conceptualize, build and test different designs of wave energy converters (WECs) to convert some of this wave energy into useful electricity. Existing designs of such converter are quite costly to build, install and maintain. The most promising way to reduce this cost is to integrate wave energy converters with existing floating platforms, such as deep-water oil rigs. However, traditional linear wave energy converters, whilst efficient when operating in wave condition close to their resonance frequency due to the large frequency response, would compromise the stability of the floating platform due to the same reason. The purpose of this research is to build and experimentally test a new non-linear wave energy converter that promised both good vibrational isolation for the floating platform and energy conversion efficiency. In particular, the damping coefficients of pendulum bearings and generator were calculated using optical encoder data and MATLAB fitting. The vibration mitigation ability of the design was also tested by exciting the model across a range of different frequencies to simulate various wave conditions.

HARVESTING ENERGY FROM ENGINE VIBRATIONS
Presenter(s): Daniel Lantz (LeTourneau Univerisity), Joshua Kobus (Oakland university)
Mechanical Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1612
Mentor(s): Chris Cooley (Oakland University)

Despite extensive balancing and dampening systems, all engines vibrate because of the combustion process, motion of reciprocating components, and imbalance in rotating components. Accelerometers mounted on an inline, 3-cylinder engine revealed vibration amplitudes of up to 0.5 g at some frequencies. This project approaches engine vibration as an opportunity rather than an obstacle. We present a system of electrically connected piezoelectric beams to harvest energy from engine vibrations. Using piezoelectric bending transducers as small generators, this system creates a voltage when it is vibrated at a consistent frequency. These beams are mounted onto a part of the engine that experiences high vibration amplitudes, and the power generated by the system can be used to power sensors or other small electronic components. A great focus of the project is the limited frequency range of the piezoelectric beams. Because they only generate significant voltages within a narrow frequency range near their natural frequency, they must be "tuned" to specific frequencies that correlate to engine operating points. This is done by adding precisely measured masses to the free end of the beams, which changes the natural frequency of the beam. Upon completion of this project, future developers will understand the limitations and capabilities of piezoelectric bending transducers as engine vibration energy harvesters, and our system will provide a benchmark to compare alternative technologies for this application. Our research will also inform piezoelectric energy harvesting engineers about broadband energy harvesting using multiple beam devices.

SIMPLIFICATION AND FABRICATION OF A CUSTOMIZABLE LIGHTWEIGHT WHEELCHAIR BASE
Presenter(s): Jeffrey Li (Michigan State University)
Mechanical Engineering

Section: 2
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1613
Mentor(s): Justin Scott (Michigan State University), Tamara Bush (Michigan State University)

Wheelchair users are seated for extended periods of time. This prolonged sitting posture can cause pressure injuries in wheelchair users' soft tissues due to load concentrations in their soft tissues near bony prominences where their body contacts the wheelchair. Customizable wheelchairs allow users to adjust their seating positions to determine positions that reduce load on the tissues around bony prominences. The goal of work was to design and fabricate a simple lightweight wheelchair base that allowed for the customizable placement of the motors needed to drive the repositioning of seated individuals, the batteries that power those motors, and the electronic system that controlled the repositioning. The resultant design included using common aluminum bar stock to replace bent and welded aluminum piping. By using the aluminum bar stock instead of the pipe, the base was able to sustain more attachment points for the motors, batteries, and control system. With the increased number of attachment points for the wheelchair components, the work explored different placements of the components. Doing so allowed for the placement of all necessary components, ultimately increasing the range of seating positions the wheelchair users can use and allowed them to have more control over their seated position.

SYSTEMIC APPROACH OF DETERMINING MELT PARAMETERS EFFECTS ON SWELLING OF ELECTRON BEAM MELTING PRINTED TI-6AL-4V PARTS
Presenter(s): Richard Lin (Michigan State University)
Mechanical Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1614
Mentor(s): Patrick Kwon (Michigan State University), Tyler Bauder (Michigan State University)

Powder bed fusion using electron beam melting (EBM) is an additive manufacturing process used to melt metal powder into solid parts. Using an ARCAM A2X machine, thin layers of Ti-6Al-4V powder are deposited over a surface and melted by an electron beam. This process is repeated until the desired part is made. Currently parts made exhibit "the bathtub effect" (TBE) causing flat surfaces to have raised outer edges compared to the inner surface like a bathtub. Swelling also occurs when air is trapped inside leaving voids inside parts. Optimizing melt parameters such as speed and energy can reduce both TBE, swelling, and may reduce building time. Trial and error testing melt parameters is both an expensive and time-consuming process. By using a systemic approach to quantify and correlate each melt parameter's effects on swelling and TBE, to reduce and eliminate it. The results will lead to better final dimensional accuracy and deeper understanding of the effects of melt parameters on Ti-6Al-4V printed parts.

HYGROTHERMAL AGEING OF EPDM RUBBER: EFFECTS ON MECHANICAL AND CHEMICAL PROPERTIES
Presenter(s): Lili Pakko (University of Nevada - Reno)
Mechanical Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1615
Mentor(s): Mamoon Shaafaey (Michigan State University), Roozbeh Dargazany (Michigan State University)

In this work, the effects of hygrothermal ageing (80%RH) at different temperatures and for different exposure durations on the mechanical and chemical properties of EPDM rubber (ethylene propylene diene monomer) is presented. Uniaxial tensile tests with quasi-static tensile loading was performed on this material as the main analysis method, and the changes in the constitutive behavior was measured. Furthermore, Attenuated Total Reflection-Fourier Transform Infrared Spectroscopy (ATR-FTIR) spectra analysis, cross-link density (swelling method), and material toughness was analyzed for as-received and aged samples. The accelerated ageing process was conducted at three temperatures (60C, 80C, and

95C) and two exposure durations (10 and 20 days). This work confirms that accelerated ageing leads to a decrease of the ultimate mechanical properties and of the molar mass between cross-links on one hand, and an increase of the cross-linking density and material hardness, on the other hand. This aging mode involves the formation and disassociation of physical and chemical bonds within the polymer matrix, which take place in the form of creation and breaking of crosslinks, along with chain scission and formation. We investigated the damage regimes caused by thermal stresses and those caused by moisture. This will help identify the conditions in which they augment each other and conditions where they work against one another. The results are being considered towards proposing a model of stress and strain at break as a function of effective aging time, which is expected to give acceptable results.

LAMINAR FLAME SPEED MEASUREMENT IN A CONSTANT VOLUME COMBUSTION VESSEL
Presenter(s): Ethan Smydra (Michigan State University)
Mechanical Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1616
Mentor(s): Ahmed Barain (Michigan State University), Elisa Toulson (Michigan State University), Grace Trombley (Michigan State University)

As the demand for fossil fuels increases, the search for alternative fuel grows along with it. Hydrogen has long been looked at as a viable replacement because of its high power to weight ratio and reactivity. To reduce the emission of dangerous nitrous oxides into the atmosphere, Exhaust Gas Recirculation can be added to hydrogen-air mixtures, which have been investigated in a constant volume combustion vessel in this study. Exhaust Gas Recirculation causes the laminar flame speed of hydrogen to decrease which in turn changes the mixture's reactivity, exothermicity, and diffusivity. This information can be used to validate chemical mechanisms and is important in turbulent combustion modeling. A constant volume combustion vessel was used to ignite the mixtures and a high-speed camera recorded the flame using Schlieren imaging techniques. Chemical kinetic simulations were performed and compared with the experimental results. With information from this study, a better understanding of hydrogen combustion can be used for further investigation. The development of hydrogen combustion would be extremely beneficial in automotive and aviation applications.

EFFECTS OF MECHANICAL DYSSYNCHRONY ON LEFT VENTRICULAR CONTRACTILE FUNCTION, INSIGHTS FROM A GRADIENT-BASED INVERSE MODELING FRAMEWORK.
Presenter(s): Haosen Sun (Michigan State University)
Mechanical Engineering
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1617
Mentor(s): Lei Fan (Michigan State University), Lik-Chuan Lee (Michigan State University)

Mechanical dyssynchrony (MD), where there is a delayed contraction in the left ventricular free wall (LVFW) relative to the septum, affects LV functions. While the effects of MD on LV pressure, volume, and regional myocardial strains can be measured experimentally, some important quantities related to LV functions such as regional myocardial contractility, however, cannot be measured directly. To address these limitations, we develop an inverse modeling framework to predict and quantify the effects of MD on the regional contractility in finite element models of the LV. By solving the inverse problem using animal-specific LV geometries, volume, pressure as well as regional circumferential and longitudinal strains from 3D echocardiography images acquired from swine models under normal (right atrial pacing) and MD (right ventricular pacing) conditions at the same heart rate, the model is able to capture the variation of regional contractility in the LV induced by MD. The findings of this study could provide insights that help better understand the underlying mechanisms of MD.

MICROBIOLOGY, IMMUNOLOGY & INFECTIOUS DISEASE

DEVELOPMENT OF AN AIR-LIQUID INTERFACE MODEL FOR USE IN STUDYING KENNEL COUGH VIRUSES
Presenter(s): Kennedy Baldwin (Michigan State University)
Microbiology, Immunology & Infectious Disease
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1702
Mentor(s): Gisela Hussey (Michigan State University)

Canine infectious respiratory disease (CIRD) complex, more commonly known as kennel cough, causes significant problems in dogs worldwide despite vaccination efforts. Vaccines for some pathogens contributing to CIRD are available but their efficacy varies, while no vaccines exist for others. Recently, there has been interest in the use of recombinant interferon lambda 3 (IFNL3) to stimulate the innate immune system to prevent and treat virus infection. Our hypothesis is that epithelial immunity to CIRD can be enhanced by use of canine IFNL3 and will prevent infection with the viruses that contribute to CIRD. To test this hypothesis, we developed and characterized a canine respiratory in vitro model using canine respiratory epithelial cells (CRECs) isolated from dogs that were humanly euthanized for unrelated reasons. CRECs were characterized immunologically and morphologically, and we demonstrated that they resemble the natural airway. Specifically, CRECs differentiated into a pseudostratified epithelium, secreted mucus, developed cilia and expressed pattern recognition receptors and interferons, cytokines, and chemokines. Most importantly, they support replication of the canine viruses involved in CIRD. We will now use this system to evaluate the efficacy of IFNL3 for prevention of CIRD and stimulation of epithelial immunity.

MODULATING T-CELL REGULATORY MOLECULES ON ANTIGEN PRESENTING CELLS TO IMPROVE IMMUNE RESPONSES AGAINST MYCOBACTERIUM TUBERCULOSIS INFECTION
Presenter(s): Olivia Beckman (Michigan State University)
Microbiology, Immunology & Infectious Disease
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1703
Mentor(s): Andrew Olive (Michigan State University)

Infections with Mycobacterium tuberculosis (Mtb) result in chronic disease due to immune evasion mechanisms. These mechanisms allow Mtb to prevent the robust activation of CD4+ T-cells, that are required for controlling infection. Mtb blinds T-cells from identifying infected cells by altering the expression of critical immune regulatory molecules on infected cells, suppressing immune activation. Yet how modulating these immune regulatory molecules on antigen presenting cells (APCs) alters Mtb-specific T-cell activation remains unclear. We hypothesize that an over-expression of T-cell regulatory molecules on Mtb-infected cells may overcome immune evasion mechanisms and drive protection. To test this, we are optimizing a novel ex vivo platform to probe interactions between Mtb-specific T-cells and macrophages engineered to express variable amounts of immune regulatory molecules. To begin, we examined activation of T-cells from a newly engineered transgenic mouse (p25) where all T-cells are specific for an Mtb antigen. We activated these cells ex vivo and are quantifying proliferation, activation, and cytokine production. In parallel, we are optimizing a gain-of-function approach using CRISPR-activation to drive the expression of T-cell regulatory molecules on APCs. Independent sgRNAs targeting these molecules along with catalytically dead Cas9 will be expressed in macrophages. Flow cytometry and RT-PCR will be used to quantify the expression of target genes. Future goals include combining p25 T-cells with CRISPR-activation macrophages. This will define how distinct immune regulatory molecules control T cell activation and identify new targets for immunotherapies. Thus, these experiments have major implications for treating Mtb alongside similar chronic infections.

IN-VITRO ASSAYS TO EVALUATE MICROBIAL RESPONSES TO PLANT STRESS
Presenter(s): Tai Brass (Michigan State University)
Microbiology, Immunology & Infectious Disease
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1704
Mentor(s): Sreejata Bandopadhyay (Michigan State University)

In crop production systems, there are numerous factors that can cause plant stress: drought, extreme temperatures, and nutrient deficiency are just a few to name. Different plants can have unique responses to stress, but there are specific hormones, called phytohormones, that most plants release when faced with conditions that challenge their survival. One such growth-promoting hormone is indole-3-acetic acid (IAA), which belongs to the auxin family. Both plant-produced IAA and exogenous application of IAA has been shown to aid plant recovery from drought and heavy metal exposure by improving plant growth. Moreover, the microbiome of plant roots may shift in response to the production or application of IAA, and it is possible to test how these microorganisms react to plant stress hormones in a lab setting. This experiment uses an in-vitro well assay to expose numerous strains of bacteria to high and low concentration gradients of IAA. Culturing bacteria in this way allows for the investigation of bacterial growth curves based on specific levels of phytohormones. Overall, this poster displays the strains of bacteria that indicate a change in growth as a response to elevated stress hormone levels. Other strains that have no differential growth in the presence of these hormones are also noted and described. Identifying, consolidating, and applying the beneficial microbes from these screening assays to plants could improve the health of a wide range of crops in the case of drought or other stress events.

PROGESTERONE AND ESTROGEN: UNDERSTANDING EFFECTS ON NEUTROPHIL RESPONSES FOLLOWING GROUP B STREPTOCOCCUS (GBS) INFECTION IN MURINE MODELS
Presenter(s): Leah Liszak (Oakland University)
Microbiology, Immunology & Infectious Disease
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1705
Mentor(s): Margaret Petroff (Michigan State University), Morgan Collins (Michigan State University)

Group B Streptococcus (GBS) is a gram-positive bacteria that asymptomatically colonizes the vaginal tract. During pregnancy, ascension of GBS from the vaginal tract to the uterus can lead to infection of gestational tissues, which causes neonatal and maternal invasive disease. The objective of this study is to investigate how steroid sex hormones impact innate immune responses to GBS infection. In particular, the effects of progesterone and estrogen on neutrophil and macrophage responses to GBS infection will be assessed. Neutrophils will be isolated from the bone marrow of C57BL/6 mice using a anti-Ly6G antibody-positive selection kit from Biolegend (San Diego, CA). Following isolation, neutrophils will be treated with 10-6, 10-7, and 10-8 progesterone, 10-9,10-10, and 10-11 estrogen, or both over a 24-hour period then infected with (GBS) at MOI of 50. Neutrophil extracellular traps (NETs) will be measured by flow cytometric detection of SYTOX green-positive cells. SYTOX Green ready flow reagent is a plasma-membrane impermeable DNA binding dye. We hypothesize that neutrophils exposed to GBS will have a heightened capacity to form NETs and that hormones (or hormone treatment) will alter neutrophil NET formation in response to GBS infection. This study is designed to further our understanding of how steroid sex hormones impact immune responses to GBS infection.

CHARACTERIZING CBASS PHAGE DEFENSE AND ACTIVATION OF VIBRIO CHOLERA EL TOR
Presenter(s): Ram Sanath Kumar (Michigan State University)
Microbiology, Immunology & Infectious Disease
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1706
Mentor(s): Christopher Waters (Michigan State University), Kaylee Wilburn (Michigan State University), Soo Yoon (Michigan State University)

Cholera is a serious threat causing 1.4 to 4.3 million cases every year worldwide especially in developing countries2. Vibrio cholerae El Tor differs from the previous pandemic causing classical biotype through its two pathogenicity islands VSP-1 and VSP-2 that offer an advantage in virulence and its epidemiological success2. Transposon mutagenesis was done on VSP-1 which isolated an abortive cyclic-oligonucleotide based antiphage signaling system dubbed CBASS. CBASS is not unique to Vibrio cholerae, with it being a well-conserved system in all bacteria phyla and found near 65.5% of other microbial defense systems1. Better understanding of the mechanism and gene relationships may reveal novel bacteria control methods amid rising drug resistant microbes. In addition, as a well-conserved phage defense mechanism, further exploitation of this system may prove imperative in growing areas such as phage therapy. One area of exploitation is the initiation of the defense system to induce cell death. CBASS is activated by activation of its dinucleotide cyclase through folate level changes during phage infection. The proposed activation comes from prior protein work indicating CBASS's dinucleotide cyclase is regulated by folate6. Work done found CBASS defense being specific to phages T2, T4, and T5 all which carry viral gene products for dihydrofolate reductases (DHFR)3 that manipulate host folate levels. The proposed activation mechanism will be tested through viability assays of phage DHFR expression along with DHFR phage mutant testing and mass spectrometry of folate levels within the cell during infection.

DEVELOPING A BIOSENSOR TO IDENTIFY THE SYNTHASE OF A NOVEL CYCLIC DI-NUCLEOTIDE
Presenter(s): Aubree Muethel (Michigan State University)
Microbiology, Immunology & Infectious Disease
Section: 2
Time and Location: 11:00 AM - 12:30 PM, 2202 STEM Facility
Presentation Number: 1711
Mentor(s): Christopher Waters (Michigan State University), Micah Ferrell (Michigan State University)

Cyclic di-nucleotides (cdNs), global signaling molecules found across all domains of life, regulate important biological behaviors such as biofilm formation, infection, and the associated host immune response. The Cyclic Oligonucleotide-based Antiphage Signaling System (CBASS) is a pathway that protects bacteria from phage replication through synthesis of cdNs that induce bacterial antiphage defenses. Cyclic di-UMP (c-di-UMP) is a type of cdN in Yersinia aleksiciae that binds to the transmembrane effector protein CD-NTase-associated protein 15 (cap15). We hypothesize that c-di-UMP may be synthesized by a variety of organisms, but the organisms and enzymes involved is unclear. Our goal is to exploit the c-di-UMP binding activity of cap15 to create a c-di-UMP biosensor that will enable high-throughput screening of c-di-UMP synthesis from various organisms and identification of the synthases that generate this novel cdN. We expressed cap15 in two E. coli strains, MC4100 yfhs::Tn10 (permeable outer membrane) and DH5? (impermeable control), and assayed for growth inhibition in the presence of c-di-UMP. We found induction-dependent growth inhibition of MC4100 cells on c-di-UMP media in strains bearing cap15, while no inhibition with the empty vector or the DH5? control strains. To further characterize this system, we generated cap15 alleles harboring mutations that block c-di-UMP binding (T129Q and Y188F) or c-di-UMP-dependent multimerization/killing (W120A). In solid media assays, cap15 mutants showed arabinose-dependent inhibition comparable to the wild type cap15. We are currently exploring the function of cap15 and these mutants with their response to c-di-UMP and are optimizing growth inhibition in liquid cultures using different arabinose concentrations.

GENETIC STUDIES OF MYCOBACTERIUM SMEGMATIS CITRATE TOLERANCE
Presenter(s): Megan Murto (Michigan State University)
Microbiology, Immunology & Infectious Disease
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1712
Mentor(s): Robert Abramovitch (Michigan State University)

Mycobacterium smegmatis is a commonly used model for Mycobacterium tuberculosis (Mtb) because of the faster doubling time and lack of infectiousness. M. smegmatis has shared physiologies with Mtb, making it a useful model to test hypotheses rapidly. It was previously found that M. smegmatis is killed by treatment with concentrated citrate in a glycerol-supplemented minimal media. A forward genetic screen

was conducted to select for transposon mutants of M. smegmatis that are resistant to killing by citrate. Mutants associated with glycerol metabolism lead the laboratory to hypothesize that citrate tolerance is carbon source dependent. The goal of this ongoing study is to identify the difference in citrate tolerance in Mycobacterium smegmatis depending on the carbon source present in the media. A forward genetic screen was performed across 6 different carbon sources to isolate M. smegmatis transposon mutants tolerant to killing by citrate. 20 mutants were selected from the glucose, lactate, and succinate screens, 60 mutants in all, to be confirmed to be tolerant to citrate killing. 5 glucose mutants, 1 lactate mutant, and 4 succinate mutants were selected for further testing. This includes inverse PCR and sequencing to identify the transposon mutant site and complementation. The return of citrate susceptibility with the re-introduction of the mutated gene would support the association of the gene and susceptibility to killing by citrate.

TRIPEPTIDE IMPORT AND CATABOLISM BY THE SIGNIFICANT HUMAN PATHOGEN STAPHYLOCOCCUS AUREUS.
Presenter(s): Rosemary Northcote (Michigan State University)
Microbiology, Immunology & Infectious Disease
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1713
Mentor(s): Neal Hammer (Michigan State University), Paige Kies (Michigan State University)

The Gram-positive, opportunistic pathogen Staphylococcus aureus is a significant cause of hospital-acquired infections due to an ability to propagate within numerous host tissues. The element sulfur is an essential nutrient S. aureus must acquire to proliferate throughout dynamic host environments. During infection, S. aureus procures a variety of host-derived sulfur metabolites to meet the nutritional sulfur requirement. Glutathione (GSH) is a tripeptide consisting of g-glutamyl-cysteinyl-glycine. Previously, we identified that S. aureus employs GisABCD to import GSH and a g-glutamyl transpeptidase (Ggt) that cleaves the tripeptide g-bond to liberate cysteine (Cys) for use as a sulfur source. However, a S. aureus DgisABCD-ggt mutant proliferates in medium supplemented with physiologically relevant concentrations of GSH, indicating S. aureus encodes another GSH utilization mechanism. To identify alternative GSH utilization proteins, we exploited S. aureus sensitivity to the toxic tripeptide, bialaphos. The active form of bialaphos requires import and catabolism -resembling the release of Cys from GSH. Therefore, we hypothesized that the bialaphos transporter and peptidase would also recognize GSH as a substrate. We demonstrate that the DtpT transporter is responsible for import of bialaphos into S. aureus and accordingly performed bialaphos Kirby Bauer assays with a dtpT overexpression strain to identify the bialaphos peptidase. Abundant DtpT renders S. aureus more sensitive to bialaphos than wild type and yields significantly fewer resistant colonies, which have been isolated and are being analyzed. Furthermore, a directed bioinformatic approach stemming from a PSI-BlastP query using eukaryotic peptidases ChaC and Dug2/3-known to cleave g-peptide bonds-is being explored.

INVESTIGATING THE ROLE OF ENVELOPE INTEGRITY PROTEIN EIPA IN THE OVINE PATHOGEN BRUCELLA OVIS
Presenter(s): Laura Pena Serrano (University of Puerto Rico - Mayagüez)
Microbiology, Immunology & Infectious Disease
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1714
Mentor(s): Aretha Fiebig (Michigan State University), Melene Alakavuklar (Michigan State University), Sean Crosson (Michigan State University)

Brucella ovis is a facultative intracellular pathogen that causes Brucellosis in small ruminant males, which is characterized by reproductive issues such as epididymitis and infertility. B. ovis contains the periplasmic protein EipA. The molecular function of this protein is not well understood, but studies in a similar species, Brucella abortus, suggest it is important for envelope stress resistance. These studies have shown that when the eipA gene is deleted in B. abortus, the replication and survival of the pathogen is attenuated in macrophages. In B. ovis, however, eipA is an essential gene. When eipA is depleted, B.

ovis cells form chains and present a viability defect that is hypothesized to be related to membrane instability. Based on this information, our project aims to discover the role of eipA within B. ovis. To test our hypothesis that eipA is important for B. ovis infection of macrophages, we compared macrophage entry, replication, and survival between a wildtype B. ovis strain and a B. ovis strain containing elevated levels of eipA. THP-1 cells were differentiated into a macrophage-like phenotype and infected with the B. ovis strains. Moreover, preliminary evidence suggests that the eipA depletion strain may overproduce an unknown polysaccharide. To characterize this putative production, we performed a plate assay containing the polysaccharide dyes calcofluor-white, Congo red, and trypan blue. This study will inform our understanding of the role of eipA in macrophage infection and polysaccharide production by B. ovis.

THE ROLE OF AMINO ACID PRECURSORS IN THE BIOSYNTHESIS OF TETRODOTOXIN
Presenter(s): Faheed Shafau (Michigan State University), Fernanda Lopez Bermejo (Michigan State University)
Microbiology, Immunology & Infectious Disease
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1715
Mentor(s): Heather Eisthen (Michigan State University)

Tetrodotoxin (TTX) is a potent neurotoxin that inhibits voltage-gated sodium channels, preventing generation of action potentials. TTX is found in many unrelated organisms, including pufferfish, molluscs, and amphibians, but little is known about how TTX is synthesized. Our lab has shown that TTX is produced by bacterial symbionts living on the skin of rough-skinned newts (Taricha granulosa). We are using these bacteria to identify precursors in the TTX biosynthetic 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 marine toxins. To test this hypothesis, we are cultivating two newt-derived TTX-producing bacterial strains, one Pseudomonas and one Aeromonas, in a low-nutrient medium, M9, at 20°C. We are supplementing the medium with L-arginine and D-arginine, as both forms may be bioavailable to TTX-producing bacteria. As a control substance, we will test the effects of L-histidine; histidine and arginine are both positively charged, but histidine lacks a guanidinium group. We are currently quantifying bacterial growth curves to identify when the strains produce TTX. Next, we will supplement cultures with an amino acid and quantify TTX in supernatant to determine whether arginine supplementation enhances TTX synthesis, suggesting that it is a precursor for TTX production. Researching the relationship between newts and their symbiotic bacteria will help better understand evolution and the role of beneficial bacteria living on animals.

ANALYSIS OF MACROPHAGE CELL DEATH IN RESPONSE TO DIVERSE GROUP B STREPTOCOCCUS ISOLATES
Presenter(s): Michelle Thompson (Aquinas College)
Microbiology, Immunology & Infectious Disease
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 2202 STEM Facility
Presentation Number: 1716
Mentor(s): Rebecca Flaherty (Aquinas College)

Group B Streptococcus (GBS) is a leading cause of preterm birth, stillbirth, neonatal sepsis, and meningitis worldwide. It is a common resident of the genitourinary tract in approximately 40% of pregnant women and is a risk factor for preterm birth and neonatal disease. In order to develop effective treatment and diagnostic strategies, there is a critical need to understand how GBS interacts with human tissues to induce inflammation, invade the extraplacental membranes, and harm the fetus or newborn. Macrophages are a key immune system cell type that plays critical roles at the maternal-fetal interface during pregnancy as well as in the immune system of newborn infants. Our lab and others have previously identified differences in macrophage cell death in response to different GBS strains of varying virulence. A key goal of this project will be to explore the type of cell death that is being induced in these

macrophages following GBS infection with these diverse strains and to explore some of the macrophage signaling pathways that regulate these responses.

SCREENING OF MUCILAGE-ASSOCIATED BACTERIA FOR THEIR POTENTIAL ON GROWTH PROMOTION OF BIOENERGY SORGHUM
Presenter(s): Maisie Smith (Haverford)
Microbiology, Immunology & Infectious Disease
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1721
Mentor(s): Marco Mechan Llontop (Michigan State University)

Bioenergy sorghum (Sorghum bicolor) is a heat and drought tolerant crop that is generally grown on marginal lands. To adapt to abiotic stress, Sorghum produces several exudates on its external aerial surfaces (phyllosphere), including sugar-rich mucilage on aerial roots likely to facilitate nutrient uptake such as nitrogen fixation. Using an amplicon sequencing approach, the Shade lab has found that the sorghum aerial root mucilage harbors a microbiota with known diazotroph bacterial species. In parallel, we have isolated and characterized hundreds of bacteria from the aerial root mucilage with putative plant-beneficial traits, including nitrogen-fixation, phosphate solubilization, drought tolerance, and pathogen inhibition. Here, we hypothesize that mucilage-associated bacteria possess multiple plant-beneficial traits to improve bioenergy sorghum growth and health. We will investigate the ability of mucilage bacteria to confer plant-growth promotion benefits to bioenergy Sorghum. We will also design and test synthetic communities for plant growth promotion in planta, both in growth chamber and greenhouse conditions. This research will allow us to relate the bacterial isolates to agriculturally significant growth that can contribute to Sorghum cultivation for biofuel production.

ESTABLISHING HEAT RESISTANT WOLBACHIA IN AEDES AEGYPTI FOR DENGUE CONTROL
Presenter(s): Edward Sun (Canterbury School)
Microbiology, Immunology & Infectious Disease
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1722
Mentor(s): Andrew Xi (4435 Oak Pointe Ct.), Meichun Zhang (Michigan State University), Zhiyong Xi (Michigan State University)

Mosquito-borne diseases such as Dengue, Zika, and Malaria threaten billions of people around the world. One of the novel strategies with the potential to result in sustainable disease control is population replacement, in which disease-susceptible mosquito populations are modified to be disease resistant such that transmission of pathogens between humans and mosquitoes is blocked. This has been accomplished through the release of mosquitoes carrying a maternally transmitted bacterium Wolbachia, with a recent field trial showing a reduction in dengue incidence by 77% and hospitalization by 86%. However, similar success has not been made in some tropical regions due to the sensitivity of the released Wolbachia strain wMel to the local high temperature. To identify heat-resistant Wolbachia strains with a capacity to be spread and maintained in Aedes aegypti population in a broad tropical region, we have transferred two Wolbachia strains, wAlbA and wAlbB, from Aedes albopictus into Ae. aegypti by embryonic microinjection. Wolbachia in these two transinfected lines maintain 100% maternal transmission efficiency. The densities of two Wolbachia strains in whole bodies and ovaries are measured by quantitative polymerase chain reaction (PCR) and compared after the two transinfected mosquitoes are exposed to temperature cycle 28-38 degree, a condition that previously caused leaky maternal transmission of other Wolbachia strains. We will provide new evidence to show heat resistance of wAlbB as compared to wAlbA in Ae. aegypti. These results will be discussed in relation to current efforts in global deployment of Wolbachia for dengue control in disease-endemic countries.

DISSECTING INTERLEUKIN-1 REGULATION IN ALVEOLAR MACROPHAGES
Presenter(s): Iniya Umachandran (Michigan State University)
Microbiology, Immunology & Infectious Disease
Section: 3

Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1723
Mentor(s): Andrew Olive (Michigan State University)

Alveolar macrophages (AMs) are immune cells that coordinate lung inflammation. While the local lung environment modulates AM function, we lack mechanistic understanding of how these changes are regulated due to limited ex vivo models. To address this shortcoming, we developed Fetal liver Alveolar Macrophages (FLAMs), a new model that recapitulates many functions of AMs. Our preliminary data suggests that FLAMs differentially produce two cytokines, IL1a and ILb, following inflammatory stimuli. We hypothesized these differences were due to transcriptional and posttranscriptional differences of IL1a and IL1b in resting AMs. To investigate this regulation, we examined the response of Wild Type FLAMS with and without IL1 receptor blocking antibody and FLAMs lacking IL1R to different inflammatory treatments. We isolated mRNA and quantified the expression of IL1a. Our data suggests that IL1a and IL1b activation alone do not significantly modulate the IL1a expression, but dual treatment does. Surprisingly the levels of IL1a expression in wild type FLAMs following IL1 activation are 100-fold less than those treated with LPS yet blockade or loss of IL1R-/- on FLAMs resulted in almost a 10-fold decrease of IL1a following LPS. This data suggest that the coordination of distinct cytokines is required to robustly induce IL1a expression in FLAMs. In the future, we will quantify changes in the expression of IL1b and other inflammatory cytokines including IL6 and TNF. These studies will define the overlapping regulation of cytokine signaling in AMs enabling the development of new therapies to protect the lungs during inflammation.

ASSESSING THE EFFECTS OF TETRAHYDROCANNABINOL (THC) ON INTERFERON-ALPHA (IFNα) PRIMED INTERLEUKIN-2 (IL-2) RESPONSES BY PRIMARY HUMAN T CELLS.
Presenter(s): Kathleen Velez (University of Central Florida)
Microbiology, Immunology & Infectious Disease
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1724
Mentor(s): Joel Marty (Michigan State University)

Human Immunodeficiency Virus (HIV) positive individuals are at risk of developing HIV-associated neurocognitive disorders (HAND), regardless of being medicated with combined antiretroviral therapy (cART). Immune cells such as CD8+ T cells and monocytes can release pro-inflammatory cytokines in the brain, associated with HAND symptoms. These cytokines will interact with cells in the central nervous system, such as astrocytes, causing a release of additional pro-inflammatory cytokines. This can recruit more CD8+ T cells from the periphery into the brain, supporting the persistent neuroinflammation. THC, the main psychoactive cannabinoid found in cannabis, will interact with immune cells through cannabinoid receptors (CB) 1 and CB2. This study will test the hypothesis, THC treatment suppresses CD8+ T cell secretion of IL-2, an autocrine paracrine growth factor that promotes T cell proliferation. To study the effects of cannabinoids on IL-2 regulation, we will utilize primary human CD8+ T cells. 30 minutes prior to stimulation, CD8+ T cells will be treated with THC. After pretreatment, these cells will be stimulated through the T cell antigen receptor by antibodies targeting CD3 and CD28. To determine whether THC mediates its effects through CB2, the cells will be treated with JWH-015, a selective CB2 agonist. At the time of activation, IFN will be added to mimic an inflammatory environment similar to that experienced by HIV+ individuals. To assess the interactions between IFN and THC on the IL-2 response, protein production will be measured by ELISA and flow cytometry, additionally, IL-2 mRNA expression will be quantified via qPCR.

VARIATION IN METABOLISM AND SURFACE PROTEIN EXPRESSION TO AFFECT M1/M2 RE-POLARIZATION IN ALVEOLAR-LIKE MACROPHAGES
Presenter(s): Taryn Vielma (Michigan State University)
Microbiology, Immunology & Infectious Disease
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1725
Mentor(s): Andrew Olive (Michigan State University)

Macrophages are immune cells that elicit variable functions that are dependent on the local inflammatory environment. Within the lungs, alveolar macrophages (AMs) control inflammation to protect respiratory function. Importantly, the activation state of AMs can be polarized/re-polarized based on local signals. However, our understanding of polarization in AMs and its role in lung function remains poor due to a lack of ex vivo models. To overcome this technical hurdle, we developed the fetal liver alveolar-like macrophage (FLAM) model that closely resembles AMs. Previous studies suggest that AMs are metabolically distinct from well characterized bone marrow-derived macrophages (BMDMs), yet these differences in metabolism that impact polarization/re-polarization remain unknown. We hypothesize that these FLAMs will regulate polarization/re-polarization differently from BMDMs because of metabolic differences. To test this hypothesis, we will polarize/re-polarize BMDMs and FLAMs to either pro-inflammatory (M1) or anti-inflammatory (M2) states and quantify changes in phenotypic traits. We will quantify the expression of surface marker proteins using flow cytometry, gene expression using RT-PCR, and metabolism using Seahorse assays for macrophages that are resting, polarized to M1/M2, or re-polarized to M1/M2 following initial polarization. Our preliminary data suggest that FLAMs differentially regulate the surface expression of M2-associated markers compared to BMDMs. We will build upon these observations to dissect unique immune regulatory functions of AMs in the future. These regulatory mechanisms are potential therapeutic targets to protect the lungs against inflammation and infection-mediated damage.

MANIPULATING MOSQUITO SEX-SPECIFIC DEVELOPMENT TO PRODUCE INCOMPATIBLE MALES FOR POPULATION SUPPRESSION
Presenter(s): Andrew Xi (4435 Oak Pointe Ct.), Edward Sun (Canterbury School)
Microbiology, Immunology & Infectious Disease
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1726
Mentor(s): Meichun Zhang (Michigan State University), Zhiyong Xi (Michigan State University)

Mosquito-borne diseases, including malaria, dengue and Zika, cause millions of people's death annually due to insufficiency of traditional disease control tools, such as drugs, vaccines and chemical insecticides. Wolbachia, a maternally transmitted endosymbiotic bacterium that infects over half of insect species in nature (but cannot infect vertebrate hosts), has showed great potential as a novel solution to protect human life. This is based on the ability of Wolbachia to induce cytoplasmic incompatibility, a phenomenon of early embryo death occurring as a result of a male Wolbachia-infected mosquito mating with a female mosquito that either is uninfected or does not contain the same Wolbachia type. In a strategy referred to as Incompatible Insect Technique, mosquito populations would be suppressed or eliminated by the continuous release of males carrying a novel Wolbachia infection to induce sterile matings in the field. However, it requires for the development of an effective and scalable sex-sorting system to mass produce males. Using CRISPR-Cas9, we identified a gene candidate in Aedes aegypti sex determination pathway, with its knockout resulted in female-specific lethality. Another hormone-regulated gene was also found to play a role in modulating sex-specific development, with an ability to produce a male biased population when treating in larvae stage. The potential of their use in sex separation will be discussed in relation to the existing approaches. These results provide important implications on effective mass production of incompatible males through manipulating mosquito sex-specific development and thus facilitate developing Wolbachia-based population suppression to combat mosquito-borne diseases.

NEUROSCIENCE

ASSESSMENT OF THE EFFECTS OF VENTRAL TEGMENTAL AREA NEUROMEDIN S ACTIVATION AND MORPHINE EXPOSURE ON CELLULAR ACTIVITY IN THE NUCLEUS ACCUMBENS
Presenter(s): Milagros Alday (University of Arizona)
Neuroscience
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility

Presentation Number: 1801
Mentor(s): Cristina Rivera Quiles (Michigan State University), Michelle Mazei-Robison (Michigan State University)

Drug addiction is a debilitating disease that has life-long consequences. Opioid drugs, like other drugs of abuse, engage the brain's reward circuitry to promote the euphoric feeling that rewards and reinforces drug use. Morphine, specifically, increases dopamine signaling in the nucleus accumbens (NAc) via modulation of ventral tegmental area (VTA) dopamine neuron activity. Our lab found that Neuromedin S (NMS) expression increases in a subset of VTA dopaminergic neurons after exposure to chronic morphine. We believe that VTA NMS neuron activation increases morphine reward and thus promotes morphine behavior and response. To test this, we are using designer receptors exclusively activated by designer drugs (DREADDs) to activate NMS expressing neurons in the VTA through the use of an excitatory Cre-dependent-DREADD viral vector (AAV-DIO-hM3Dq-mCherry) in NMS-Cre mice and administration of the designer drug, clozapine-n-oxide, CNO. NMS-Dq and control mice will then undergo morphine behavioral testing to determine whether NMS activation increases morphine behaviors. Following behavioral testing, we will assess activation of NAc neurons via IHC staining for c-fos, a cellular marker of neuronal activity. We will also conduct IHC studies to assess the proximity of VTA NMS neuronal terminals to the NMS receptor, NMUR2, in the NAc. Collectively, these data will help us define the function of the novel VTA NMS - NAc circuit and its role in addiction by showing how VTA NMS neuron activation affects morphine behaviors and responses.

CHARACTERIZATION OF THE GAD1-ICRE RATS AS A TOOL TO STUDY SOCIAL PLAY BEHAVIOR IN JUVENILE MALE AND FEMALE RATS
Presenter(s): Daniela Anderson (Ana G. Mendez University)
Neuroscience
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 1802
Mentor(s): Alexa Veenema (Michigan State University), Elie Huez (Michigan State University), Jessica Lee (Michigan State University)

Social play is a rewarding behavior displayed by juveniles across various mammalian species, including humans and rats. Engaging in social play is critical for the development of social skills throughout lifetime. Autistic children show social play deficits which may contribute to deficiencies in social communication later in life. Furthermore, autism spectrum disorder is diagnosed 4X more in boys than girls, suggesting the neural circuits contributing to this disorder are sex-specific. Therefore, it is crucial to understand the brain mechanisms that underlie social play to develop effective means of treatment. One system that may be involved in regulating social play is the GABAergic system, or the brain's main inhibitory neurotransmitter. Studies have demonstrated that extracellular GABA concentration changes as juvenile rats engage in social play, suggesting the involvement of GABAergic signaling in regulating social play. Current neuroscience techniques have allowed researchers to target the GABAergic system by using Gad1-iCre rats, in which cre recombinase is expressed on Gad1+ cells. Gad1 is a GABA-producing enzyme that can be used as a marker for GABAergic cells. Since Gad1-iCre rats have never been used to study social play, we first determined whether social play behavior in Gad1-iCre rats was comparable to that of wildtype rats. We then determined whether iCre expression is specific to Gad1 cells via in situ hybridization. These steps are necessary in order to validate the use of Gad1-iCre rats in studying social play behavior and enables researchers to study the involvement of the GABAergic system in regulating social play behavior.

COMPARATIVE GENE EXPRESSION ANALYSIS OF DUPLICATED GLUTAMATE RECEPTOR GENES IN THE BRAINS OF ZEBRAFISH AND SPOTTED GAR
Presenter(s): Keyana Blake (Michigan State University)
Neuroscience
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility

Presentation Number: 1803
Mentor(s): Ingo Braasch (Michigan State University), Jamily Ramos De Lima (Michigan State University), Julia Ganz (Michigan State University)

The teleost fish zebrafish (Danio rerio) is an important biomedical model species, but due to an ancestral teleost genome duplication (TGD), it can be challenging to determine gene functions and to make connections to the human genome. 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 retained duplicates from the TGD (~70% were kept). Metabotropic glutamate receptors regulate synaptic transmission and can be important drug targets for many neurological disorders. 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 the functions of grm genes before and after the TGD we analyze spotted gar (Lepisosteus oculatus), a ray-finned fish outgroup that did not go through the TGD. Gar thus can be used as a proxy to the pre-TGD ancestor to identify the mode of genome functionalization in teleost like zebrafish. Using RNA in situ hybridization on brains, 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 INTERACTIVE EFFECTS OF PROGESTERONE AND ANXIETY ON ERROR-RELATED EEG ACTIVITY
Presenter(s): Ben Chandler (Michigan State University)
Neuroscience
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 1804
Mentor(s): Ania Pathak (Michigan State University)

Recent research has found an association between progesterone and certain types of anxiety (both within subjects/across the menstrual cycle and between subjects), and extant literature indicates mechanistic support for this relationship. Electroencephalographic studies report that anxious symptoms are associated with increased amplitude of the error-related negativity (ERN), an event-related potential (ERP) component associated with error detection. Interestingly, this relationship has only been established with trait-related anxious symptoms; state-related anxiety does not affect ERN amplitude. The present work seeks to examine the effects of both progesterone levels and trait-related anxiety scores on ERN amplitude. Progesterone is measured via daily saliva samples, and EEG data is collected at four time-points, each followed by a trait anxiety questionnaire. We hypothesize that both increased progesterone levels and increased trait anxiety scores will be associated with increased ERN amplitude. A potential explanation for the relationship between progesterone and ERN would be that increased progesterone levels cause functional changes in the brain resulting in trait-level increases in anxious symptoms. If this relationship is not supported by our data, it may be that progesterone causes only state-related increases in anxious symptoms.

ROLE OF ENTORHINAL CORTEX NEURONS IN THE CONSOLIDATION AND/OR RECALL OF A COCAINE-CONTEXT MEMORY
Presenter(s): Luis Colon (Michigan State University)
Neuroscience
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 1805
Mentor(s): Alfred Robison (Michigan State University), Andrew Eagle (Michigan State University)

Drugs, like cocaine, hijack the brain's reward circuitry, including a key region called the nucleus accumbens (NAc), leading to the dysfunctional processing of reward and motivation underlying addiction. Reward dysfunction can be mediated by altered afferent neuronal projections to the NAc. Neurons in the

Lateral Entorhinal Cortex (LEC) project to the NAc suggesting that the LEC may be important for mediating cocaine's rewarding effects. Supporting this, previous studies showed that LEC is activated by cocaine cues in cocaine-dependent humans and cocaine self-administering rats. However, it is currently unknown whether this population of LEC neurons that project to NAc (LEC-NAc) are important for cocaine reward. We use cfos immunohistochemistry to show that LEC-NAc neurons are activated by cocaine. Using DREADDs (Designer Receptors Exclusively Activated by Designer Drugs), we further demonstrate that LEC-NAC activity is important for cocaine conditioned place preference (CPP) in mice, a test of cocaine's rewarding effects. We now aim to determine whether LEC-NAc neurons are important for the consolidation and/or recall of a cocaine CPP. To test this hypothesis, we are using DREADDs to inhibit LEC-NAc neuron activity during either cocaine place conditioning (consolidation) or a test of a cocaine CPP (recall). The results of these experiments will tell us whether LEC-NAc neurons are important for the consolidation and/or recall of cocaine place associative memory. Such findings will elucidate the role of LEC neurocircuitry in the development of cocaine addiction.

NOVEL SELECTIVE PEROXISOME PROLIFERATOR ACTIVATED RECEPTOR (PPAR) AGONISTS AS PROMISING TREATMENTS FOR ALZHEIMER'S DISEASE.
Presenter(s): Logan Workman (Ferris State University)
Neuroscience
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 1806
Mentor(s): Tracey Ward (Ferris State College of Pharmacy)

Alzheimer's Disease (AD) is a significant disease facing the aging population as one in every 10 Americans over 65 are living with AD. Current medications on the market only temporarily improve symptoms of the disease but fail to treat the underlying problems. A new promising class of molecules, the thiazolidinediones, selective for the a & d PPAR receptors that have shown potential promise as therapeutic alternatives for AD. These promising molecules have shown improved long and short-term memory in an animal model, improved neural plasticity, decreased beta-amyloid plaques, decreased hyper-phosphorylated tau protein, decreased neuroinflammatory cytokines and improved neural regeneration. There is significant need for novel drug discovery in this field, and these molecules offer an extremely promising alternative for new treatment options.

THE IMPACT OF EXERCISE ON SUBSTANTIA NIGRA DOPAMINE NEURON SURVIVAL IN THE ALPHA-SYNUCLEIN PREFORMED FIBRIL MODEL OF PARKINSON'S DISEASE
Presenter(s): Priscilla Coriano (Interamerican University of Puerto Rico)
Neuroscience
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1811
Mentor(s): Caryl Sortwell (Michigan State University), Irving Vega (Michigan State University)

The degeneration of dopamine (DA) neurons in the substantia nigra and the presence of Lewy Bodies (intracellular aggregates of misfolded α-synuclein) are the two main pathological hallmarks of Parkinsons disease (PD). It is observed that PD patients who engage in frequent exercise can show improved motor function. However, the mechanism behind this improvement has yet to be discovered. Previous preclinical studies that have investigated this issue have not used PD animal models that display both Lewy body-like pathology and nigral degeneration. The α-synuclein pre-formed fibril (?-syn PFF) model results in accumulation of aggregated α-syn followed by nigral degeneration. In the current study we examined whether exercise decreases the extent of nigral degeneration in the α-syn PFF model in rats. A total of 40 young F344 male rats received either unilateral intrastriatal injections of α-syn PFFs or injection of saline as a control. Half of the rats in each surgical treatment group received treadmill exercise (consisting of 5, 30-minute sessions/week) starting one month after surgery and continuing until Month 6. The remaining rats in each surgical treatment group received no exercise. Rats were euthanized at the 6-month time point when PFF injection normally results in loss of approximately 50% of nigral DA neurons.

Postmortem evaluation will include analysis of nigrostriatal DA neuron survival using immunohistochemistry for tyrosine hydroxylase (TH), combined with stereological assessment. This study will determine whether exercise has the potential to prevent or lessen nigrostriatal degeneration induced by α-syn inclusion formation.

THE ROLE OF BETA-ARRESTIN BIASED AGONISM IN NTSR1 TO MODULATE WEIGHT LOSS BEHAVIORS
Presenter(s): Netanya Dennis (North Carolina Central University)
Neuroscience
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1812
Mentor(s): Gina Leinninger (Michigan State University), Jariel Ramirez-Virella (Michigan State University)

Obesity is an ongoing epidemic that increases the likelihood of developing life-threatening type 2 diabetes and cardiovascular disease. However, current treatments have not been effective in tackling the obesity epidemic. Some promise has been seen via systemic Neurotensin (Nts) treatment that largely acts on neurotensin receptor-1 (NtsR1) to induce dual weight loss behaviors by reducing feeding and increasing locomotion. Unfortunately, systemic agonism of NtsR1 also causes detrimental side effects like lowering blood pressure and body temperature. Excitingly, a novel NtsR1 β-arrestin biased agonist, SBI-553, was recently developed that does not produce these deleterious effects but it is yet to be determined how it influences energy balance. We hypothesize that SBI-553 treatment will promote weight loss behaviors in lean and obese mice. To test this we are treating normal weight and diet-induced obese mice with vehicle and SBI-553 while they are in metabolic cages, to assess how the treatment impacts their body weight, feeding, and metabolism. We are also examining whether a vehicle or SBI-553 treatment alters motivated feeding in mice by measuring their operant response to palatable food. Taken together, these findings will reveal if SBI-553 agonism of NtsR1 may be a safe and effective pharmacological approach to promote weight loss and ultimately curb the obesity epidemic.

INVESTIGATING THE ROLE OF NEUROMEDIN S IN THE VENTRAL TEGMENTAL AREA IN MORPHINE BEHAVIORS
Presenter(s): Olivia Dodson (Michigan State University)
Neuroscience
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1813
Mentor(s): Cristina Rivera Quiles (Michigan State University), Michelle Mazei-Robison (Michigan State University)

The opioid crisis in the United States has become an increasing problem within the past few decades. Although we know that the ventral tegmental area (VTA) is responsible for behavioral reward, the heterogenous population of dopamine (DA) neurons in this brain region has limited our understanding of its role in opioid addiction. Thus, we are focused on VTA neurons that express Neuromedin S (NMS), because we have found that NMS expression is increased in VTA DA neurons in mice following chronic morphine administration. This has led us to believe that NMS neurons in the VTA may play a role in morphine addiction. To explore this, we stereotaxically injected viral vectors (Hm3Dq or Hm4Di) into the VTA of mice that allowed us to either activate or inhibit VTA NMS neurons following CNO administration. Our preliminary data suggest that VTA NMS-activated mice are more susceptible to the locomotor stimulatory effects of morphine, whereas mice whose VTA NMS neurons were inhibited showed less morphine induced motor movement. In addition to behavioral studies, we are conducting immunohistochemistry in VTA NMS neurons. By using c-fos as a marker for cell activation and staining for the Hm3Dq virus we confirmed that the NMS neurons are being activated. Additionally, we are determining which percentage of these neurons are also activated by morphine treatment. With further research, we hope to understand the role of VTA NMS neurons in morphine behaviors.

INVESTIGATION OF S100BETA'S IMPACT ON MICE GUT MOTILITY THROUGH VIDEO IMAGING
Presenter(s): Josh Edwards (Michigan State University)
Neuroscience
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1814
Mentor(s): Brian Gulbransen (Michigan State University), Jonathon McClain (Michigan State University)

The gastrointestinal system of our body is home to the enteric nervous system (ENS). Consisting of the myenteric plexus, and the submucosal plexus, this autonomous nervous system is responsible for the detection of chemicals, regulation of vomiting reflex, and coordination of contractions that allow material to be moved along the digestive tract. Inside the enteric nervous system, enteric glial cells (ECGs) are organized into connected ganglia, and dispersed between the myenteric plexus, and submucosal plexus where they are responsible for the modulation of homeostasis, motility, and inflammatory processes inside the gut. Part of carrying out this function involves ECGs releasing various signal molecules, one of which is the S100Beta (S100B) protein. In nervous system, and non-nervous system tissue, this protein is found in the either the cytoplasm, nucleus, or both. In the brain, the action of S100B depends on the concentration that is present in the external cell environment. At nanomolar concentrations, it exerts proliferative and neurogenic effects on astroglia neurons, while at micromolar concentrations it also results in neurodegenerative function, leading to an unregulated increase in glial cell population, increasing neuroinflammation. I plan to investigate the question: How does S100Beta influence motor function in the gut? This study will allow for further understanding of the role that S100B plays in mice gut motor function. With this knowledge, the inflammatory diseases we see in the human gastrointestinal system can be better understood and investigated.

AN AUTOMATED METHOD TO QUANTIFY PROTEIN EXPRESSION AROUND IMPLANTED ELECTRODES
Presenter(s): Blake Evans (Michigan State University)
Neuroscience
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1815
Mentor(s): Cort Thompson (Michigan State University)

Implantable electrode arrays for biomedical applications have fostered life altering treatments, such as cochlear implants and deep brain stimulators. Ideal application of such technologies involves closed-loop systems, where an implanted electrode can monitor physiological activity and deliver therapeutic electrical stimulation. However, detected signals are often lost after long periods of device implantation. One hurdle to in-vivo device success is the foreign body response to an implanted electrode. Studies have shown that the role of different cell types in the tissue response to implanted electrode arrays is incompletely understood. Previously, we performed RNA-sequencing analysis in both acute and chronic implantation conditions in rat brain, and we identified hundreds of differentially expressed genes. This RNA-seq data lacks discrete transcriptomic dynamics of microglia, astrocytes, and oligodendrocytes. In this study, we have demonstrated a novel MATLAB based approach to extract new quantitative metrics on the spatiotemporal patterns of RNA-seq identified proteins in immunohistochemically stained tissue at the device interface by: (1) contrast adjusting and binarizing the target probe and Hoechst for cell counting, (2) classifying these cells as target or non-target based on centroid proximity, and (3) drawing circular regions of interest around each centroid for localized protein intensity analysis. This algorithm presents a way to contextualize RNA-seq by comparing protein expression with alterations in cell density relative to the injury, which broadens our current understanding of how implanted devices interact with surrounding brain tissue. Our results show that the cell-type specificity of RNA-seq identified proteins are dynamic and spatiotemporally expressed around indwelling electrodes.

IL-10 SIGNALING ON SENSORY NEURONS REGULATE INFLAMMATION
Presenter(s): Jesus Rosario-Claudio (University of Puerto Rico - Cayey)
Neuroscience
Section: 2

Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1816
Mentor(s): Geoffroy Laumet (Michigan State University)

Inflammation is a beneficial process designed to suppress threats to the host organism. However, dysregulated inflammation is a central pathological process in diverse disease, stating the importance of understanding the mechanisms that regulate inflammation. One master regulator of inflammation is the anti-inflammatory molecule interleukin (IL)-10. The common view is that the only way for IL-10 to regulate inflammation is by signaling to its receptor (IL- 10R1) on immune cells. We and others have demonstrated that sensory neurons also expressed IL-10R1, opening the possibility that IL-10 regulate inflammation by signaling to sensory neurons. Preclinical works have shown that some sensory neurons regulate several inflammatory conditions. We hypothesize that IL-10 receptors on sensory neurons regulate inflammation. To test this, inflammation was induced in wild type and sensory neurons IL-10R1 knock out (KO) mice by intraperitoneal injection of lipopolysaccharide (LPS). The IL-10R1 KO mice result from crossing AvilCre (Avil-positive cells are sensory neurons) with Il10raflox mice, therefore Cre recombinase removed the gene Il10ra only on sensory neurons. Inflammation was assessed by expression[LG1] of tumor necrosis factor (TNF) and IL-1? by RT-qPCRin the brain, spinal cord, liver, and distal colon to compare the expression of cytokines in the central nervous system and the periphery and associated sickness behaviors. Our results indicate that inflammation was exaggerated by the lack of the IL- 10R1 on sensory neurons. The data reveals a novel neuroimmune mechanism involved in inflammation control and, suggest that targeting sensory neurons may help regulate inflammation locally and prevent systemic immunosuppression.

ROLE OF LEPTIN RECEPTOR EXPRESSING NEUROTENSIN NEURONS IN THE LATERAL HYPOTHALAMIC AREA ON BODY WEIGHT
Presenter(s): Koralee Santiago-Rivera (University of Puerto Rico - Cayey)
Neuroscience
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1817
Mentor(s): Gina Leinninger (Michigan State University), Rabail Khan (Michigan State University), Raluca Bugescu (Michigan State University)

Obesity is caused by excess food intake and reduced physical activity, behaviors that are modulated by heterogeneous neurons within the Lateral Hypothalamic Area (LHA) of the brain. Interestingly, our lab has identified a large population of LHA neurons expressing the neuropeptide neurotensin (Nts, LHANts neurons), whose activation temporarily increases body weight due to water consumption, but later reduces feeding and increases moving that reduces weight. Since LHANts neurons are a molecularly and functionally heterogenous population of cells it is possible that there could be subsets of LHANts neurons that mediate feeding restraint vs. drinking behavior. One such candidate are the LHANts neurons co-expressing the leptin receptor (LepRb), since LepRb is necessary for the anorectic response to leptin and proper body weight (LHANts+LepR neurons). Taken together, we hypothesize that selectively activating LHANts+LepRbneurons will reduce food intake and body weight without invoking the drinking observed with bulk LHANts neuronal activation. To test this, we will inject NtsFlpO :LepRCre mice in the LHA with AAVs to express dual-recombinase excitatory Designer Receptors Exclusively Activated by Designer Drugs (DREADDs) in LHANts+LepR neurons. Mice are analyzed in metabolic cages while treated with vehicle (control) or the DREADD ligand Clozapine-N-Oxide (to activate LHANts+LepR neurons on command), and we measure the effect on food and water intake, locomotor activity and metabolism. This study will reveal if LHANts+LepR neurons selectively promote weight loss without invoking drinking. If true, approaches to augment this neural subset might suggest new cell targets to treat obesity.

THE IDENTIFICATION OF PROTEINS DIFFERENTIALLY ASSOCIATED WITH 4R AND 3R TAU ISOFORMS IN NORMAL AGING AND ALZHEIMER'S DISEASE
Presenter(s): Stephanie Hernandez (University Of Puerto Rico - Humacao)
Neuroscience
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility

Presentation Number: 1821
Mentor(s): Irving Vega (Michigan State University)

Tauopathies are a group of neurodegenerative diseases characterised by the aberrant aggregation of tau proteins, where Alzheimer's disease (AD) is the best known. There are six tau protein isoforms divided in two major groups based on the inclusion of four (4R) or three (3R) microtubule binding repeats. Aggregation of either 4R or 3R tau protein isoforms are a pathological hallmark that distinguishes specific tauopathies. However, how 4R and 3R tau protein isoforms differentially aggregate is still unknown. We hypothesize that 4R and 3R tau protein isoforms may form different interactomes in specific brain regions and disease states. To test this hypothesis, we propose to identify proteins that associate with either 4R or 3R tau, specifically in temporal cortex and cerebellum samples from normal aging and AD cases. Human recombinant 2N4R and 2N3R tau proteins were purified from bacteria and incubated with either temporal cortices or cerebellum protein lysates from three normal aging and AD cases. The recombinant proteins were pulled down and the associated proteins identified by tandem mass spectrometry. This approach allowed us to identify the interactome for 4R and 3R tau in a brain region specific and disease associated manner. Validation and further characterization of the identified associated proteins will contribute to better understanding of the biological and pathological roles of tau proteins in the central nervous system.

MOUSE MOTION TRACKING AND NEURAL ACTIVITY ANALYSIS
Presenter(s): Brighty Renli (Michigan State University), Emma Niebrzydoski (Michigan State University)
Neuroscience
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1822
Mentor(s): Mark Reimers (Michigan State University), Michael Moore (Michigan State University)

In the current state of neuroscience, the relationship between motor activity and neuronal activity remains enigmatic. In this project, we attempt to model the organic spontaneous motions of a small animal using deep-learning software and data modeling techniques as a first step to formulating models reliable enough to explain brain activity. DeepLabCut is a labeling tool used to track the locations of different key points, such as the ears, whiskers, and paws, on video footage of mice. DeepLabCut is a type of neural network; we train a model by labelling the animal's respective body parts on a small collection of video frames. Then we apply the network to automatically annotate these key point locations throughout the entire duration of a recorded video. Errors or glitches can be detected by finding large differences between point locations per frame and fixed by interpolation. We also re-train the neural network by relabeling glitched or problematic frames.
With further refinement, comparing accurately labelled body positions with corresponding neural activity data can help us in understanding the neural activity generating motor activity and movement.

EFFECTS OF CEREBROVASCULAR DISEASE ON AMYLOID PATHOLOGY IN A NOVEL RAT MODEL OF MIXED DEMENTIA
Presenter(s): Geraldine Ortiz (University of Puerto Rico - Cayey)
Neuroscience
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1823
Mentor(s): Scott Counts (Michigan State University)

Alzheimer's disease (AD) is characterized by amyloid plaques and neurofibrillary tangles associated with neurodegeneration in the brain. The interplay between co-morbid cerebrovascular disease (CVD) and AD results in the most common form of mixed dementia, in which the CVD element aggravates clinical AD progression. However, the extent to which CVD impacts the accrual of AD pathological hallmarks such as amyloid plaques remains unclear. To address this question, we are using a mixed dementia rat model generated by crossing the Tg344-19 rat model of AD with spontaneously hypertensive stroke-prone rats (SHRSPs). This project will measure and compare amyloid plaque density in male and female 9-month-old mixed dementia and AD rats (n=4-6/group) to test the hypothesis that CVD potentiates amyloid

pathology in AD. Immunohistochemistry will be performed on select formalin-fixed, paraffin-embedded brain tissue sections using an antibody that detects AD-like amyloid pathology. Slides will be scanned and quantified for hippocampal and cortical amyloid load using HALO image analysis software. This investigation using a novel translational rat model may provide new insights into mechanisms of AD progression and improved therapies for disease modification.

ENVIRONMENTAL AND PHYSIOLOGICAL CHANGES IMPACT SUPRACHIASMATIC NUCLEUS FUNCTION IN FEMALE MICE.
Presenter(s): Fabiola Ramos (Antillean Adventist University)
Neuroscience
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1824
Mentor(s): Hanne Hoffmann (Michigan State University)

The suprachiasmatic nucleus (SCN) is a brain structure in the hypothalamus responsible for translating daylight information into the synchronization of physiological events to a 24h day. Disruptions to the day-night light cycle such as shiftwork are linked with increased reproductive deficits and reduced fertility. Studies have primarily focused on understanding how the SCN in males adapts to environmental changes in light-dark cycles; however, how the female SCN adapts to such changes is poorly understood. To understand this, we exposed female mice to rotating light shifts (RL), which advance and delay the 12h light-12h dark cycle for 6h every 4 days, a light scheudule designed to mimic lighting changes in shift workers. We found that RL reduced by 50% the percentage of females exhibiting estrous cycles, while the other half of the female mice exhibited estrous cycle lengths similar to controls. As vasoactive intestinal polypeptide (VIP) neurons in the SCN are important for translating light cues into the timing of physiological processes, we hypothesize that a reduction of VIP expression and changes in circadian rhythms within the SCN would define RL acyclic females. To measure this, we conducted immunohistological staining to evaluate the levels VIP in control and RL females. To understand if RL alter SCN circadian timekeeping, we measured tissue level circadian rhythms in the SCN using a validated bioluminescent reporter mouse. The results from this work will help us understand the mechanisms by which RL disruption can reduce fertility, providing a foundation for potential treatments to counteract the deletetiouse effects of shiftwork on reproductive function in the future.

DETERMINING THE EFFECTS OF TAU PROTEIN ON THE MEMORY OF NOVEL ODORS
Presenter(s): Yanilis Rodriguez (Interamerican University of Puerto Rico - San German)
Neuroscience
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1825
Mentor(s): Marcia Gordon (Michigan State University)

Tau protein has an important role in the brain, but abnormal phosphorylation causes neurodegenerative disorders including Alzheimer's disease (AD). Our main goal is to determine if tau has a significant impact on memory. We hypothesize Tau will negatively affect mice's (PS19) memory and learning process. To prove it we will compare the behavior of non-transgenic mice and with transgenic mice that over-express a tau protein mutation associated with frontotemporal dementia (PS19) using the Novel Object Recognition test (NOR). This test consists in evaluating the recognition memory of mice when they are exposed to a familiar object or a novel object. Mice have an innate preference for new, therefore we expect to see non-transgenic mice spending more time with novel objects. Contrary, we expect to see impairments in memory in transgenic mice, being unable to distinguish between familiar and new objects. However, one problem with the NOR test is that mice are uninterested in the objects and spend little time interacting with them. For that reason, I will perform a new memory test based on odor recognition. First, I will identify food-based smells that mice like equally to adapt NOR test using odors as cues more salient to the mice. Next, I will compare both test methods to know which test is more accurate to measure memory impairments. It is hypothesized that this new odor recognition task will provide superior identification of memory impairments and could be used to assess the positive effects of potential treatments for AD.

NEUROPEPTIDE ACTIVATION IN A MODEL OF OVERCONSUMPTION: HOW OBESOGENIC CUES INFLUENCE NEURAL ACTIVITY AND MAY CONTRIBUTE TO OBESITY
Presenter(s): Dorothy Zhao (Michigan State University), Kate Sapkowski (Michigan State University)
Neuroscience
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 2202 STEM Facility
Presentation Number: 1826
Mentor(s): Alexander Johnson (Michigan State University), Lauren Raycraft (Michigan State University)

Obesity prevalence in the United States has steadily increased, including a rise in the percent of adults (age 18 and older) who are obese from 27.4% in 2011 to 31.9% in 2020 (CDC). Obesity is a significant risk factor for comorbidities that can lead to preventable, premature death, including complications from COVID-19. Ideally, the body maintains homeostasis by balancing caloric intake and expenditure. However, in our current environment, easily accessible and affordable food tends to be high in sugar and fat. These highly palatable foods are often paired with cues - such as the McDonald's golden arches or "I'm lovin' it" jingle - that signify their availability. Together, these contribute to an obesogenic environment, promoting overconsumption. In the lab, these cues can be modeled in Cue Potentiated Feeding (CPF) in mice, where cues signal the availability of sucrose. In this study, we examined the activation of lateral hypothalamic (LH) cells that produce either Melanin-Concentrating Hormone (MCH) or Orexin (ORX) during overconsumption in the CPF test. Given that both MCH and ORX promote feeding behavior, we expect that these cells will be active during overconsumption. Specifically, we examined differences in the amount and activation of MCH and ORX cells in lean and diet-induced obese (DIO) mice using FOS, an immediate early gene, which indicates cellular activation. Dual-immunofluorescence with FOS and MCH or ORX was used to analyze both the expression of these neuropeptides and their activation. Understanding how these neuropeptides contribute to overconsumption will inform obesity interventions.

PHARMACOLOGY & TOXICOLOGY

CHEMICAL EXPOSURE INDUCED APOPTOTIC CELL DEATH IN OCULAR TISSUE IN MICE
Presenter(s): Andrew Decker (Michigan State University)
Pharmacology & Toxicology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 1901
Mentor(s): Neera Tewari-Singh (Michigan State University)

Chloropicrin (CP) and phosgene oxime (CX) are potent warfare and terrorist threat agents. CP, a choking agent used in World War I, is a widely used pesticide, making it a persistent occupational threat. CX, categorized as a vesicating agent, has effects like urticant or nettle agents, which are rapid and severe due to its highly penetrative property. Ocular tissue is highly sensitive to exposure to these chemicals. The pathophysiology of ocular injuries from these chemicals is not well studied, and no therapies are available. In this study, we are examining the toxic effects of CP and CX exposures on cell death in maximally exposed corneal tissue in mice. Ocular CP exposure (left eye: 20% CP for 1 min; right eye: DMSO control) was carried out in BALB/c mice. For CX, C57BL/6 mice were exposed to CX vapor (10µL CX for 15 sec or 30 sec at MRIGlobal). Clinical observations showed increased periorbital edema, corneal opacity and ulceration upon exposure to these chemical agents. Eyes were harvested at either 24h or 72h post exposure and fixed and processed for analysis. Ocular tissue sections subjected to TUNEL showed an increase in cell death upon both CX and CP exposure in the corneal tissue, which is being quantified and other apoptotic cell death markers are currently being investigated. A better understanding of the apoptotic cell death pathway and damage caused by these chemicals will aid in understanding the toxicity mechanism and into identifying effective treatments for ocular injury from such chemical exposures.

PREDICTING ENDOCRINE DISRUPTING CHEMICALS VIA A HUMAN DERIVED AND METABOLICALLY COMPETENT UTEROTROPHIC ASSAY
Presenter(s): Milady Feijoo (Ana G. Mendez University)
Pharmacology & Toxicology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 1902
Mentor(s): Brian Johnson (Michigan State University), Keri Gardner (Michigan State University)

Human populations are constantly exposed to low levels of endocrine disrupting compounds, including chemicals that disrupt the estrogen receptor signaling pathway. The uterotrophic assay (UA), which measures increased uterine weight in response to estrogenic compounds is the gold standard determinate of potential endocrine disruption of estrogen signaling, but the assay uses large number of animals and is resource intensive. Replacing this in-vivo UA assay with a metabolically competent in-vitro UA would fulfill critical shortcomings in current in-vivo estrogen receptor assays and has the potential to enrich endocrine toxicity data. Our laboratory is developing a high-throughput screening (HTS) assay that mimics the UA and is constructed using human derived Ishikawa cells cocultured with human hepatocytes to incorporate drug metabolism. This work uses quantitative high content imaging to develop new readouts of cellular response to estrogens using a multiplex fluorescent panel to test endpoints. Estrogenic activity is determined by fluorescent imaging probes such as BioTrackerTM Cyp-AP for intra-cellular alkaline phosphatase, lipophilic tracer DiO to visualize cellular membranes, MitoTracker OrangeTM to evaluate active mitochondria and Hoechst 33342 for cellular proliferation. Additionally, Ishikawa cell line heterogeneity and multiplicity will be evaluated. This work aims to yield a more predictive, human specific and metabolically competent in-vitro assay to determine the potential of a chemical or its metabolites to disrupt estrogen signaling.

LUNG INJURY FOLLOWING DERMAL PHOSGENE OXIME EXPOSURE IN SKH-1 HAIRLESS MICE
Presenter(s): Maddie Godziela (Michigan State University)
Pharmacology & Toxicology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 1903
Mentor(s): Neera Tewari-Singh (Michigan State University)

Phosgene oxime (dichloroform oxime; CX) is a potential chemical threat agent. It is categorized with vesicating agents; however, its effects are more like a nettle agent or an urticant. Upon exposure CX has faster penetration compared to other vesicants, leading to rapid onset of severe and prolonged symptoms. CX exposure affects the eyes, skin, and lungs, causing immediate irritation, injury, and systemic toxic effects. Inhalation of CX or its systemic absorption through the skin could lead to pulmonary edema, accompanied by necrotizing bronchiolitis and thrombosis of pulmonary venules. We have shown that dermal CX exposure in SKH-1 mice causes pooling or RBCs in alveolar capillaries of the lungs. In this study, we further analyzed the effect of dermal CX exposure (CX exposure for 0.5 or 1.0 min using two 12 mm vapor caps on the dorsal skin at MRIGlobal) on toxic effects in lungs of SKH-1 hairless mice. Following CX exposure, the mice experienced acute skin lesions and reduction in physiological parameters such as breath rate and heart rate, and mortality at higher exposure duration. Histopathological analyses of the lung tissue showed acute hemorrhage and tissue loss that appeared to progress over time after CX exposure. Extensive coagulation and loss of parenchyma was observed in lung tissues from mice at 8h post 1.0 min CX exposure. CX induced inflammation in lungs was shown by qPCR analysis using the mRNA from the lungs that exhibited increased expression of proinflammatory cytokines TNF-? and IL-6. Studies are being carried out to further analyze the lung injury and inflammation from dermal CX exposure and to understand the mechanism of its toxicity. Together, these studies will assist in designing countermeasures to reduce the lung injury and possible mortality from CX exposure.

USING THRASHING TO COMPARE FERROPTOSIS OF CED-3 VERSUS BLI-3 WORMS.
Presenter(s): Brandon Hall (Michigan State University)
Pharmacology & Toxicology

Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 1904
Mentor(s): Jamie Alan (Michigan State University)

Ferroptosis is a novel cell death characterized by large amounts of iron accumulation and lipid peroxidation. Previous evidence has demonstrated that excessive iron accumulation results in neurological damage, leading to neurodegenerative diseases such as Alzheimer's disease, Parkinson's disease, and multiple system atrophy. Within this study, genetic knockouts of bli-3, a NOX homolog typically involved in promoting ferroptosis, and ced-3, a key enzyme involved in apoptosis, were used as models for these cell death mechanisms in C. elegans. Previous evidence also suggests that wheat-diet worms experience ferroptosis from the toxicity of the wheat. Thus, it is hypothesized the absence of ferroptosis in the bli-3 strain, compared to the ced-3 strain, should demonstrate less neurodegenerative effects in thrashing and life-span of the wheat-diet assays. Thrashing examines an assay for damage to the motor neurons without looking at the actual neurons.

A TRANSLATIONAL MODEL OF MOXIFLOXACIN-INDUCED QT INTERVAL PROLONGATION
Presenter(s): Evan Hughes (Michigan State University)
Pharmacology & Toxicology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 1905
Mentor(s): Adam Lauver (Michigan State University)

The United States Federal Drug Administration (FDA) requires pharmaceutical companies to provide safety data in animals demonstrating that new drugs do not induce QT interval (QT) prolongation of the electrocardiogram. QT is a biomarker used to predict whether a drug is arrhythmogenic. The FDA requires positive controls (drugs that are known to prolong QT) to demonstrate that these safety studies were of sufficient sensitivity to detect the changes in QT. Moxifloxacin is a fluoroquinolone antibiotic known to induce QT prolongation in animals and humans. We hypothesize that moxifloxacin induces a predictable prolongation of QT which is directly correlated to dose and subsequent plasma concentrations. The aim of this study was to develop a translational model of moxifloxacin-induced QT interval prolongation (QTp). We conducted a literature review of studies evaluating the effects of moxifloxacin on QT in canines, non-human primates (NHPs), and humans. We recorded the QTp effects observed at each moxifloxacin dose in the study. A translational model based on the dose/QTp relationship was developed to describe the effects of moxifloxacin dose on QTp in each species. Our results confirm the dose-dependency of the moxifloxacin-associated QTp effect in canine, NHPs, and humans. This information will be used in preclinical cardiovascular safety studies to identify appropriate doses of moxifloxacin and their associated effects on QTp.

DREADD RECEPTOR INDUCED HYPERTENSION AND HYPERALDOSTERONISM IN MICE ACCELERATES COGNITIVE IMPAIRMENT:
Presenter(s): Evan Johnson (Michigan State University)
Pharmacology & Toxicology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 1906
Mentor(s): Theresa Lansdell (Michigan State University)

Hypertension is a major risk factor for the development of dementia. This risk is only present if hypertension occurs throughout midlife. Unfortunately, hypertension research has primarily been conducted in young male hypertension models. Recently, an adrenal specific Gq-coupled designer receptors exclusively activated by designer drugs (DREADDs) mouse model of primary aldosteronism was developed. Hyperaldosteronism is a common cause of hypertension. This model will be useful in understanding the combined effects of hypertension and aging. Clozapine N-oxide treatment of AS+/Cre hM3Dq mice during midlife will result in hyperaldosteronism, hypertension, and cognitive impairment. AS+/Cre hM3Dq and AS+/+ hM3Dq nine-month-old male and female mice were treated with clozapine N-

Oxide for three weeks. Fecal aldosterone concentration, mean arterial pressure (MAP) were measured. Behavioral tests were used to assess working memory, spatial memory, anxiety, and locomotion. Fecal aldosterone concentration in AS+/+ hM3Dq males was 23.35±4.08 pg/g and 69.88±14.62 pg/g in AS+/CrehM3Dq males. In AS+/+ hM3Dq females, fecal aldosterone was 27.66±3.38 pg/g and 512.90±175.80 pg/g in AS+/CrehM3Dq females. MAP of AS+/+ hM3Dq males was 98.50±13.94 mmHg and 146.4±14.17 mmHg in AS+/Cre hM3Dq males. MAP of AS+/+ hM3Dq females was 108.4±14.09 mmHg and 155.3±19.70 mmHg in AS+/Cre hM3Dq females. Studies are currently ongoing for changes in working and spatial memory. This preliminary study indicates that both male and female CNO treated AS+/Cre hM3Dq mice develop hyperaldosteronism and hypertension during midlife. Future data will indicate if these conditions cause cognitive impairment.

HOW TCDD-ACTIVATED AHR AFFECTS THE LIVER CIRCADIAN RHYTHMS
Presenter(s): Brenely Rivera (Ana G. Mendez University)
Pharmacology & Toxicology
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 1907
Mentor(s): Daniel Marri (Michigan State University), Sudin Bhattacharya (Michigan State University)

The aryl hydrocarbon receptor (AHR) is a cytosolic protein and transcription factor that acts as an environmental sensor. Exposure to environmental AHR ligands such as 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) can lead to liver toxicity and metabolic disease. TCDD is one of the most potent toxicants known, with the primary route of human exposure being through ingestion of food. The circadian clock is a molecular mechanism that synchronizes gene expression, physiology, and behavior with the 24-hour solar day. Recent studies have suggested, AHR can alter the expression pattern of clock genes in the liver and disrupt metabolic homeostasis. Additionally, disruption of the circadian clock genes can lead to heart disease, diabetes, bipolar disorder, and cancer. Our goal is to understand the role of AHR activation in regulating the circadian clock genes in the liver. To test this, we are developing an ordinary differential equation-based mathematical model of the interactions of the genes in the circadian clock mechanism and the perturbation of these interactions by TCDD. The model will be developed and analyzed using computational tools CompuCell3D, MATLAB, and Python.

HEMATOLOGICAL CONSEQUENCES OF DERMAL EXPOSURE OF CHEMICAL THREAT AGENT
Presenter(s): Ellen Kim (Michigan State University)
Pharmacology & Toxicology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1911
Mentor(s): Neera Tewari-Singh (Michigan State University)

Sulfur mustard (SM) is a vesicating agent that causes severe toxic effects and inflammation when absorbed through the skin. Nitrogen mustard (NM) is a structural analog of SM and causes similar but less severe toxicity. Currently, no mustard-specific therapy exists. Previous studies have shown that SM causes toxic effects in hematological cells and bone marrow. As these effects have not been fully characterized, investigating the hematologic consequences of exposure to NM can further our understanding of the mechanisms of mustard toxicity. C57BL/6 mice were topically exposed to 0.5 mg or 1.0 mg of NM in 100 µL of acetone. Body condition and survival of the mice were monitored up to 28 days post-exposure. Mice were sacrificed at different time points post NM-exposure. Blood was collected and analyzed using the IDEXX ProCyte Dx Hematology Analyzer. NM exposure caused transient toxic effects on the bone marrow which recovered over the subsequent days/weeks. 0.5 mg NM caused lymphopenia and decreased eosinophils, RBCs, hemoglobin, and reticulocytes at 24h post exposure. Lymphocytes and eosinophils recovered at later time points, while RBCs and hemoglobin did not. 1.0 mg NM also caused lymphopenia and decreased RBCs, MCV, reticulocytes, eosinophils, and basophils. Neutrophilia was observed at 24h post 1.0 mg NM-exposure. Our results indicate NM induces specific effect on hematopoiesis possibly by modulating specific pathways, which could be involved in NM-induced

inflammatory responses. Based on the initial findings, further investigations are being carried out to fully characterize these hematological changes which could contribute towards development of effective countermeasures.

ANALYZING PFAS CONCENTRATIONS IN GREAT LAKES FISH
Presenter(s): Krishna Kottai (Michigan State University)
Pharmacology & Toxicology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1912
Mentor(s): Ankita Bhattacharya (Michigan State University), Courtney Carignan (Michigan State University)

Due to their surfactant properties and chemical stability, perfluoroalkyl substances (PFAS) are used throughout a variety of industries such as the military and automotive. However, these chemicals are persistent in the environment and difficult to dispose of. PFAS often contaminate lakes, rivers, and other bodies of water and end up in fish tissue. Increasing knowledge about potential risks of PFAS raises concerns of the risks of human exposure. This study aimed to expand the knowledge regarding PFAS in Great Lakes water and fish by accumulating data from previous studies. We analyzed concentrations of PFAS analytes in water and fish, along with the fish type and location. We estimated Great Lakes fish would contain elevated levels of PFAS due to the industrial prevalence in the area. Across various samples and studies, perfluorooctane sulfonate (PFOS) was found in the highest concentration in water, followed by perfluorooctanoic acid (PFOA). Perfluorononanoic acid (PFNA) was detected in low concentration. In fish, PFOS concentrations were the highest, followed by PFNA, with PFOA in lower concentrations. Compared to the other lakes, Lake Erie fish (?96 ng/g) and water (?5.46 ng/L) had higher levels of analytes on average, while Lake Superior fish (?13.7 ng/g) and water (?0.65 ng/L) had lowest levels. Using New Jersey's PFAS fish health advisory for PFNA (<1.6 ng/g) and PFOS (<3.9 ng/g), consumption of trout and walleye should be limited to once per week per 8oz meal. Future studies should utilize questionnaires to determine how much fish communities across the Great Lakes region consume.

EFFECT OF HYPERTENSION AND AGING ON 11-BETA-HYDROXYLASE EXPRESSION IN ADRENAL GLANDS OF SPONTANEOUSLY HYPERTENSIVE/STROKE PRONE RATS
Presenter(s): Ally Lewis (Michigan State University)
Pharmacology & Toxicology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1913
Mentor(s): Anne Dorrance (Michigan State University), Theresa Lansdell (Michigan State University)

Cortisol is an adrenal steroid that is essential for the maintenance of normal blood pressure. Sustained periods of stress can result in hypercortisolism. Hypercortisolism results in increased blood pressure and has been attributed to cognitive impairment in Cushing's patients. Hypertension results in chronic cerebral hypoperfusion via small vessel disease and is a major risk factor for vascular dementia. It is possible that the hypothalamic-pituitary-adrenal axis (HPA) can be activated under cerebral hypoperfusion resulting in a cycle of hypertension, HPA-activation, and hypercortisolism. We hypothesized that aging hypertensive rats would have increased corticosterone production compared to younger or normotensive rats. We measured blood pressure, adrenal weights, CYP11B1 mRNA expression, and adrenal 11-?-Hydroxylase immunopositivity in aging SHRSP rats. CYP11B1 mRNA expression was higher in six-month-old male and female spontaneously hypertensive rats/stroke-prone (SHRSP) compared to Sprague Dawley normotensive controls (SD; male SHRSP 14.44±1.44 fold change from control, P=0.0009; female SHRSP 710±59 fold change from control, P=0.0016). Fecal corticosterone content was higher in SHRSP compared to age matched controls (Male SD vs. SHRSP: 167±29 pg/g vs. 1091±166 pg/g, P<0.0001; Female SD vs. SHRSP: 134±19 pg/g vs. 376±47 pg/g, P=0.0017). We are currently performing immunohistochemistry and qPCR experiments to determine if CYP11B1 mRNA and its gene product, 11-?-hydroxylase, expression is increased in the adrenal glands of aged SHRSPs compared to younger SHRSPs. These results indicate hypertension is associated with increased production of corticosterone in SHRSP.

THE EFFECT OF HYPERTENSION ON CAROTID ARTERY STRUCTURE IN MALE AND FEMALE C57BL6 MICE
Presenter(s): Sarah Lucas (North Carolina Agricultural & Technical State University)
Pharmacology & Toxicology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1914
Mentor(s): Laura Chambers (Michigan State University)

Hypertension results in inward hypertrophic remodeling in peripheral arteries, leading to vascular insufficiency. Reduced blood flow through carotid arteries can result in cerebral hypoperfusion and cognitive decline. The impact of biological sex on hypertension-induced vascular damage is not well understood. We tested the hypothesis that hypertensive mice would have carotid arteries with reduced lumen diameter and increased wall thickness compared to normotensive controls. Sixteen-to-eighteen-week-old male and female C57BL6 mice were implanted with angiotensin II (AngII)-filled osmotic minipumps to induce hypertension. Male mice were treated with 800ng/kg/min AngII, and female mice were treated with either 800ng/kg/min or 1200ng/kg/min AngII. Blood pressure was measured using tail-cuff plethysmography. Carotid artery structure was assessed using Masson's trichrome staining and Image J software. Systolic blood pressure was elevated in AngII-treated male mice and in 1200ng AngII-treated female mice. Preliminary data suggests AngII-hypertension may increase carotid artery wall thickness in male but not female mice. AngII-hypertension may also reduce lumen diameter and area in carotid arteries of male but not female mice. Appropriate blood flow to the brain is essential for cognitive function. Understanding sex differences in hypertension-associated vascular disease is critical for developing effective therapeutic strategies.

EFFECT OF NRF2 ACTIVATORS ON NITROGEN MUSTARD INDUCED DECREASE IN SKIN EPIDERMAL CELL VIABILITY AND PROLIFERATION
Presenter(s): Elizabeth Mateo Pagán (Ana G. Mendez University)
Pharmacology & Toxicology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1915
Mentor(s): Andrew Roney (Michigan State University), Neera Tewari-Singh (Michigan State University)

Nitrogen mustard [bis(2-chloroethyl) methylamine (HN2, NM)] and sulfur mustard [bis(2-chloroethyl) sulfide] are chemical threat and warfare agents that possess strong bifunctional alkylating and blistering properties. These chemicals induce skin vesication, inflammation, necrosis and long-term skin injuries. Currently, we possess no targeted therapies specific for mustard exposure-induced skin injuries. Previous studies have indicated that NM skin exposure activates pathways related to inflammation, oxidative stress, and DNA damage. Therefore, therapies that promote anti-inflammatory and anti-oxidative pathways, such as the nuclear factor erythroid 2-related (Nrf2) pathway, may be of significant benefit in treating NM exposure induced-skin injuries. Triterpenoids are among the most potent known inducers of the heme oxygenase-1 (HO-1) enzyme and the Nrf2 cytoprotective pathway. We are testing the efficacy of synthetic oleanane triterpenoids in reversing toxic chemical exposure induced ocular injury. In the current study, we will test the efficacy of the triterpenoids, 2-cyano-3,12-dioxooleana-1,9(11)-dien-28-oic acid (CDDO)-methyl ester (CDDO-Me; bardoxolone methyl), and dicyanotriterpenoid 2-cyano-3,12-dioxooleana- 1,9(11)-dien-28-onitrile (TP-225) in mouse skin keratinocytes (JB6 epidermal cells). The JB6 cells will be either pre-treated with triterpenoids or treated 30min/2h after NM exposure, and cell viability and proliferation (DNA synthesis) will be measured at 24 h after NM exposures. Further molecular studies will be carried out based on the outcomes of this study. These studies will help identify a potent triterpenoid that could be further tested in in vivo vesicating agents'-induced skin injury models, to identify an effective targeted therapy to counteract vesicant skin injury.

INHIBITION OF CYTOKINE PRODUCTION IN DENDRITIC CELLS BY THE NRF2 ACTIVATOR, TBHQ, IN FEMALE C57BL/6 MICE
Presenter(s): Kelly Montanez (University of Puerto Rico - Mayagüez)

Pharmacology & Toxicology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1916
Mentor(s): Cheryl Rockwell (Michigan State University)

Tert-butylhydroquinone (tBHQ) is a food additive and antioxidant used to extend shelf life. It is commonly found in cooking oils, crackers, and frozen fast food. In addition, tBHQ activates the nuclear factor erythroid 2-related factor 2 (Nrf2). Nrf2 is a master regulator of oxidative stress and modulates inflammatory genes as a cytoprotection mechanism. tBHQ inhibits T cell, NK cell, and B cell functions in a Nrf2-dependent manner, marked by a decrease in IL-2 and IFN-? production, a decrease in cell activation, and an increase in IgM antibody. However, the effects of tBHQ on dendritic cells (DCs) has not been well explored. The reduced inflammatory function of immune cells in the presence of tBHQ presents a major health risk for susceptibility to pathogens. Since Influenza A virus is one of the most common and deadliest viral infection in the world and given the effects of tBHQ on other immune cells, we hypothesize that tBHQ decreases DC cytokine productions such as IL-6, IL-12, and TNF-a in a Nrf2-dependent manner. Splenocytes were collected from wildtype and Nrf2 knockout C57BL/6 mice and treated with 0.005% EtOH, 0.05 µM tBHQ, 1 µM tBHQ, or 5 µM tBHQ for 30 mins prior to activation with influenza A virus for 24 hours. Supernatants were collected and will be used to perform ELISAs for the cytokines IL-12, IL-6, and TNF-a to determine tBHQ-induced changes in DC function.

THE TRITERPENOID CDDO-METHYL ESTER POLARIZES HUMAN LUNG TUMOR-EDUCATED MACROPHAGES
Presenter(s): Jannaldo Nieves (University of Puerto Rico - Arecibo)
Pharmacology & Toxicology
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 1917
Mentor(s): Jess Moerland (Michigan State University), Karen Liby (Michigan State University)

Lung cancer is the leading cause of cancer deaths in the United States. Most cancer treatments have limited efficacy and adverse side effects, so there is a need for the development of new treatments for lung cancer. Macrophages are the most common immune cell in lung cancer and are potential therapeutic targets because they can change to either an anti-tumor or tumor-promoting phenotype. Anti-tumor macrophages are pro-inflammatory and rely on cytoprotective mechanisms to maintain their phenotype. The Nrf2 pathway is a master regulator of oxidative stress and activators of this pathway have anti-cancer effects in preclinical cancer models. The triterpenoid CDDO-Methyl ester (CDDO-Me) is a potent, well-tolerated Nrf2 activator that has advanced to human clinical trials. Previous studies have shown that CDDO-Me polarizes mouse tumor-educated macrophages from a pro-tumor phenotype to an anti-tumor phenotype in vitro, which may explain the reduced tumor burden in mouse cancer models. To test the effects of CDDO-Me in human macrophages, THP-1 differentiated macrophages were cultured in conditioned media from human lung cancer cancers to induce a pro-tumor phenotype, then treated with CDDO-Me. In this model, CDDO-Me increased mRNA expression of the pro-inflammatory cytokines TNFa and IL-6 and decreased mRNA expression of the angiogenic factor VEGF and the chemokine CCL2, indicating a switch from a pro-tumor phenotype to an anti-tumor phenotype. Importantly, these data are consistent with observations from previous studies in mouse macrophages and show that CDDO-Me can polarize human lung tumor-educated macrophages to an anti-tumor phenotype and may reduce human lung tumor burden.

CLOPIDOGREL INDUCES MORE BLEEDING IN P2Y12-DEFICIENT MICE.
Presenter(s): Taylor Rabanus (Michigan State University)
Pharmacology & Toxicology
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 1921
Mentor(s): Adam Lauver (Michigan State University)

Arterial thrombosis remains the most common cause of death in the developed world. Clopidogrel, a P2Y12 antagonist, is often prescribed to inhibit platelet activation and aggregation; however, patients who take clopidogrel are known to have cerebral bleeding events. The purpose of this study was to determine if the clopidogrel bleeding effect is dependent on P2Y12 receptor inhibition. Previous research from our laboratory suggests that clopidogrel possesses inhibitory effects on hemostasis independent of platelet P2Y12 inhibition. We hypothesized that P2Y12-deficient mice treated with clopidogrel will bleed significantly more than the P2Y12-deficient mice treated with the vehicle. A tail-bleeding assay was used to determine clopidogrel's effect on hemostasis. P2Y12 deficient mice were administered clopidogrel (10 mg/kg) or vehicle daily for five days before the procedure was performed. Bleeding was evaluated using a tail amputation assay. After tip amputation, the tail was quickly placed in a tube containing Drabkin's reagent. Blood loss was determined by measuring the concentration of hemoglobin in the tube using a standard curve. Our data demonstrate that clopidogrel induced more bleeding in the P2Y12 deficient mice. These results suggest that clopidogrel's bleeding effect is not completely dependent on the P2Y12 receptor inhibition. Other elements in the hemostatic system, such as the vessel-related factors, could be responsible for the observed clopidogrel bleeding effects.

MODIFYING THE LINKER OF SOLUBLE EPOXIDE HYDROLASE INHIBITORS IMPROVES BLOOD BRAIN BARRIER PENETRATION AND DRUG-LIKE PROPERTIES
Presenter(s): Megan Shuck (Michigan State University)
Pharmacology & Toxicology
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 1922
Mentor(s): Kin Sing Lee (Michigan State University)

Soluble epoxide hydrolase (sEH) is a cytosolic enzyme that degrades largely beneficial endogenous epoxy-polyunsaturated fatty acids to their corresponding pro-inflammatory dihydroxy-polyunsaturated fatty acids and plays an important role in Alzheimer's disease (AD). Recent epidemiology studies show that sEH levels in AD brains is at least two times higher than that of healthy controls. Additionally, using sEH inhibitors as treatment alleviates AD pathology in an animal model of AD. However, the leading compound, TPPU, has poor drug-like properties and a low blood brain barrier (BBB) penetration. We hypothesized that modifying the linker of sEH inhibitors will improve the BBB penetration, lower the melting point, and increase the solubility to develop a better candidate for AD treatment in a mouse model. The new inhibitors were synthesized to identify linkers that increase solubility, decrease melting point, and improve BBB penetration. Additionally, we will use the Central Nervous System Multiparameter Optimization (CNS-MPO) to predict whether the newly synthesized compounds have an increase in CNS exposure. CNS-MPO is a system that analyzes the properties of neurological drugs and their central nervous system exposure. In this presentation, we will show that by modifying the linker of sEH inhibitors, we reduced the crystal packing to achieve a higher solubility and lower melting point than previous inhibitors. We also found that specific modification of the linker of sEH inhibitors improves BBB penetration. Therefore, the new sEH inhibitors could be a better lead candidate for treating AD.

THE IN VITRO EFFECT OF PER AND POLYFLUOROALKYL SUBSTANCES ON GAP JUNCTIONAL INTERCELLULAR COMMUNICATION IN WB-F344 RAT LIVER EPITHELIAL CELLS
Presenter(s): Alanis Torres (University of Puerto Rico - Mayagüez)
Pharmacology & Toxicology
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 1923
Mentor(s): Brad Upham (Michigan State University)

Per and polyfluoroalkyl substances (PFAS) are environmentally persistent compounds used in many commercial and industrial products. Some types of PFAS such as perfluorooctanoate (PFOA) were shown to promote tumors in rodent livers. To assess the toxic effects of these contaminants, we will determine if PFAS will dysregulate gap junctional intercellular communication (GJIC), which is a crucial mechanism needed to maintain tissue homeostasis. Uncontrolled cell proliferation requires the chronic closure of gap junction channels, which is a hallmark phenotype of tumor promotion. PFAS of carbon

chain lengths of 7-10 carbons can promote tumors and inhibit GJIC. Thus, we hypothesize th at perfluorohexanoic acid (PFHxA) will inhibit GJIC in a F344 rat liver oval cell line (WB-F344). We will compare the PFHxA effects to the known inhibitory effects of perfluorohexanesulfonic acid (PFHxS), PFOA and perfluorooctanesulfonic acid (PFOS). In addition, we will determine the underlying cell signaling mechanism of how PFHxA and PFHxS closes gap junction channels. GJIC was assayed using the scalpel load-dye transfer assay to determine dose and time responses to the various PFAS. For the future mechanism studies, we will pretreat cells with inhibitors of signaling proteins known to regulate GJIC. Blockage of signaling proteins will aid in the discovery of a pathway that mediates PFAS-induced inhibition of GJIC.

IS THE DEVELOPMENT OF A 5-HYDROXYTRYPTAMINE RECEPTOR SPECIFIC ANTIBODY POSSIBLE?
Presenter(s): Will Tragge (Michigan State University)
Pharmacology & Toxicology
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 1924
Mentor(s): Stephanie Watts (Michigan State University)

The 5-hydroxytryptamine (5-HT, serotonin) 7 receptor is responsible for the fall in blood pressure when 5-HT is infused chronically or acutely in rats. Determining tissue-specific receptor expression would aid in understanding mechanisms that support the 5-HT7 receptor-mediated fall in blood pressure. After testing over a dozen commercially available 5-HT7 antibodies, none have been unable to discriminate between wildtype (WT) and knockout (KO) rats. This is a common problem observed in antibodies targeting G-coupled protein receptors (GPCRs) of which the 5-HT7 receptor is one. We contracted with 7TM antibodies (Germany) to develop a 5-HT7 receptor specific antibody. Three different antigens were used in rabbits to generate antibodies, one targeting the C terminus and two the third internal loop. Upon receiving these nine antibodies, they've been tested in the following ways; Western and immunocytochemical (ICC) analysis of both r5-HT7 receptor expressing HEK293 cells and WT and KO thalamic brain tissues, as well as immunohistochemical (IHC) analyses of brains from 5-HT7 receptor WT and KO rats. In both westerns and IHC, there was no specificity of signal between WT and KO tissues. However, when using transfected HEK293 cells in Westerns, a strong concentration dependent binding between transfected and non-transfected cells was observed with antibodies that targeted the far C terminus only. This correlation was also observed in ICC analysis with a flag antibody showing colocalization on the membranes of transfected HEK293 cells. Future studies will look at quantification of a specific transfection rate to determine which antibodies have the highest specificity of signal.

REPRODUCTIVE SCIENCES: HOW LACK OF RESEARCH-BASED FOCUS LEADS TO DISCREPANCIES IN HEALTHCARE AND TREATMENT OPTIONS
Presenter(s): Sophie Vanderweele (Michigan State University)
Pharmacology & Toxicology
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 1925
Mentor(s): Jeremy Prokop (Michigan State University)

Reproductive sciences, especially female physiology, is poorly understood. With the rapidly growing scientific community both in academia and biomedical research companies, the priority does not lie in filling the voids of knowledge that impact so much of female health. The review article utilizes a three-pronged approach to analyze public databases through the National Institutes of Health (NIH). A history of current and past clinical trials, published articles (PubMed), and variants (eQTL, sQTL, and Clinical Variants) were analyzed to discover how research trends impact healthcare options. This article is meant to amplify the discrepancies between male and female-focused research and highlight the need for expansive research.

THE EFFECTS OF 2,3,7,8-TETRACHLORODIBENZO-P-DIOXINON CHOLESTEROL BIOSYNTHESIS IN HEPARG CELLS
Presenter(s): Amanda York (Wayne State University)
Pharmacology & Toxicology
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 1926
Mentor(s): John LaPres (Michigan State University)

2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) is an environmental contaminant that is linked to various adverse health effects including chloracne, metabolic syndrome, and liver injury that is similar to nonalcoholic fatty liver disease (NAFLD). TCDD elicits most, if not all, of its effects through the Aryl Hydrocarbon Receptor (AHR) signaling pathway. The AHR is a ligand activated transcription factor that binds planar aromatic hydrocarbons, including TCDD, and alters expression of a large battery of genes, including 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase (HMGCR). HMGCR is the rate limiting enzyme of cholesterol synthesis and TCDD suppresses its expression thus altering cholesterol levels. Interestingly, cholesterol dysregulation is also associated with metabolic syndrome and NAFLD. Therefore, there is a connection between AHR signaling, cholesterol biosynthesis, and TCDD-induced liver injury. This project is focused on gaining a mechanistic understanding of this connection using a human hepatocyte cell line HepaRG. The hypothesis of this project is that TCDD treatment will repress the expression of genes involved in cholesterol biosynthesis in human hepatocytes. In this project, HepaRG cells were treated with and without TCDD (10 nM) and the expression of genes that encode key metabolic enzymes were analyzed by quantitative real time PCR. Results showed that TCDD treatment does alter the expression of genes that encode key cholesterol enzymes, including HMGCR, in HepaRG cells. This suggests that TCDD exposure impacts cholesterol homeostasis in humans and that people suffering from cholesterol dysregulation are more prone to AHR-mediated liver injury.

PHYSICAL & MATHEMATICAL SCIENCES

THE HF-W RADIOGENIC SYSTEM IS THE KEY TO UNDERSTANDING THE FORMATION OF THE EARTH'S CORE
Presenter(s): Scarlett Abreu (Rutgers University)
Physical & Mathematical Sciences
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2001
Mentor(s): Gabriel Nathan (Michigan State University), Seth Jacobson (Michigan State University)

Earth's core formed when denser molten iron sank towards its center through less dense magma. As accreted metal from the cores of impactors fell through this magma ocean and into the Earth's center, this liquid metal chemically equilibrated with the silicate mantle establishing the composition of our planet's mantle and core. Lithophile elements like hafnium remained with the silicate mantle while siderophile elements like tungsten went with the iron to the core. 182-hafnium (182Hf) is a radioactive isotope that decays into 182-tungsten (182W) with a half-life of 8.9 million years. Here, we present a model of the radioactive Hf-W system to understand if the core of Earth was formed before or after most of the 182Hf had decayed to 182W. If the core was formed before the hafnium had decayed, then the resulting tungsten will not be able to go with the iron to the core. However, if the core was formed after the hafnium had decayed, then the resulting tungsten will be able to go with the iron to the core. We built a computational model to gain a deeper understanding of the Hf-W relationship when considering the role of multiple core-forming impacts and their timing.

IMPACT OF EARLY GIANT INSTABILITIES ON TERRESTRIAL PLANET FORMATION
Presenter(s): Sanskruti Admane (The Ohio State University)
Physical & Mathematical Sciences
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility

Presentation Number: 2002
Mentor(s): Seth Jacobson (Michigan State University)

For successful terrestrial planet formation, a given scenario must match the following observable constraints: the small eccentricities of planetary orbits, the masses of the terrestrial planets, specifically Mars' small mass, the structure of the asteroid belt, Earth's large water content, and the formation timescales of Earth and Mars. Most models of planetary formation have assumed simple merging, producing results that do not satisfy all observable constraints. To better match these constraints, we consider an early instability scenario triggering a giant impact phase, which creates more desirable outcomes. Here, we are investigating whether the debris created by giant impacts during terrestrial planet formation significantly changes the results compared to already published work that assumed perfect merging. We are using an astrophysical N-body integrator to model the dynamics of bodies in the protoplanetary disk and we model the outcomes of debris-producing collisions using an algorithm that is a function of their mass ratio, impact angle and velocity (Leinhardt & Stewart, 2009). These simulations will describe the change in mass, eccentricity and semimajor axes of the created debris particles. We will compare the constructed solar systems with published perfect merging simulations (e.g. Clement et al. 2018) and reality.

COUPLING A HYDRODYNAMIC MODEL OF THE MOON-FORMING GIANT IMPACT TO AN ASTROPHYSICAL N-BODY MODEL TO FULLY SIMULATE THE FORMATION OF THE MOON
Presenter(s): Brenna Chetan (Michigan State University)
Physical & Mathematical Sciences
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2003
Mentor(s): Seth Jacobson (Michigan State University)

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 giant 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. While recent smoothed particle hydrodynamics (SPH) models at high resolutions of around 108 particles have led to many insights regarding the impact process itself, these simulations can only be run for hours of simulated time due to their extreme computational cost. However, the accretion of the Moon from the formed circumplanetary disk takes centuries to millennia. Here, we coupled SPH giant impact models to an astrophysical N-body code that has been developed to include circumplanetary disk physics to understand how specific impact models correspond to the final accreted Moons. Our results will have applications beyond just replicating the Earth-Moon system, and by varying aspects of the giant impacts that create the circumplanetary disks, we will gain a better and more extensive understanding of what kinds of moons form from them.

THE DELTA-CROSSING NUMBER FOR LINKS
Presenter(s): Zachary Duah (Andrews University)
Physical & Mathematical Sciences
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2004
Mentor(s): Anthony Bosman (Andrews University)

An m-component link is an embedding m of circles into 3-dimensional space; a 1-component link is called a knot. The diagram for a link may be drawn so that all crossings occur within delta tangles, collections of three crossings as appear in a delta move. The delta crossing number is defined to be the minimal number of delta tangles in such a diagram. The delta crossing number has been well-studied for knots but not for links with multiple components. We determine the delta crossing number for 2-component links with up to 8 crossings as well as for an infinite family of 3-component links with unknotted components. Moreover, we prove that the difference between the delta crossing number and delta unlinking number can be arbitrarily large.

COMMISSIONING OF RESONANCE IONIZATION SPECTROSCOPY EXPERIMENTS
Presenter(s): Eren Erdogan (Michigan State University)
Physical & Mathematical Sciences
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2005
Mentor(s): Kei Minamisono (Michigan State University)

At the BEam COoling and LAser spectroscopy (BECOLA) facility at FRIB/MSU, one of the most critical properties of a nucleus e.g. its shape and size is determined for short-lived rare isotopes. Such nuclear structure information can be obtained from atomic spectra measured by laser spectroscopy, and different shapes of nuclei have different spectrum patterns. A new experimental technique called, Resonance ionization spectroscopy experiment (RiSE), is currently being developed at BECOLA, where atoms are ionized using multi-color laser lights. As prerequisites for the experiment on rare aluminum isotopes, measurements on stable 27Al are performed. I analyze a part of the data on the resonance spectrum. Details of the experimental setup and the result of the analysis will be discussed.

UNDERSTANDING ELECTRON TRANSFER AND NO ASSEMBLY AT COPPER SITES
Presenter(s): Alexa Ford (Case Western Reserve University)
Physical & Mathematical Sciences
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2006
Mentor(s): Pokhraj Ghosh (Michigan State University), Timothy Warren (Michigan State University)

Nitric oxide (NO) is an important signaling agent involved in various physiological processes. Moreover, reduction of NO to physiologically benign nitrous oxide (N2O) is an important step in the denitrification process of the global nitrogen cycle. Various nitric oxide reductases (NORs) perform a combination of substrate (NO)-binding and electron transfer steps for NO reduction. The mononuclear type II site of copper nitrite reductase (CuNiR), evolutionarily tuned for the reduction of NO2- to NO, further reduces NO to N2O under high NO flux, presumably with the help of electron transfer from the adjacent type I site. We study NO assembly at a single [CuI] center supported by a β-diketiminate ligand. The electronics of the β-diketiminate ligand, [RR'NNF6]H, can be adjusted by changing the substituents on the aryl group (where R or R' = Cl or iPr). Tuning the electronics of the ligand differentiates a mono-nitrosyl or di-nitrosyl assembly at [Cu]. These reactive intermediates can be stabilized by an external 1-electron reductant to give mono-nitrosyl {[Cu](NO)}- or cis-hyponitrite {[CuII](k2-O2N2)}[CuI]- intermediates, with electron-deficient and relatively electron-rich β-diketiminate ligands, respectively. These intermediates are being characterized by XRD, IR, EPR and CV studies. While N2O is produced upon protonation of {[CuII](k2-O2N2)}[CuI]-, similar studies are being pursued for {[Cu](NO)}-. These findings highlight how the electronic structure of the copper complexes can mechanistically control electron-transfer process, thereby demonstrating the role of NO as a signaling agent. The β-diketiminate ligand is also being modified by attaching a ferrocenyl moiety as an intramolecular electron-transfer group for stabilizing NO assembly.

SELF AND MIXED DELTA MOVES ON ALGEBRAICALLY SPLIT LINKS
Presenter(s): Devin Garcia (Andrews University)
Physical & Mathematical Sciences
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2007
Mentor(s): Anthony Bosman (Andrews University)

A link is an embedding of circles into 3-dimensional space. A Delta-move is a local move on a link diagram. The Delta-Gordian distance between links measures the minimum number of Delta-moves needed to move between link diagrams. We place restrictions on the Delta-move by either requiring the move to only involve a single component of the link, called a self Delta-move, or multiple components of the link, called a mixed Delta-move. We prove a number of results on how (mixed/self) Delta-moves relate

to classical link invariants including the Arf invariant and crossing number. This allows us to produce a graph showing links related by a self Delta-move for algebraically split links with up to 9-crossings. For these links we also determine the Delta-splitting number and mixed Delta-splitting number, that is, the minimum number of Delta-moves needed to separate the components of the link.

IDENTIFYING BCGS IN ACCEPT 2.0 CLUSTERS
Presenter(s): Agrim Gupta (Michigan State University)
Physical & Mathematical Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2011
Mentor(s): Megan Donahue (Michigan State University)

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.

EDGE COVERS OF CERTAIN GRAPH FAMILIES
Presenter(s): Evan Henning (Grand Valley State University), Jacob Ritsema (Grand Valley State University)
Physical & Mathematical Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2012
Mentor(s): Feryal Alayont (Grand Valley State University)

A graph is a visual representation of relationships between objects. The objects are represented by vertices (dots). A relationship between two objects is shown with an edge (line) connecting the related vertices. An edge cover of a graph is a collection of edges such that each vertex in the graph is connected to at least one edge. Edge covers arise in applications when counting elements in between given two elements in Hausdorff metric geometry and estimating the relevance of communication lines in a network. It is known that the total number of edge covers of path and cycle graphs are the famous Fibonacci and Lucas numbers. In fact, the edge cover polynomials, which are the generating functions of edge covers of various sizes, are the Fibonacci and Lucas polynomials themselves. In this poster we will share results on edge covers of other graph families including the spider graphs, chorded cycles and grid graphs.

FLUORESCENT AND HYDROGEN BONDING CHARACTERIZATION OF NOVEL COUMARIN, KNIGHTLETIN
Presenter(s): Isaac Jonker (Calvin University), Jonathan Holdridge (Calvin University)
Physical & Mathematical Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2013
Mentor(s): Mark Muyskens (Calvin University)

Knightletin is a novel, high quantum yield aminocoumarin that has a substitution pattern that includes adjacent amino and hydroxyl groups. Knightletin exhibits photobasic qualities, rather than the more typical photoacid behavior studied previously in our lab. Titration experiments for absorbance and fluorescence of Knightletin display a pKa of 8.80 and an excited state pKa (pKa*) of 10.65. This increase in pKa suggests photobasic behavior. Knightletin was also studied using solvatochromic methods. An array of 1-chloroalkanes, along with DMF, DMSO, and HFIP (hexafluoroisopropanol) were used to test the effect of different solvent polarities and observe the influence of hydrogen bonding on peak wavelength and intensity of absorbance and emission spectra.

COMPUTATIONS AND VISUALIZATIONS OF DEFORMATION FROM ONGOING AND PROJECTED FUTURE CHANGES IN THE DISTRIBUTION OF WATER AND ICE
Presenter(s): Brian Janicki (William & Mary)
Physical & Mathematical Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2014
Mentor(s): Jeffrey Freymueller (Michigan State University)

Our group uses satellites from the Global Positioning System (GPS) to measure and record highly precise measurements of movement on Earth's surface, which helps interpret and predict how changing water and ice levels deform the Earth. This study of mathematics specifically related to the shape and changing areas of the Earth is called geodesy. Specifically, we interpret monthly data from the Gravity Recovery and Climate Experiment (GRACE) mission, where two satellites measure the push and pull between one another as they orbit the Earth. Water, snow, and ice redistribution on land and in the ocean, and mass distributions inside the Earth's crust and mantle, generate temporal gravity variations in GRACE. We aim to implement a database that stores the predicted deformation of the Earth from the redistribution of water mass measured by GRACE, with the data being processed by MATLAB code developed by Dr. Freymueller. An SQL relational database will be created to keep the data in an organized structure, and be easy to access. Results will be funneled with a MATLAB read and write program, which combs through calculated values from an existing spherical harmonic load deformation time series program, and inputs them into the database. This database will create a beneficial reference point for researchers who study the deformation of the Earth, by allowing previously elusive information to be easily stored and accessible.

APPROXIMATING FREE ENERGY FUNCTIONS WITH MACHINE LEARNING
Presenter(s): Dylan Kupetsky (Haverford College)
Physical & Mathematical Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2015
Mentor(s): Huan Lei (Michigan State University)

Free energy functions dictate the direction of physical, chemical, and biological processes and are hence important to map accurately and precisely. Numerical challenges arise from the multi-dimensionality of the energy landscape as well as the multiple local energy minima. Traditional methods such as radial basis functions are effective; however, it remains to suffer the curse of dimensionality for complex systems. The rising use and availability of neural networks provide a more efficient approach to construct such mappings. We propose a new approach that enables us to both optimize the allocation of sampling points and construct a more accurate energy landscape. A neural network coupled with a gradient loss function is used to approximate the free energy functions. We demonstrate the effectiveness of our method with multi-dimensional free energy construction using the Michigan State University HPCC (High-Performance Computing Center).

BISMUTH CONTAINING HETEROCYCLES FOR QUANTUM INFORMATION SCIENCE
Presenter(s): Luke Mangas (Eastern Michigan University)
Physical & Mathematical Sciences

Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2016
Mentor(s): Elizabeth Pugliese (Michigan State University), Selvan Demir (Michigan State University)

Bismuth is a heavy element which features unique properties such as large spin-orbit coupling, relativistic effects, extended d-orbitals, and various oxidation states. Coordinating bismuth to carbon moieties results in the formation of heterocycles. Such heavy atom containing heterocycles that are coordinated to metals are exceptionally rare with only two crystallographically characterized bismolyl containing transition metal complexes known. In general, the realization of Group 15 heterocyclic metal complexes has mainly revolved around the use of pyrroles and phospholys. Owing to the unique characteristics of bismuth, bismolyl complexes are interesting for quantum computing, molecular magnetism, and electronics. Both the large bismuth atom and the aromaticity of the ring provide the possibility of metal coordination through solely the bismuth or all components of the heterocycle. This structural difference will directly impact the physical properties of the arising molecules. In particular, the lanthanides are well-suited for the design of materials for quantum information science due to their large magnetic anisotropy. However, they are challenging to employ due to their contracted 4f-orbitals which favor ionic over covalent bonding interactions. Importantly, the diffuse 6p-orbitals of bismuth may allow for enhanced orbital overlap with the contracted 4f-orbitals of the lanthanides. Here, the synthesis and structure of an elusive gadolinium bismolyl complex, which provides insight into a single lanthanide-bismuth interaction, will be discussed.

ANALYZING LANGMUIR-BLODGETT MONOLAYER OF OCTADECYL PHOSPHONIC ACID USING CD2+ AS A METAL ION.
Presenter(s): Diana K. Nazario Torres (Pontifical Catholic University of Puerto Rico)
Physical & Mathematical Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2017
Mentor(s): Gary Blanchard (Michigan State University)

Octadecyl phosphonic acid (ODPA) monolayer will be formed on different subphase conditions containing Cadmium (II) as a metal ion. To achieve a good formation, subphase changes will be done gradually by adding small amounts of hydrochloric acid to it. Analysis such as X-ray Photoelectron Spectroscopy (XPS) will help us to determine if there is the presence of the metal ion in between the monolayer and substrate, and, Fluorescence Recovery After Photobleaching (FRAP) will determine the fluidity of the monolayer using Perylene as a chromophore which has fluorescence activity. The aim of this project is to analyze the fluidity of a monolayer in different conditions.

IS IT POSSIBLE TO DO TWO PHOTON EXCITATION WITH JUST ONE PHOTON?
Presenter(s): Alondra Negrón (University of Puerto Rico - Arecibo)
Physical & Mathematical Sciences
Section: 2
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2018
Mentor(s): Marcos Dantus (Michigan State University)

The objective of this project is to maximize two photon excitation fluorescence (TPEF) intensity by taking advantage of a little-known quantum mechanical pathway that has a linear dependence on laser intensity. We measured the intensity dependence of TPEF for two compounds, Fluorescein and Coumarin 102, in different solvents. We found that solvent polarity diminishes the dipole pathway contribution for Coumarin 102. When measuring TPEF for linear and circular polarized light, we found that circularly polarized light enhances the dipole pathway for both compounds. Under conditions that enhance the dipolar pathway, we found the power dependence coefficient n to deviate from n = 2 to 1.7. The smaller the power dependence coefficient the greater the efficiency of TPEF. Our findings may help improve two photon applications such as two-photon photodynamic therapy and multiphoton biomedical imaging. The latest developments in our efforts to enhances two photon emission will be presented.

SOCIAL NETWORK ANALYSIS
Presenter(s): Marius Nwobi (Michigan State University)
Physical & Mathematical Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2021
Mentor(s): Emily Bolger (Michigan State University), Emily Bolger (Moravian College)

The purpose of 'Partnership for Integration of Computation into Undergrad Physics' (PICUP) is to build a community around physics computation, organize events that can help support the community, and provide additional resources to help support the community. We want to form a better understanding of our PICUP slack network because we want to ensure that our slack group chat is contributing to our core values while spreading information about our events. To do so we need more information besides established nodes and edges because they only show a connection, but we don't know if that connection is abnormal or not, hence we decided to implement a weighted random graph (WRG) based on Edros Renyi Graph (ERG). WRG will help us create multiple random graphs similar to our original network while accounting for direction, edge density, and weight. The weight aspect is important in our case because we are using the weight to determine how valuable each communication line is (user A to user B?). The stronger the weight, the more messages two PICUP users have with each other. With this info, we can then visually see how our network flows and compare the calculated metrics from the random networks (produced by WRG) to our PICUP group chat network in order to see if there are any statistical differences.

SEARCHING FOR DELAYED CIRCUMSTELLAR MEDIUM INTERACTIONS OF TYPE IA SUPERNOVAE USING SWIFT
Presenter(s): Miranda Pikus (Michigan State University)
Physical & Mathematical Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2022
Mentor(s): Chelsea Harris (Michigan State University)

Type Ia supernovae are important tools in astrophysics since they are employed as standard candles to measure cosmological distances and influence the chemical composition of our universe. These supernovae occur when a white dwarf in a close binary gains substantial mass from its companion, suffers runaway nuclear burning, and completely explodes. However, the detailed nature of their progenitors is still not fully understood. An avenue to understanding the progenitors is searching for rare instances of the supernova ejecta colliding with the mass lost prior to the explosion, called the circumstellar material (CSM). Recent discoveries have demonstrated that the CSM might be farther from the supernovae than once thought. Hence, I search for late-time CSM interaction in a large sample of supernovae observed by the Neil Gehrels Swift space-based observatory. Using archival Swift data, I perform UV photometry on 325 type Ia supernovae at times of at least 50 days since supernova discovery, when the supernova's normal UV emission has faded. The photometry entails characterizing the background environments of the supernovae and subtracting the background light accordingly for each supernova to determine whether there is UV light from interaction. With upper limit flux measurements for the sample, I can statistically analyze the data to constrain the fraction of supernovae that have distant CSM.

COMPARATIVE SURVEY OF VARYING REAGENTS' ACTION ON CYANOPYRIDINE COPPER(II) COMPLEXES
Presenter(s): Emma Reeves (Michigan State University)
Physical & Mathematical Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2023
Mentor(s): Robert Maleczka (Michigan State University)

Cyanopyridines are valuable molecules in organic chemistry and dependent industries. The process developed for generating them requires only two steps carried out in a single container: An iridium-catalyzed borylation followed by copper-mediated cyanation. The trade-off for the simplicity of this procedure is the resultant complex formed between the copper (II) ions and the cyanopyridine, which is difficult and costly to separate. The goal of the study is to determine the qualities of this complexation and find an efficient means of decomplexation and separation, to afford the cyanopyridine in high yield, with high purity

UNDERSTANDING ACCESSIBILITY OF GROUP-BASED PHYSICS COURSES FOR STUDENTS WITH DISABILITIES
Presenter(s): Alex Reynolds (University of Washington)
Physical & Mathematical Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2024
Mentor(s): Daryl McPadden (Michigan State University)

College students with disabilities, and specifically students with Attention Deficit Hyperactivity Disorder (ADHD), are enrolling in STEM disciplines at higher rates than before. Therefore, we want to ensure that college courses & experiences are accessible and that they follow principles of Universal Learning Design (UDL) to be inclusive for participants with different needs and abilities. To better understand disabled students' experiences in group-based STEM classes and general college experiences, we conducted a series of interviews in multiple formats. In this work, I focus on a case study with one undergraduate student who identifies as having ADHD. This student discusses university and professor supports, as well as interview supports, from her experience. From this case study, we will highlight different themes found in her perspective as a student with ADHD, takeaways for researchers designing qualitative research studies, and takeaways for instructors designing and teaching courses.

SEARCH FOR LOW-ENERGY PROTON INTENSITIES FOLLOWING THE BETA DECAY OF 32AR
Presenter(s): Logan Schaedig (Michigan State University)
Physical & Mathematical Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2025
Mentor(s): Christopher Wrede (Michigan State University)

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 results of the proton data analysis will be presented.

HOW STUDENT CONNECTIONS IMPACT PHYSICS AND ASTROPHYSICS MAJORS
Presenter(s): Nick Schwartz (Michigan State University)
Physical & Mathematical Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2026
Mentor(s): Rachel Henderson (Michigan State University)

Given how important connections are in other aspects of life, it is assumed that they should play an important role in a students' academic trajectory. This research seeks to determine how these connections correlate with student success, specifically for students majoring in Physics and Astrophysics. Here, we define a connection as a student sharing three or more courses within a semester with another student. Data were analyzed via network analysis (e.g. associativity) and tetrachoric

correlations. The results show that the amount of connections a student with other physics and astrophysics majors has is correlated with whether or not they graduate with a degree in Physics. This same pattern is also present when looking at just first generation and transfer students that majored in Physics and Astrophysics. This has an important implication for our students of improving the opportunity for them to make more connections which, in turn, could lead to more students graduating with a degree in Physics.

CREATING A DICTIONARY OF TASK RESPONSES FROM AN ESM SURVEY
Presenter(s): David Seiden (University of Georgia)
Physical & Mathematical Sciences
Section: 3
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2027
Mentor(s): Carissa Myers (Michigan State University), Rachel Henderson (Michigan State University), Vashti Sawtelle (Michigan State University)

This poster will present a portion of a mixed methods research study designed to investigate how students' self-efficacy (SE), or one's confidence in their abilities to complete a task, varies from moment to moment. Our quantitative methods utilized the Experience Sampling Method (ESM), which pings participants semi-randomly several times a day to answer surveys. The survey items were designed to measure the in-the-moment, domain-specific SE of undergraduate science majors. To identify the task the participant is doing at that moment, one of the open-ended survey questions asked students "What is the main thing you are doing?" The data from this question are being used to generate a dictionary of responses which will then be used to categorize tasks. This categorization will be used to create a new survey item including a dropdown list of responses which will be utilized in future studies.

PREPARATION OF AN ELECTROCHEMICAL ENZYME-BASED BIOSENSOR FOR ACETYLCHOLINE DETECTION IN VITRO
Presenter(s): Madison Strait (Iowa State University)
Physical & Mathematical Sciences
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2031
Mentor(s): Greg Swain (Michigan State University), Skye Russell (Michigan State University)

Acetylcholine (ACh) is a neurotransmitter found in both the central and peripheral nervous system that acts as a neuromodulator in the brain and neuromuscular signaler in the periphery. In the enteric nervous system, ACh is released from excitatory motor neurons to contract smooth muscle along the gastrointestinal tract, aiding in propulsion. Alterations in cholinergic signaling have been linked to several disorders including Alzheimer's disease, Parkinson's disease, and myasthenia gravis. Therefore, measurement of the real-time release of ACh would provide valuable insight on any dysfunction associated with these disease states. Electrochemical microelectrode sensors are useful for detecting neurotransmitters near sites of release and action both in vitro and in vivo due to their spatiotemporal resolution. As ACh is not electrochemically active, enzyme-based sensors were fabricated following a literature report and used in vitro to detect the real-time release of ACh from mice colon. Platinum disk microelectrodes were electrochemically modified with a permselective poly(m-phenylenediamine) film and multienzyme layer consisting of acetylcholinesterase (AChE) and choline oxidase (ChOx). The enzymes were crosslinked using glutaraldehyde to the electrode and bovine serum albumin for enhanced stability. ACh reacts in the presence of AChE to produce choline, which is then oxidized in the presence of ChOx to produce H2O2. H2O2 is then detected by the biosensor as oxidation current. Preliminary work revealed the biosensor exhibited a sensitivity of 9.54 ?A/M, a LOD of 0.5 ?M, a LOL of 162.5 ?M, and response reproducibility of 11% RSD. This presentation will focus on biosensor preparation and electrochemical characterization.

A SIMULATION OF VARIABLE UV BACKGROUND IMPACTS ON CGM METAL ION ABUNDANCES
Presenter(s): Elias Taira (Michigan State University)
Physical & Mathematical Sciences

Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2032
Mentor(s): Brian OShea (Michigan State University)

The Circumgalactic Medium (CGM) is a mass of gaseous material that exists in a very large, spherical area around galaxies. Due to its importance in galactic evolution, it has become pivotal in understanding how galaxies change over time. To learn about the CGM through observation, we typically look for the distribution of metals (any element heavier than Helium) throughout the medium, as they have very recognizable spectra that make it possible to characterize the observed CGM. However, due to the limitations of the current state of observational techniques, obtaining accurate measurements of the distribution and composition of these particles has proven to be quite difficult. To work around this issue, we employ the use of numerical simulation software known as Trident to develop model CGMs with known quantities. Working to improve the software used to build these models, I focus on analyzing the impact of UV radiation from nearby galaxies and quasars on the states of the metals within current models through the use of a simulation analysis software known as SALSA.

THE PHOTOPHYSICAL PROPERTIES OF ISOSCOPOLETIN
Presenter(s): Lauren Timmer (Calvin University)
Physical & Mathematical Sciences
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2033
Mentor(s): Mark Muyskens (Calvin University)

Isoscopoletin (6-hydroxy-7-methoxycoumarin) is a coumarin naturally produced by several plants including Clausena dunniana and Olea capensis. It is a member of a class of coumarins called hydroxycoumarins which are known for their bioactivity specifically as defensive compounds in plants and animals. In studying their photophysical properties, oftentimes, we study the photoacidic behavior of these molecules, however, isoscopoletin provides a great counterexample. This is exhibited not only by its lack of photoacidic behavior but by its photobasic behavior. Using techniques such as absorption and emission spectroscopy, time-resolved spectroscopy, and computational modeling, we were able to determine the pka, lifetime, and relative quantum yield of isoscopoletin. Additionally, through solvatochromic studies we determined differences in the Stokes shifts. Of primary interest in these studies is that whenever water is present, an orange emission peak appears and at high pH that peak dominates which greatly increases the Stokes shift. The reason for this could be explained by emission from the tautomer of isoscopoletin. We predict that the tautomer is formed in the excited state when the isoscopoletin anion is excited and pulls a proton from the water.

PHOTOPHYSICAL PROPERTIES OF DHMC (5,7-DIHYDROXY-4-METHYLCOUMARIN)
Presenter(s): Andrea Van Engen-Ver Beek (Calvin University)
Physical & Mathematical Sciences
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2034
Mentor(s): Mark Muyskens (Calvin University)

DHMC (5,7-dihydroxy-4-methylcoumarin) is a fluorescent coumarin that can be characterized by its two pka's and quantum yield. DHMC shows photoacidic properties like those of Aesculetin (6,7-dihydroxycoumarin). DHMC and Aesculetin have two hydroxy groups, a common one in position seven, and the other in positions five and six respectively. This change in position of one of the hydroxy groups gives them different properties. After its second pka, DHMC shows photobasic properties. DHMC is resistant to decomposition at extreme pH allowing its study at low and high pH. DHMC has been studied under excitation and emission spectra, time resolve fluorescence, and computational modeling techniques.

STUDYING CORE-COLLAPSE SUPERNOVA ROTATIONS EFFECT ON THE EMISSION DIRECTION AND INTENSITY OF GRAVITATIONAL WAVES
Presenter(s): Steven Vancamp (Michigan State University)
Physical & Mathematical Sciences
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2035
Mentor(s): Michael Pajkos (Michigan State University), Sean Couch (Michigan State University)

The stellar core collapse preceding a core-collapse supernova (CCSN) inscribes information of the morphological changes of the stellar object onto the gravitational wave (GW) signal produced in the event. GWs produced during the stellar core collapse prior to CCSNe provide astronomers with an opportunity to observe the inner workings of CCSNe and study the mechanisms that drive these energetic events. This study focuses on how the GW signal is influenced by other processes occurring during the stellar core collapse. In particular, constraining information on two properties of the CCSN from the GW signal: core angular momentum and standing accretion shock instabilities (SASI). To conduct our study, we analyzed data produced by 3D CCSN simulations. Much of the study focuses on tracking the direction and intensity of the maximum strain of the GW signal and using this information to constrain properties of the CCSN. The associated presentation will focus on how the study has provided evidence of a connection between CCSN rotation and the associated GW signal intensity and emission direction.

PREDICTION OF BIODIESEL BLEND COMPOSITION USING PRINCIPAL COMPONENT REGRESSION
Presenter(s): Megan Voisinet (Lake Superior State University)
Physical & Mathematical Sciences
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2036
Mentor(s): Ruth Smith (Michigan State University)

With the global goal of reducing air pollution, biodiesels have increased in prevalence. These environmentally friendly biodiesels are produced from a variety of oils, such as corn, soybean, and canola oils. The oil undergoes a transesterification reaction which produces fatty acid methyl esters (FAMEs) and glycerol. The FAMEs can be used in their pure form or can be mixed with diesel at various percentages for use as a biodiesel blend. The objective of this research is to predict the blend percentage of an unknown biodiesel using principal component regression (PCR). To do this, initial work will focus on canola oil and its corresponding FAME composition. After biodiesel synthesis, it will be mixed with diesel at percentages ranging from 0-100%. Each biodiesel blend will then be analyzed using gas chromatography-mass spectrometry. The resulting data will be subjected to PCR to develop a model capable of predicting the biodiesel blend percentages. PCR is a multivariate statistical procedure which applies principal component analysis in conjunction with multiple linear regression to identify variables which are most responsible for data variation amongst sample sets. It then uses the relative amounts of these variables to help establish the quantifiable composition of a sample. Going forward, the developed model will be tested for robustness by analyzing biodiesel blends synthesized from a variety of other oils. This presentation will focus on the characterization of biodiesel blends and will describe the development of a PCR model to predict blend percentage.

THE ELECTROCHEMICAL AND MATERIAL CHARACTERIZATION OF TITANIUM ALLOY, TI-5553, BY SELECTIVE LASER MELTING FABRICATION
Presenter(s): Ryan Weston (College of the Holy Cross)
Physical & Mathematical Sciences
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2037
Mentor(s): Greg Swain (Michigan State University)

The process of additive manufacturing allows for the creation of metal alloys layer by layer, increasing design and manufacturing freedom. Additive manufacturing enables complex material shapes to be fabricated from the bottom-up rather than traditional top-down approaches (machining). This flexibility makes these metal alloys of particular interest for aerospace applications. However, with many of the prospective uses of these additively manufactured alloys being situations where the materials will be under mechanical stress, there is a need to characterize the mechanical strength and hardness of this 3D printed alloy and to understand how the electrochemical properties are affected by tensile stress loads. Our research focused on studying the mechanical properties and electrochemical properties of the additively manufactured Ti-5553 alloy containing 5 wt.% aluminum, vanadium, and molybdenum, and 3 wt.% chromium. The microstructure of Ti-5553 was investigated using scanning electron microscopy. The electrochemical behavior or corrosion resistance was investigated using potentiodynamic polarization curves, and electrochemical impedance spectroscopy measurements at the open circuit potential in 3.5 wt.% NaCl at room temperature. Electrochemical studies were performed with alloy specimens under controlled tensile loads to learn how these stresses impact the corrosion behavior of the alloy. Overall, our studies have indicated that the additively manufactured Ti-5553 alloy displays greater corrosion resistance in comparison to other aluminum and titanium-based alloys.

COMPUTATIONS OF DEFORMATION FROM CURRENT AND PREDICTED CHANGES IN THE DISTRIBUTION OF WATER
Presenter(s): Madison Winkeler (Murray State University)
Physical & Mathematical Sciences
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2038
Mentor(s): Jeffrey Freymueller (Michigan State University)

Geodesy is the study of measurements related to the shape of the Earth, which includes deformational changes such as surface loading by water. Our group uses satellites from the Global Position System (GPS) to measure relative positions of Earth's surface and record any changes to gain a better understanding of certain contributions to the deformation of the Earth. Specifically, this data being evaluated is from the Gravity Recovery and Climate Experiment (GRACE) mission. This mission launched two satellites that measured the distance between one another which was representative of local gravitational changes relative to water shifts on Earth's surface. Our primary goal is to create a database that stores both the predicted deformation data from the GRACE mission and future glacier mass changes predicted by a modeling approach driven by future climate predictions. These changes are used to predict the Earth's deformation using either the program LoadDef or MATLAB to calculate the load deformation time series for multiple locations. The results from these calculations will be transferred to the database using the readtable function and the Database Explorer connection in MatLab. The database will be created using MariaDB, which will allow for queries such as a time series of motion expected at a single location, or a map of deformation at a specific time. The creation of this database will aid those studying the effects of deformation by providing a user-friendly and easily accessible platform for data that is essential to accurately study and interpret these changes of the Earth.

STUDY OF THE KEY RESONANCE FOR THERMONUCLEAR RUNAWAYS ON NEUTRON STARS
Presenter(s): Arian Andalib (Michigan State University)
Physical & Mathematical Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2041
Mentor(s): Christopher Wrede (Michigan State University)

During neutron star mass accretion from a hydrogen-rich binary companion, a thermonuclear runaway can occur producing X-ray bursts that are observed with space-based X-ray telescopes. When sufficiently high temperatures of 0.4 GK are reached, alpha-particle capture on the oxygen-15 isotope enables nucleosynthesis to proceed beyond the C, N, and O elements. The unknown strength of a resonance in neon-19 at an excitation energy of 4034 keV has the strongest effect of any nuclear data on simulated light curves. To determine the resonance strength experimentally, we will measure the alpha-particle

branching ratio, which is the fraction of decays of the resonance by alpha particle emission. We will do so by observing the proton-alpha emission following the beta decay of magnesium-20, provided by the FRIB (Michigan State University). The tools used to aid this research are GADGET (Gaseous Detector with Germanium Tagging), a gaseous radiation detector used to detect charged particles couples to SeGA (Segmented Germanium Array), which assists in clarifying the decay scheme by detecting gamma rays as well as being a useful diagnostic tool. GADGET itself cannot distinguish multiple particle emissions, thus GADGET is currently being upgraded to operate as a Time Projection Chamber to allow for 3D reconstructions of events that take place in the detector. Furthermore, when a charged particle enters the gas-filled TPC ionizes the gas around it. The charge spreads as it drifts in an electric field, and during amplification in Micromegas. This presentation will focus on simulations of the gamma-ray detection in SeGA as well as modeling the charge dispersion occurring within the TPC.

ULTRALUMINOUS X-RAY SOURCES IN EXTRAGALACTIC GLOBULAR CLUSTERS
Presenter(s): Wasundara Athukoralalage (Michigan State University)
Physical & Mathematical Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2042
Mentor(s): Stephen Zepf (Michigan State University)

The question of whether or not black holes are hosted by globular clusters is one of the leading open questions in Astronomy. While globular clusters are "black hole factories" through normal stellar evolution, some theories predict that black holes will be ejected early in the history of the globular cluster. However, recent observational work and theoretical studies in the last 15 years have suggested that this may not be the case, and studies of ultraluminous X-ray sources in extragalactic globular clusters have provided evidence of some of the most exotic black hole candidates in globular clusters. We have evidence that one of these sources might be an intermediate black hole.

GIANT PLANET INSTABILITIES AND IMPERFECT ACCRETION IN A GPU-ENHANCED N-BODY SIMULATOR
Presenter(s): Ryan Copeland (Michigan State University)
Physical & Mathematical Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2043
Mentor(s): Seth Jacobson (Michigan State University)

Accretion during the late stage of terrestrial planet formation is dominated by collisions between planetary embryos-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 oblique impact. Impact outcomes are sorted into several different regimes by the relative impact velocity, the angle of impact, and the mass ratio 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 N-body integrators, 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 N-body integrator and how it modifies the outcomes of terrestrial planet formation from previous results. 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 re-accreted soon after each impact, or this could be a significant way of eroding planetary mass and distributing it throughout the Solar System in a new population of planetesimals.

BAYESIAN ANALYSIS OF NUCLEAR SATURATION
Presenter(s): Saad Bezoui (City University of New York - Hunter College)
Physical & Mathematical Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online

Presentation Number: 2044
Mentor(s): Christian Drischler (Michigan State University)

The study of nuclear physics constitutes studies on atomic nuclei and its constituents and interactions as well as the study of nuclear matter. One of the key aspects of this field is a quantity known as nuclear saturation which exhibits a phenomenon where the volume of nuclei increases proportionally to the number of nucleons. Chiral effective field theory (ChEFT), a low energy quantum chromodynamic theory based on the strong force utilizes microscopic calculations (no nuclei data) to predict saturation points. ChEFT calculations with empirical constraints and associated uncertainties have been plotted alongside the energy density functionals that give about the empirical saturation point. There is a sizeable disconnect between the theoretical and empirical calculations. The main focal point of the paper will be how to estimate unknown systematic uncertainties in the energy density functionals (EDF) i.e., the empirical saturation point. Namely, how can we apply Bayesian analysis such that we uncover undiscovered physics. Secondly, how well does ChEFT reproduce the empirical saturation point quantitatively. The methods in developing this new model for the empirical saturation point is to assume an estimated posterior destiny function of the various models with the idea in mind that such models may contain biased data i.e., missing physics/statistical errors. We will aim to estimate the central value from every model and classify models that correlate to one another to avoid repeated models. The important parameters related to the prediction can be classified as the distances from the central estimation of each model

NUCLEAR MANY-BODY THEORY
Presenter(s): Peter Morton (Michigan State University)
Physical & Mathematical Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2045
Mentor(s): Julie Butler (Michigan State University), Morten Hjorth Jensen (Michigan State University)

The infinite electron gas (homogeneous electron gas) is a useful system in many-body physics. It can be used to examine new many-body methods because its energies have analytical solutions. Ab initio many-body physics is a field that attempts to explain properties of matter by studying only the interactions between the particles that make up that matter. Modeling an infinite electron gas comes with some difficulties, such as simulating infinity. Computers can, however, simulate an ever-increasing number of electrons and use those calculations to extrapolate to the thermodynamic limit. This project will use correlation energies for the infinite electron gas calculated by two different many-body methods. One method is many-body perturbation theory (MBPT) which is faster, but less accurate. The other is the coupled-cluster doubles (CC) which is slower, but more accurate. Other problems come from computation because the number of single particle states must be limited to reduce the run-time. This introduces error into the energy calculations that decreases as the number of single particle states increases. Various machine learning methods will be used to attempt to achieve convergence of the energies with respect to the number of single particle states. This goal is to do this in a way that is quick, accurate, and accommodates both large and small numbers of electrons. This poster plans to show how successful the attempt was in simulating the convergence of the energy of the electron gas, and how successful it will be in simulating numbers close to the thermodynamic limit.

PLANT SCIENCE

GREENHOUSE EVALUATION OF DIFFERENT RESISTANT SOURCES OF SOYBEANS AS A 'TRAP CROP' FOR SOYBEAN CYST NEMATODE MANAGEMENT
Presenter(s): Navid Ali (Michigan State University)
Plant Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2101
Mentor(s): Marisol Quintanilla Tornel (Michigan State University), Sita Thapa (Michigan State University)

Soybean is a major agricultural commodity. There are several soybean diseases causing soybean yield loss. Soybean cyst nematode (SCN) causes the most yield loss of any soybean pathogen, with an economic impact of $1 billion per year. The use of SCN-resistant cultivars has been a promising SCN management strategy. SCN is still accountable for a significant soybean yield loss due to the continuous use of cultivars derived from a single line of resistance. The repetitive use of the same cultivar leads to an increased population density luring the farmers to using nematicides. Due to the potential harm of nematicides on humans, environment, and soil, it is essential to find alternatives to nematode management. In this study, we propose to evaluate different sources of resistant soybean varieties: SCN susceptible, Peking derived soybean, PI88788 derived soybean, and PI437654, under greenhouse conditions to be utilized as a trap crop. This study was conducted to evaluate SCN reproduction in each soybean variety with a fallow control, four replications under a randomized block design. Each pot was inoculated with approximately 5000 SCN eggs. This experiment will be terminated two times, three weeks, and six weeks after inoculation. Soybean plants will be cut closer to the root, and susceptible soybeans will be planted for a month. SCN reproduction will be analyzed in each treatment in comparison to the fallow. We hypothesize that wild soybean cultivar treatment will have less reproduction in susceptible soybean. This is an ongoing experiment; results will be updated as the trial progresses.

INVESTIGATING MOLECULAR INTERACTIONS DURING HEAT STRESS IN EARLY CHLOROPLAST BIOGENESIS
Presenter(s): Gloria Baker (Grand Valley State University)
Plant Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2102
Mentor(s): Linqu Han (Michigan State University)

As global temperatures rise, it has never been more imperative to investigate the molecular mechanisms of heat-stress response in plants. Using the model organism Arabidopsis Thaliana this project seeks to further characterize the molecular interactions that occur during heat stress in early chloroplast biogenesis. The development of chloroplasts in the true leaves of a plant is very different from their development in the cotyledons. Embryonic chloroplasts, contained in the cotyledons, are partially formed prior to germination while the chloroplasts of the true leaves are differentiated after the onset of germination from proplastids. Stem cell differentiation is partially controlled by reactive oxygen species (ROS), one of which being superoxide. ROS accumulation plays a key role in signaling during stress conditions. Chloroplast heat shock protein 90 (HSP90c) is a heat sensitive molecular chaperone involved in import of pre-proteins into the stroma of the chloroplast; which is required for chloroplast biogenesis in early stages of development. The chlorate resistant mutant, cr88 causes a mutation in HSP90c and displays an albino phenotype in the first two true leaves under heat stress while the cotyledons remain green; the plant is not able to recover from this. We hypothesize that initial chloroplast differentiation is impaired in germinating cr88 mutants, and upon heat stress, the altered oxidative state in the cr88 mutant hinders proplastid differentiation in the SAM. We aim to investigate the connection between chloroplast biogenesis in the SAM, heat stress, and the mechanism of HSP90c during heat response in the true leaves of A. Thaliana.

LINKING MAIZE PHENOTYPIC AND GENETIC TRAITS WITH TAR SPOT
Presenter(s): Donielle Brottlund (University of Missouri)
Plant Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2103
Mentor(s): Addie Thompson (Michigan State University), Brandon Webster (Michigan State University)

Tar spot is a fungal disease caused by an obligate pathogen, Phyllachora Maydis, that is negatively affecting the United States maize production. The first record of tar spot in the US was in 2015 and since then has caused the approximate loss of 4.5 million tons of maize yield. Tar spot will continue to have major direct and indirect effects on the US economy if more research is not done to understand this

disease. This research aims to explore how phenotypic and genetic traits are related to tar spot disease. To achieve this, tar-spot severity ratings and agronomic traits were collected manually from a Michigan State University Field in 2021. The Pearson's correlation coefficient between tar-spot severity ratings and agronomic traits, such as silk color and time of anthesis, were calculated to identify traits related to tar spot severity. A Genome-Wide Association Study (GWAS) was conducted using phenotypic data and the Wisconsin Diversity Panel to identify Single Nucleotide Polymorphisms (SNP) that are significantly associated with tar spot severity and other traits. From the GWAS results, there were four significant SNPs for tar spot severity which are candidates for further genetic screening. Having a better understanding of these genes is crucial for breeders to create a more resilient line of maize to the devastating effects of tar spot disease.

HOW TO MAXIMIZE MLG PRODUCTION: PROTECTING DEGRADATION OF OVER-PRODUCED MLG
Presenter(s): Kaylee Chang (Michigan State University)
Plant Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2104
Mentor(s): Sang-Jin Kim (Michigan State University)

Mixed (1,3;1,4)-linkage glucan (MLG) is one of majot hemicelluloses of grass. MLG is composed of unbranched glucose connected with β(1,3;1,4)-linkages that provides better water solubility. Due to the properties MLG is considered as a desirable cell wall component for upgrading plant feedstock for biofuel production. It made us to be interested in utilizing MLG to deposit photosynthases into plant cell wall to increase the amount of easily convertible glucose and extractability of cell wall. MLG regulation is known to accompany two enzymatic reactions: MLG synthase (Cellulose synthase like-F) and MLG hydrolase (lichenase). These enzymes determine the level of MLG during plant development. In previous research, transgenic lines of Brachypodium with altered expression of the enzymes clearly showed impact of gene expression level on the level of MLG accumulation. Therefore, to maximize the MLG deposition during Brachypodium development, we are trying to generate Brachypodium plant with increased net yield of MLG by over expressing synthase gene CSLF6 and suppressing Lichenase gene to minimize degradation of MLG. We are questioning whether the combination of these two traits would allow the plant to reach maximum amount of MLG and what effect on biomass is. We will analyze biomass, expression level of both genes and MLG accumulation during development along with the parental lines to clarify actual difference of MLG accumulation level. Data obtained from the Brachypodium research will be translated into our target crop such as energy sorghum with outstanding biomass trait to further improve plant biofuel feedstock.

IDENTIFYING BENEFICIAL SWITCHGRASS MICROBES
Presenter(s): Lille Cunic (Michigan State University)
Plant Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2105
Mentor(s): Keara Grady (Michigan State University)

The soil microbiome is extremely diverse and plays a significant role in plant health. The microbial community closely associated with plant's roots is known as the rhizosphere. Plants send signals to the microbial community within its rhizosphere via metabolic root exudates, which influences the composition and abundance of microbes in the rhizosphere to support the plant's needs. To gain insight as to how rhizosphere microbes affect the growth of the biofuel candidate switchgrass, a collection of bacteria was isolated from the rhizosphere of switchgrass plants grown at the Kellogg Biological Station in Hickory Corners, MI. Growth curve assays were performed to determine bacterial growth kinetics in the presence and absence of switchgrass root exudates. Preliminary results show several rhizosphere isolates with improved growth when supplemented with switchgrass root exudates as compared to growth in control condition, and in at least one of three key growth parameters: biomass (measured as maximum optical density at 600 nm), decreased lag time to exponential growth, or increased rate of exponential growth. 32

isolates had increased total biomass (measured as optical density). Of these, we targeted 15 isolates (14 proteobacteria, 1 actinomycetota) for follow-up studies of pairwise interactions with other isolates to construct non-inhibitive communities that could next be tested for positive plant outcomes in greenhouse studies. Ultimately, identification of beneficial switchgrass microbes can be used to treat switchgrass in the field, ideally resulting in increased biomass of switchgrass crops.

SURVEYING TEFF CULTIVATION UNDER CLIMATE-RELEVANT DROUGHT STRESS
Presenter(s): Jack Day (Michigan State University)
Plant Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2106
Mentor(s): Mckena Lipham (Michigan State University), Robert VanBuren (Michigan State University)

Teff is the leading cereal in Ethiopia where it is prized for its nutritional quality, resilience, and cultural significance. In recent years, increased efforts have been placed on researching this underutilized crop due to its higher drought and stress resilience compared to staple cereals like corn and rice. With these qualities, teff has great potential to be at the forefront of sustainable agriculture, especially with more prevalent droughts in the face of climate change. Here, we will survey the effects of drought stress on productivity and yield traits in sixteen diverse teff varieties using rainout shelters to simulate climate-relevant drought events. Morphological characteristics including plant height, photosynthetic efficiency, and leaf width will be collected across teff genotypes in well-watered and drought conditions. These data will be collected during the growing season and compared across genotype and the two watering regimes. These results will provide insight for the future of sustainable teff production as the agriculture industry is confronted with an increasingly dynamic climate.

REDUCTION IN DNA METHYLATION IN CLONAL ANGIOSPERMS AND ITS IMPACT ON TE EXPRESSION
Presenter(s): Diego DeSousa (Bowdoin College)
Plant Science
Section: 1
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2107
Mentor(s): Chad Niederhuth (Michigan State University), Eleanore Ritter (Michigan State University)

Plants employ a wide variety of mechanisms in order to organize DNA and control gene expression. One such mechanism which is receiving increased attention due to next generation sequencing technologies is cytosine methylation, part of the exciting field of epigenetics. Recently, it has been observed that clonal crop species have lower levels of CHH methylation (where "H" denotes any nucleic acid other than cytosine) compared to sexually reproducing species. Reductions in DNA methylation levels associated with clonality are known to affect phenotype, for example the mantled phenotype in oil palm which results in yield decreases of 30%. It is thought that reductions in CHH methylation can result in less effective suppression of transposable elements (TEs) which then wreak havoc on the genome through their deleterious insertions. My study seeks to determine if a link between methylation deficiency in clonal plants and TE expression exists between three model species: Arabidopsis lyrata (clonal), Arabidopsis thaliana (sexual), and Capsella rubella (sexual). A comparative genomics analysis will be performed between the three Brassicaceae species using pre-existing WGBS (whole genome bisulfite sequencing) and RNA sequencing data. The expected results will be that the WGBS data will show reduced CHH methylation in A. lyrata compared to the sexually reproducing species, which will correlate with increased TE expression. The results of this study will shed light on the negative impacts on genome maintenance and crop yield that may arise in plants that reproduce clonally, which include many of the agricultural crops that we rely on so heavily.

CHENOPODIUM: A TALE OF TWO PLANT GENOMES
Presenter(s): Kira Falaschi (Montana State University)
Plant Science
Section: 1

Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2108
Mentor(s): Nick Johnson (Michigan State University)

Chenopodium quinoa is an important agricultural crop that produces nutritious seeds and is able to grow in many different environments, particularly in arid and semi-arid climates. However, its relative Chenopodium album is considered an agricultural weed in many parts of the world, able to grow very well in drought and salty conditions and reducing the yield of corn, soybean, and many other crops if not controlled. Both plants are allopolyploids: C. quinoa is a tetraploid (2n = 4x = 36) and C. album is a hexaploid (2n = 6x = 54). Genomic analysis on these two species was conducted by first assembling the genome of C. album and then aligning it with the C. quinoa genome to identify conserved sequences (i.e. synteny) between the two genomes. From these alignments, a shared subgenome between the plant species was determined. To further determine the relatedness of the subgenomes, phylogenetic analysis was conducted on all of the subgenomes. Gene model annotation of C. album revealed >60,000 gene loci. These genes were compared to C. quinoa genomic annotation to identify shared and exclusive genes of these two species as well as gene families that are undergoing significant expansion or contraction in each species. Analyzing the similarities and differences between the genomes of C. quinoa and C. album provides insights into which genomic elements contribute to weediness of C. album and the domestication of C. quinoa.

LEAF SHAPE VARIATION IN THE POLYPLOID CARDAMINE FLEXUOSA AND ITS DIPLOID PARENTS
Presenter(s): Audrey French (Utah Valley University)
Plant Science
Section: 2
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2111
Mentor(s): Asia Hightower (Michigan State University), Emily Josephs (Michigan State University)

Leaf shape can be an indicator of plant health and having the right leaf shape for an environment can improve a plant's fitness. In this project, we look at C. flexuosa, an allotetraploid with 32 chromosomes and a hybrid of the diploid species C. hirsuta and C. amara, which each have 16 chromosomes. We expect to see differences in phenotype between diploid and polyploid species. In this project we examine leaf shape variation in relation to their ploidy status and in relation to the environment. Studies show different leaf margin shapes can improve gas exchange, light capture, and hydraulics. Genotype and environment can both influence leaf shape throughout a plant's life, so we obtained environmental data. The environmental factors that are collected are: location, date, elevation, temperature (max, min, mean), and precipitation. Using imageJ, leaf shapes are outlined and then later analyzed using the R package MOMOCS. The goal is to look at interspecies and intraspecies leaf variation and potential factors that influence it and which one has the greatest influence.

FUNGAL - PLANT INTERACTIONS IN THE TERRESTILIZATION OF EARTH
Presenter(s): Alder Fulton (Michigan State University)
Plant Science
Section: 2
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2112
Mentor(s): Patrick Edger (Michigan State University)

The process of how early plants moved from aquatic environments to terrestrial ones is not fully understood. To make this evolutionary leap, plants need to adapt to a number of stressors such as radiation, lack of water, and rapidly changing temperatures. One theory on how plants made this transition is through mutualism with fungi that facilitate nutrient acquisition. We test this theory by examining the gene expression and growth rate of Ceratopteris richardii, a type of water fern, with and without the mycorrhizal fungi Benniela eriona (GBaus27b) and Linnemania elongata (NVP64) present. Growth rate was measured by image analysis over four weeks. At the end of this period gene expression was compared between the ferns with fungi and the ferns without.

INVESTIGATING PHYSIOLOGICAL RESPONSES TO SINGLE AND REPEATED DROUGHT STRESS EVENTS IN SORGHUM BICOLOR.
Presenter(s): Michael Gasdick (Robert Morris University)
Plant Science
Section: 2
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2113
Mentor(s): Jeremy Pardo (Michigan State University), Robert VanBuren (Michigan State University)

Drought is a prevalent issue in modern agriculture, leading to a significant loss in crop yield and a decrease in crop quality. Most drought research has focused on crop responses to a singular water-deficit stress event, but natural drought events are often prolonged and result in repeated water-deficit stress. Here, we examined the impact of repeated water deficit stress compared to a single stress event and well-watered conditions across three developmental stages in the drought-resistant cereal crop Sorghum bicolor. We monitored the physiological and gene expression responses to water stress across well-watered, singularly stressed, and repeatedly stressed plants at each developmental stage. We identified differentially expressed genes between the described conditions to better understand how repeated water-deficit stress events impact drought responses in sorghum. Overall, this study highlights the importance of conducting physiologically relevant drought experiments in order to better improve crop drought resilience.

CHARACTERIZING ESTERASE/LIPASE/THIOESTERASE 4 (ELT4) ASSOCIATED WITH THE JASMONIC ACID BIOSYNTHESIS PATHWAY IN ARABIDOPSIS THALIANA PLASTOGLOBULI
Presenter(s): Earl Givens (California State University - Long Beach)
Plant Science
Section: 2
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2114
Mentor(s): Febri Susanto (Michigan State University), Peter Lundquist (Michigan State University)

A large portion of stress responses are mediated through the plant hormone jasmonic acid. Jasmonic acid biosynthesis begins with the hydrolytic cleavage of the 18:3 fatty acid substrate from chloroplast membrane lipids. However, the sub-plastidic localization(s) of this initial step remain unclear, impeding our ability to understand and manipulate jasmonic acid biosynthesis for enhanced plant stress resilience. Previous quantitative proteomic analyses have suggested a role for the uncharacterized Esterase/Lipase/Thioesterase 4 (ELT4) protein of the plastoglobule in the initial step of jasmonic acid biosynthesis. We have set out to test the hypothesized function of ELT4 as an esterase and its role in jasmonic acid biosynthesis. Initial efforts have included cloning and expressing the ELT4 protein and in vitro biochemical assays will follow. Definitive characterization of this protein is expected to result in better understanding of localization and regulation of the initial, plastid-localized steps of jasmonic acid biosynthesis, and its impact on plant stress resilience. Understanding how the plastoglobule ties into stress responses and the jasmonic acid biosynthesis pathway can lead to better understanding of stress responses overall within plants. Key words: Plastoglobule, ELT4, Jasmonic acid, Arabidopsis thaliana, Stress tolerance

RESPIRATION IN THE LIGHT AND ITS POSSIBLE DEPENDENCE ON REFIXATION
Presenter(s): Briana Hashim (Eckerd College)
Plant Science
Section: 2
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2115
Mentor(s): Stephanie Schmiege (Michigan State University)

Respiration occurs in the light and dark, but respiration in the light (RL) is the least understood and most poorly represented in models. This is because RL often happens spontaneously with carbon fixation during photosynthesis, making it challenging to measure. Furthermore, some evidence suggests that

CO_2 released during RL may be refixed in the cell when photosynthesis is high; which could lead to inaccurate estimations of RL. Nevertheless, the literature currently suggests that respiration is suppressed in the light. Our question is whether RL is truly light dependent or if it is an artifact of refixation. Using a new measurement technique, we will measure the $12CO_2$ efflux from a leaf (RL) in a $13CO_2$ environment with a tunable diode laser. We will collect RL light response curves under ambient (440ppm), and high (1200 ppm) $13CO_2$ concentrations. Our hypothesis is that refixation of $12CO_2$ will be less likely to occur under extremely high $13CO_2$ concentrations, allowing us to measure the total $12CO_2$ emitted from the leaf. Thus, if there is no refixation in the leaf, the light responsive curves should all have the same RL as our control concentration (440ppm) at each light intensity. However, if refixation is occurring, then the high $13CO_2$ light response curves would disappear or be muted. Only by gaining a clear estimation of refixation and its relationship to RL can we improve estimates of RL used in models and increase our understanding of the effect of this small but important flux on the global carbon balance.

IMPACT OF PRATYLENCHUS PENETRANS ON THE GROWTH OF THREE VARIETIES OF CARROTS
Presenter(s): Saniya Henderson (Michigan State University)
Plant Science
Section: 2
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2116
Mentor(s): Ellie Darling (Michigan State University), Marisol Quintanilla Tornel (Michigan State University)

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). In this study, we aim to determine how the root lesion nematode,P. penetrans, impacts the growth and development of three carrot varieties. In a 60-day experiment, we examined three carrot varieties (cv. Cupar, Nantes half-long, and Danvers 126) using 100 cm3 volume cone-tainers to compare non-inoculated plants and inoculated plants of each variety. This trial was used to study the root lesion nematode's damage severity between each variety. During experiment takedown, we used 1g of roots and 100cm3 of processed soil to obtain nematode counts to determine if there were differences in final counts between varieties. Finally, we collected the final root weight and measured the final plant height of the carrots to better determine the impact the P. penetrans had on carrot varieties. This trial was repeated to ensure trends were consistent between varieties. A second study was conducted to better understand how different treatments and methods impacted the growth and colonization of P. penetrans using a variety of standard carrot disc culturing methods. Method 1 is an adapted culturing method current used in the MSU Applied Nematology laboratory. Method 2 included applying a small layer of pure ethanol over the peri discs as well curing them with UV bench.

PRELIMINARY ANALYSIS OF ROOT TRAITS IN ERAGROSTIS TEF
Presenter(s): Dilyn Heslinga (Michigan State University)
Plant Science
Section: 2
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2117
Mentor(s): Miranda Haus (Michigan State University)

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 2021. Each accession was grown in three separate plots and three plants within each 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 fuel 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.

ROOT ANGLES ARE NARROWED BY MUTATION OF WEEP GENE IN ARABIDOPSIS
Presenter(s): Joy Johnson (Michigan State University)
Plant Science
Section: 2
Time and Location: 11:00 AM - 12:30 PM, 3202 STEM Facility
Presentation Number: 2118
Mentor(s): Courtney Hollender (Michigan State University)

Lateral shoot and root orientations are agriculturally applicable traits that have potential for use in breeding programs of tree fruit. These traits may be used to improve orchard management in high density systems by reducing tree vigor and thereby reducing the need for pruning. Genetics play a significant role in determining lateral shoots (branches) and roots initiation angles and subsequent orientations. WEEP is present in all plants, but its molecular function is unknown. Peach trees with a mutation in the gene WEEP exhibit a weeping branch phenotype, but the root architecture has never been observed. Additionally, mutations in the Arabidopsis WEEP homolog do not result in a weeping or abnormal branch phenotype, despite documented gene expression in shoots. This project investigated the root architecture of three different Arabidopsis weep mutant lines. We found that all three weep lines exhibited narrower root angles than wildtype plants. We also found that when compared to wildtype plants, the weep lines had a smaller convex hull. We were also able to determine that the weep mutants did not exhibit longer lateral roots than the wildtype plants. This knowledge could be used as a basis for using Arabidopsis as a model for peach tree root architecture.

IDENTIFICATION OF GENES INVOLVED IN BIOSYNTHESIS OF REGULAR AND IRREGULAR DITERPENOIDS IN ANISOTOME LYALLII
Presenter(s): James Hinson (The University of Southern Mississippi)
Plant Science
Section: 3
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2121
Mentor(s): Trine Andersen (Michigan State University)

Terpenoids, a superclass of plant metabolites derived from 5-carbon isoprene units, are not only essential to the survival of plants but are also important to our usage of many species. Anisotome lyallii is known for its unique terpenoids. While the majority of 20-carbon terpenoids, known as diterpenoids, are biosynthesized through the head-to-tail coupling of 5-carbon isoprene subunits, A. lyallii seems to have developed a novel system to synthesis these metabolites. Their unique nature comes from the head-to-head coupling of two geranyl diphosphate (GPP) subunits instead of head-to-tail coupling of isoprene subunits. In this project, genes coding for Terpene synthases (TPSs), which establish the initial steps of terpenoids, belonging to A. lyallii were identified and characterized to determine their participation in the biosynthesis of the terpenoids found in this endemic species. The unique precursor of irregular diterpenoids is expected to be biosynthesized by a class of enzymes known as prenyltransferases. To clone the genes and characterize the enzymes, the transcriptome of A. lyallii was sequenced. From there, full length candidates were characterized in one of the following ways. TPS candidates were transformed into Agrobacterium and infiltrated into Nicotiana benthamiana and metabolites extracted after 5 days. Prenyltransferase candidates were expressed in E. coli, purified, and tested by in vitro enzymatic assays. Both products of which were analyzed by GC-MS after expression. The genes coding for these enzymes are imperative for the further characterization of these unique compounds holding the keys to promising biomedical breakthroughs without destroying their natural occurrence in the wild.

MECHANISMS OF RESISTANCE TO INDAZIFLAM IN POA ANNUA
Presenter(s): Sarah Holmes (Truman State University)
Plant Science

Section: 3
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2122
Mentor(s): Mohit Mahey (Michigan State University)

Poa annua, also known as annual bluegrass, is a widespread grass weed that is difficult to control and is problematic in the turfgrass industry and certain grass crops such as wheat. Certain populations of P. annua have developed resistance to indaziflam, a pre-emergence herbicide, however, the mechanisms of resistance are not known. Additionally, P. annua is a tetraploid, which contributes to its ability to evolve resistance. This project aims to identify possible target- and non-target-site resistance mechanisms through the use of RNA sequence analysis. RNA samples were collected from 3 susceptible and 3 resistant populations. The RNA samples were sequenced using Illumina sequencing and aligned to the known transcriptome of P. annua and analyzed for single nucleotide polymorphisms (SNPs) as well as changes in levels of gene expression. Upregulation or downregulation of gene expression between the susceptible and resistant populations could help us identify the genes that may be responsible for resistance. In addition to RNA-seq analysis, computational methods such as in-silico molecular docking will be used to identify the potential target sites of indaziflam, which are still unknown. This information could help identify the proteins that may be involved in resistance. Molecular docking and RNA sequencing results complement each other and help us gain a more fundamental knowledge of how this herbicide functions in plants and the potential for resistance evolution.

FATTY ACID DESATURASE 4(FAD4) AND PEROXIREDOXIN Q(PRXQ) ARE NEEDED FOR THE EFFICIENT TURNOVER OF CHLOROPLAST MEMBRANE LIPIDS
Presenter(s): Aubre Joyner (Elizabeth City State University)
Plant Science
Section: 3
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2123
Mentor(s): Timothy Nicodemus (Michigan State University)

Abiotic stress events are known to cause tens of billions of dollars in crop damages in the U.S. with more than 40 billion dollars of abiotic stress induced crop damage occurring in 2021. The primary cause of plant loss is inability to maintain membrane integrity when assessing cold, nutrient, and light stress, three of the most common abiotic stresses. The work presented investigates how plants sense and deal with chloroplast membrane damage that eventually leads to plant death. This damage is frequently caused by the production of reactive oxygen species or ROS as a byproduct of carrying out photosynthesis under inopportune conditions. Two enzymes, Fatty Acid Desaturase 4(FAD4) and Peroxiredoxin Q(PRXQ) are key to this through the production of a singlet oxygen sensing fatty acid species 16:1t delta 3 trans. Our work suggests that these enzymes are part of a "safety switch" for turning on and off photosynthesis in the chloroplast during times of stress. The following data shows that FAD4 and PRXQ are needed to facilitate the flow of membrane lipids into TAGs following abiotic stresses as well. It is also suggested that the lack of these enzymes decrease the ability of the chloroplast membrane to turnover damaged lipids in the face of nitrogen and phosphorus deprivation and increases the de novo synthesis of lipids which we hypothesize is to deal with the inhibited ability to turnover damaged fatty acids in the plastid membrane.

THE ROOT OF ALL MATTER: ISOPRENE
Presenter(s): Raeshell Leek (St. Augustine University)
Plant Science
Section: 3
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2124
Mentor(s): Bianca Serda (Michigan State University)

Isoprene is a volatile and colorless hydrocarbon that is synthesized in the chloroplast stroma from the methylerythritol 4-phosphate pathway and is dependent on the Calvin-Benson cycle for carbon and energy sources. Isoprene protects plants from abiotic and biotic stresses such as: High temperature stress, herbivory, and ozone stress. Isoprene is found in some but not all plant species. In recent studies,

isoprene has been shown to alter gene expression related to suppressing stress signaling pathways and genes related to root growth. In order to understand the underlying mechanism of isoprene, we will be characterizing the effects of isoprene on root growth and morphology. We hypothesize that the plants that emit isoprene will have enhanced root growth and root length patterns. Arabidopsis thaliana does not emit isoprene naturally. We are using two Arabidopsis thaliana transgenic lines B2 and C4 that have been engineered with isoprene synthase (ISPS). Arabidopsis thaliana lines B2 and C4 root morphology observations will be from plants grown in an aeroponic system and agarose plates. Root growth was monitored by measuring the roots' dry weight, primary and lateral root length, and the number of lateral roots. Thereafter, we measured isoprene emission using the Fast Isoprene Sensor (FIS). These results will show us the effects of isoprene on root morphology. We predict that plants engineered with ISPS would emit isoprene in their roots and have greater root lengths in comparison to wild type plants.

DEVELOPMENT OF A NOVEL TUBERIZATION IMAGE ANALYSIS PIPELINE
Presenter(s): David Mowbray (University of Central Florida)
Plant Science
Section: 3
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2125
Mentor(s): Julia Brose (Michigan State University)

Observations of phenotypic variation in plant growth and development inform explorative efforts of underlying genetic and molecular pathways. High-throughput image analysis techniques prove invaluable towards diverse ranges of phenotyping applications. Due to their inconspicuous development, belowground structures such as root systems, modified roots, and belowground modified stems (stolons) suffer from a lack of in-situ image analysis methodologies. This absence is of particular significance given the indispensable role that tubers and belowground structures occupy in advancing global food security. Furthermore, the underlying genetics encoding tuber development remains poorly resolved. To address these and further questions of developmental diversity of underground stem structures, an image analysis pipeline was generated in order to quantify stolon numbers, stolon and tuber relative growth rates, as well as assist in the assembly of developmental time lapses for three respective species: Solanum tuberosum, S. dolichocremastrum, and Physalis alkekengi. Ultimately, the phenotypic data collected from these efforts will accompany genetic analyses regarding key genes involved in tuberization and the elucidation of how this important agronomic trait evolved independently across multiple distinct angiosperm clades.

IMPACT OF DROUGHT ON SORGHUM PHYSIOLOGY AND GENE EXPRESSION
Presenter(s): Annie Nguyen (Michigan State University)
Plant Science
Section: 3
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2126
Mentor(s): Jeremy Pardo (Michigan State University), Robert VanBuren (Michigan State University)

Drought has a severe impact on plant photosynthetic efficiency, resulting in reduced biomass and yield. In this study, we aimed to better understand the effect of water-deficit stress on the physiology of the drought resistant cereal crop Sorghum bicolor, and how drought response varies across diverse sorghum genotypes. While many prior studies have examined the physiological response of sorghum under drought, most have focused on one or a few genotypes. We grew 25 diverse genotypes of sorghum in a replicated complete block design during the summer of 2020. We collected data during a natural drought event where no rainfall occurred for 2 weeks, and during recovery after a heavy rainfall. We surveyed physiological changes underlying drought stress response in sorghum using a multispeQ fluorometer and surveyed gene expression dynamics using RNA sequencing. We identified a significant difference in non-photochemical quenching between the drought stressed and rehydrated samples. However, we did not observe any difference in overall photosynthetic efficiency, suggesting the stress was not strong enough and the sorghum were able to recover. We used Pearson's correlation coefficient to identify genes with expression correlated with photosynthetic parameters and elucidate candidate genes associated across the diverse sorghum genotypes.

AN EVALUATION OF ANDEAN COMMON BEAN (PHASEOLUS VULGARIS) ROOT TRAITS USING "ROOT ROLL-UP" PROCEDURE
Presenter(s): Katie Philipps (Michigan State University)
Plant Science
Section: 3
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2127
Mentor(s): Miranda Haus (Michigan State University)

In Africa and Europe, common beans (Phaseolus vulgaris) of Andean origin are of widespread importance. They hold high commercial value, accounting for approximately 75% of common beans produced in East and South Africa. Despite their popular nature, there has been little effort in breeding roots against disease and low fertility in Andean Beans. To further explore root architectures in Andean Diversity Panel (ADP) genotypes, root systems of early seedlings were phenotyped after 14 days of growth in germination paper rolls. Using ImageJ and SmartRoot software, root architecture traits including taproot length, lateral root number, and length of the apical unbranched zone were measured. Seed size was also measured and tested for a relationship with taproot length. Correlations between the unbranched zone length and plant determinacy were discovered. These findings highlight valuable root phenotypes that should be considered in further breeding efforts and future research.

VARIATIONS IN ABIOTIC FACTORS AFFECTING SHORT-DAY CROP FLOWERING TIME
Presenter(s): Will McDonald (Michigan State University)
Plant Science
Section: 3
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2128
Mentor(s): Acer VanWallendael (Michigan State University)

Proso millet has been a staple crop of Asia for millenia, being one of the first crops ever domesticated. Domesticated millet is an extremely drought tolerant short-day grass whose grains are known for being very nutritious; essentially it is a plant well-adapted for adverse growing conditions. Millet can flower in as little as 17 days after germination, but little is known about how environmental conditions impact flowering. The goal of my experiment was to find if a number of variables (soil water availability, nutrient abundance or deficiency, and pot size) would have a significant effect on the flowering time of millet given an 8 hour light cycle. The expected results from the study should show that plants with less water available, a smaller pot size, and nutrient deficiency should flower the quickest. Those plants which flower quicker can then be crossed with a heavier fruiting variety to hopefully yield a faster flowering high yielding crop. With significant increases in the popularity of millet as a grain and a less stable climatic future ahead, better cultivated varieties of millet could relieve food insecurity in many parts of the world.

SELF-POLLINATION OF DIPLOID POTATO LINE 1S1
Presenter(s): Samantha Sikora (Michigan State University)
Plant Science
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2131
Mentor(s): David Douches (Michigan State University), Thilani Jayakody (Michigan State University)

Cultivated potato is an asexually propagated autotetraploid (2n=4x=48) with a high genetic load. Breeders and researchers have been looking to diploid potato (2n=2x=24) as a source of progress in overcoming barriers associated with cultivated potato to gain access to modern genetic engineering and breeding approaches. A limitation to transitioning potato to a diploid bred crop is the presence of self-incompatibility mechanisms commonly found throughout diploid potato germplasm that prevent the production of viable fruit after self-pollination. Promising diploid lines have been evaluated for regeneration in tissue culture and amenability to Agrobacterium-mediated transformation, and the ability to then produce fruit with seeds upon self-pollination to serve this goal. This project evaluates the diploid potato line 1S1's ability to produce viable fruit upon selfing under different flowering conditions. Specifically, the results of fruit set

from self-pollinations performed when the flowers are open or closed at the time of pollination were examined. 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 in diploid potato, lines like 1S1 can be better utilized for genetic engineering and breeding applications.

SCREENING PERENNIAL PHASEOLUS SPECIES FOR SEEDLING VIGOR IN MICHIGAN
Presenter(s): Jack Sinnaeve (Michigan State University)
Plant Science
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2132
Mentor(s): Miranda Haus (Michigan State University)

With increases and variation of climatic events, scientific attention has turned to the improvement and sustainability of our world's food crops. Perennial crops allow for greater capture and forage of nutrients, decreased soil erosion, and the sustaining of robust food soil webs. The genus Phaseolus holds many of the world's cultural and nutritional food staples, including Phaseolus coccineus and Phaseolus dumosus. These are two species of bean grown as perennials primarily in South and Central America. This study focuses on the phenotypic traits necessary for perennialization of the Phaseolus crops in a temperate climate. Preliminary phenotypic data including seed data, germination rates, and overall field growth of 55 lines of Phaseolus dumosus and 46 lines of Phaseolus coccineus has been gathered at the Michigan State University Horticulture Teaching and Research Center. A subset of plants showed acclimated seedling vigor in relatedness between seed size and growth, higher germination rates, and required less time to establish. Comparisons between genotypes aim to provide a potential resource in the applied research and breeding of a more adaptable perennial Phaseolus crop and the expansion of perennial food crops worldwide. Future work will focus on measuring time to flower, harvest index, photosynthetic performance, and plant cold tolerance.

WILD BEAN (PHASEOLUS VULGARIS L.) ADAPTIVE SEED AND DEVELOPMENTAL TRAITS
Presenter(s): Paige Smith (Michigan State University)
Plant Science
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2133
Mentor(s): Miranda Haus (Michigan State University)

Domestication of the common bean, Phaseolus vulgaris, has been essential for global food security. With the changing climate, the domestic bean's narrow genetic diversity limits its ability to adapt to harsh growth conditions, reducing food production. My research focus is comparing pre-domestication (wild) seed and growth rate phenotypes between Andean and Middle American gene pools. Seed size and growth rates were used to explore the relationship between evolutionary history and adaptive traits. The hypothesis is that seed size varies between the two gene pools, and the size of the seed will influence growth rate, such that larger seeds will reach key developmental stages faster than smaller seeds. Wild beans with geographical information (166 accessions) were grown in rhizoboxes for ten days, monitoring developmental stages. Seeds were measured for color, size, and shape in ImageJ. Results of this experiment will inform the dry bean community about the phenotypic diversity of wild beans. Future direction for this data will involve the inclusion of climate data, like precipitation and temperature, as well as analysis of the root system architecture. The long term goal of this research is to improve the genetic diversity of the common bean.

TRANSCRIPTOME APPROACH TO UNDERSTANDING FUNCTIONAL ROLES OF BRACHYPODIUM DISTACHYON IRE1 IN GROWTH AND PHYSIOLOGY
Presenter(s): Sherry Sun (Haverford College)
Plant Science
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility

Presentation Number: 2134
Mentor(s): Dae Kwan Ko (Michigan State University)

Protein folding capacity in the endoplasmic reticulum (ER) is often challenged by physiological demands and pathological perturbation. Failure in ER stability can cause a lethal condition, known as ER stress. To recover ER stability, eukaryotic cells trigger a set of signal transduction pathways, the unfolded protein response, in which inositol requiring enzyme 1 (IRE1) serves as a transmembrane sensor protein. The functional roles of IRE1 in response to ER stress are well-established, yet how IRE1 controls normal growth and physiology remains elusive in plants. To address this, we investigate transcriptome changes in Brachypodium transgenic lines in which IRE1 is overexpressed (IRE1ox). RNA-sequencing analyses reveal massive gene expression changes in IRE1ox lines, indicating that IRE1 is not only a key molecular sensor for ER stress but also could orchestrate significant biological processes necessary for normal growth. We further identify potential upstream regulators of differentially expressed genes in IRE1ox lines by performing de no motif analyses on the gene promoters. These results demonstrate the functional importance of IRE1 in normal growth and physiology and reveal gene regulatory cohorts of which understanding could be applied to improve productivity in bioenergy crops.

USING CRISPR/CAS9-MEDIATED GENE EDITING TO STUDY THE REGULATION OF ACYLSUGAR BIOSYNTHESIS IN CULTIVATED TOMATO
Presenter(s): Alora Sundbeck (Michigan Technological University)
Plant Science
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2135
Mentor(s): Rachel Kerwin (Michigan State University)

Acylsugars are specialized metabolites produced in the leaf trichomes of the Solanaceae family that help the plant defend against insects. The enzymes that synthesize cultivated tomato acylsugars, acylsugar acyltransferase (ASAT) enzymes ASAT1, ASAT2, ASAT3, and ASAT4, are expressed specifically in trichomes. Transcription factors are proteins that bind to a specific spot on DNA in order to control whether the gene is turned on or off. To better identify how the ASAT enzymes are regulated, we identified transcription factors that may be responsible for the regulation of these enzymes. We used CRISPR/Cas9-mediated gene editing to create a loss-of-function mutation in candidate transcription factors. This will show us whether or not they have an effect on the plant's ability to make acylsugars. Then we genotyped the transformed plants to see if they had mutated and phenotyped them using liquid chromatography-mass spectrometry (LC-MS) to identify mutants with altered acylsugar profiles. The results of this project will advance our understanding of how plants regulate when and where specialized metabolites, such as acylsugars, are produced.

HOW DO PLANTS BEAT THE HEAT? IMPROVING PHOTOSYNTHETIC EFFICIENCY AT ELEVATED TEMPERATURES
Presenter(s): Faith Twinamaani (University of Florida)
Plant Science
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2136
Mentor(s): Berkley Walker (Michigan State University), Deserah Strand (Michigan State University), Luke Gregory (Michigan State University)

Plants face the unique challenge of photorespiration when performing photosynthesis at elevated temperatures. Photorespiration occurs when the enzyme rubisco fixes oxygen, instead of carbon dioxide, to produce an inhibitory intermediate to photosynthesis. This intermediate is recycled by the plant through the photorespiratory pathway, but at the expense of carbon loss that reduces photosynthetic efficiency. The biochemical source of this carbon loss is well understood under lab temperatures (25?), but not under high temperatures (>30?). We hypothesize that at higher temperatures, additional carbon may be lost through the reaction of H2O2, a by-product of photorespiration, with other photorespiratory intermediates. To mitigate H2O2 buildup, the photorespiratory enzyme catalase degrades H2O2 before

these reactions can occur. However, as rates of photorespiration increase with temperature, it is unclear if catalase manages larger pools of H2O2 and prevents additional carbon loss. Therefore, understanding mechanisms behind photorespiratory carbon loss at high temperatures is critical as plants adapt to the world's changing climate. To determine if net carbon fixation is affected by the temperature response of catalase, we use multiple genotypes of Arabidopsis expressing native and transgenic catalase to assess differences in H2O2 degradation. We perform fluorescence-based screens, in-depth gas exchange, and biochemical assays at low and high temperatures to assess differences in H2O2 degradation. We anticipate that Arabidopsis lines expressing a more thermotolerant catalase will have greater net carbon fixation through more effective degradation of H2O2. Our findings will advance engineering efforts to improve net carbon fixation in C3 plants under elevated temperatures.

ANALYSIS OF CHEMICAL PRETREATMENT METHODS AND ENZYMATIC HYDROLYSIS ACTIVITY IN CORN STOVER
Presenter(s): Gabriel J. Vazquez-Badillo (Inter American University of Puerto Rico - Aguadilla)
Plant Science
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2137
Mentor(s): Shiyou Ding (Michigan State University), Xuejun Qian (Michigan State University)

The complex structure of plant cell walls, especially the cross-linking between polysaccharides and lignin, serves as a deterrent to cellulose degradation and is traditionally removed so that the cellulose is fully exposed to enzymatic hydrolysis, a process known as delignification. Delignification can be achieved by two different chemical processes, including alkali and acid pretreatment. The concentration, time, and temperature of the pretreatment are critical factors that can affect the delignification process. The aim of my study is to investigate the changes in lignin and the cell wall during the pretreatment process using sodium hydroxide (NaOH) and hydrochloric acid (HCl) and to carry out an enzymatic hydrolysis process using commercial cellulase enzyme (CTec 3) on pretreated samples to compare enzymatic hydrolysis activity in relation to alkali and acid pretreatment. To analyze changes in lignin and cell wall delignification, cross-sections of corn stover were prepared by cutting them by hand using a single-blade razor. Stem sections were observed using a brightfield light microscope to select samples with uniform sections and thicknesses. Samples were treated with 0.1 M NaOH and 0.1 M HCl at room temperature and analyzed with a confocal laser scanning microscope after 1 hour, 24 hours, and 48 hours of pretreatment to observe changes in lignin and the cell wall.

1-MCP RELEASE KINETICS AND THE EFFECT OF 1-MCP TREATMENT ON THE AROMA RECOVERY OF STORED APPLE FRUIT
Presenter(s): Helena Wing (Michigan State University), Jiarui Xu (Michigan State University)
Plant Science
Section: 4
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2138
Mentor(s): Randolph Beaudry (Michigan State University)

1-MCP is typically utilized for storage of post-harvest produce and plants and has been shown to slow the ripening process of fruit. Because 1-MCP acts at ethylene receptors and the apple produces large amounts of ethylene, apples are particularly responsive to 1-MCP treatments. The purpose of this specific experiment is to analyze the kinetics of 1-MCP release from 1-MCP containing apparatuses and to then analyze the effects of 1-MCP treatment and subsequent storage on the recovery of apple aroma production. To carry out this experimentation, we analyzed the mechanics of 1-MCP release from HarvestHold brand plastic sheeting material within multiple humidity levels and temperatures using gas chromatography. Simultaneously, we carried out aroma analysis of the recovery of aroma production of apples treated with or without 1-MCP. Using gas chromatography mass spectrometry, we were able to detect which aroma molecules were being produced by the apples over several weeks of recovery. Thus far, we have discovered that 1-MCP releases at a faster rate in higher humidity environments and at a slower rate in lower temperatures in all levels of humidity. We are still amidst the process of aroma

analysis on the recovered apples; however, we anticipate that the apples treated with 1-MCP will have lower volatile production of compounds relating to ripening and fermentation.

SOCIAL SCIENCES

STRATEGIC OR SNUBBED? AUTHORSHIP CLIMATE AS A NEW MECHANISM FOR ANALYZING ETHICAL ISSUES IN AUTHORSHIP DECISIONS
Presenter(s): Lexi Nadolsky (Michigan State University)
Social Sciences
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2201
Mentor(s): Kendra Cheruvelil (Michigan State University)

Publishing academic works is an integral aspect of every scholars' career, with career advancement hinged on securing first-author positions. Yet, decisions on authorship order are often inconsistent and ambiguous, posing challenges for women, early-career scholars, and marginalized groups. Research shows that women and marginalized scholars have fewer publications and citations than white men. Disparities in author order are also present, with women less frequently securing first and last author positions than men. To address this, we propose the concept of authorship climate, a method of analyzing scholars' perceptions of procedural, informational, and distributive justice in authorship decisions within their research groups. We conducted a national survey of N = 3,585 doctoral students, postdoctoral scholars, and assistant professors from departments of biology, economics, physics, and psychology. We used ANOVAs to assess the relationships between authorship climate and our variables of interest (e.g., author order and race). We found that lead authors tended to report more positive procedural, distributive, and informational justice in the authorship climate than non-lead authors. Authorship determination method (alphabetical, contribution, or hybrid) also affected all three measures of authorship climate. Additionally, one-way ANOVAs revealed that scholars belonging to two or more marginalized identities experienced more negative perceptions of all three authorship climate measures than individuals in zero or one marginalized group. These results show that people's authorship climate experiences differ based on authorship determination and marginalization. Understanding the factors that play into authorship climate will allow for necessary changes to be made to advance equity in academia.

UNDERSTANDING HOW THE DREW SCIENCE SCHOLARS PROGRAM SUPPORTS ITS STUDENTS
Presenter(s): Tiana Carter (Michigan State University)
Social Sciences
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2202
Mentor(s): Vashti Sawtelle (Michigan State University)

The Charles Drew Science Scholars is a program that has existed at Michigan State University for over 40 years. The program has a proven track recording in supporting students in the College of Natural Science, particularly for students from historically underrepresented racial and ethnic and from economically disadvantaged communities. This presentation responds to calls from the national community to ask questions about which programs like the Drew Scholars work, how they work, and for whom they work best (Estrada, Eppig, Flores, 2019). Using qualitative analysis of interview data, this presentation will show that the Drew Scholars program understands their scholar's individuality, increases students' sense of belonging, encourages social camaraderie, provides consistent individual support, and much more. In this presentation, I will outline the qualitative discoveries as evidence for student's success within this program. Our intent is to understand how the Drew Scholars program supports students to be successful and identify strategies that could be employed across STEM majors.

FROM BETRAYAL TO COURAGE?: STAKEHOLDER PERCEPTIONS ON INSTITUTIONAL CHANGE.
Presenter(s): Katie Burkhardt (Michigan State University)
Social Sciences
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2203
Mentor(s): Sarah Prior (Michigan State University)

Since Larry Nassar was put on trial for sexually abusing hundreds of his patients, Michigan State University has created and implemented a number of programs aiming to combat and eventually eliminate sexual violence on campus. Our research aims to study the perceptions that MSU students, staff and faculty hold towards these new initiatives, and whether they think that MSU has moved towards a model of 'institutional courage' where they work to protect community members even when it means facing controversy, financial loss and other repercussions. In this presentation, we discuss the general timeline of sexual assault incidents and responses at MSU leading up the Nassar case, as well as the major changes to that MSU made after this case. We also discuss the difference between "institutional courage" and "institutional betrayal." The initial institutional response to the Nassar scandal embodied institutional betrayal wherein institutional leaders and stakeholders protected the brand of the institution over the victims/survivors. We want to know if stakeholders (students, staff and faculty) think the institution has moved beyond institutional betrayal in, instead, is moving towards institutional courage. Lastly, we talk about the instrument we are using to measure peoples' attitudes, our process of distributing this survey as well as the results we hope to see in our results.

THE ROLE OF SOCIAL BELONGING ON MAJOR CHOICE AMONG UNDERREPRESENTED STUDENTS
Presenter(s): Kerrington Curl (Michigan State University)
Social Sciences
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2204
Mentor(s): Amanda Chuan (Michigan State University)

Current statistics show a gap in representation among STEM major declarations for women and students of color within American colleges and universities. Prior studies report that choice plays a significant role in undergraduate STEM experiences. This emphasizes the influence sociocultural factors have on major declarations among underrepresented students. This study analyzes survey results for a sample of Michigan State University undergraduate students. The survey results demonstrate systematic differences in students' sense of identity and perceived belonging across different majors. The analysis reveals lower social belonging among women and students of color compared to their white male counterparts. These differences suggest that differences in identity and perceived sense of belonging may contribute to gender, racial, and intersectional disparities in major choice among undergraduate students.

RELATIONSHIP BETWEEN SPONTANEOUS SPEECH SYNCHRONIZATION AND RHYTHMIC ABILITY
Presenter(s): Bailey Rann (Michigan State University), Frank Dolecki (Michigan State University), Tess Andrews (Michigan State University)
Social Sciences
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2205
Mentor(s): J McAuley (Michigan State University), Toni Smith (Michigan State University)

A recent line of work by Assaneo et al. (2019) asked participants to whisper the syllable "tah" while they monitored an isochronous series of synthesized syllables for a set of target syllables. Surprisingly, they found that some participants (good synchronizers) spontaneously synchronized their speech with the monitored syllable sequences, while other participants did not (poor synchronizers). Moreover, they found

that good and poor synchronizers differed in both brain and language measures used in their study. Group differences were found in white matter structure connecting frontal and temporal regions of the brain, and enhanced neural synchronization to auditory speech stimuli was observed in the good synchronizers compared to the poor synchronizers. Good synchronizers also performed better on a phonological word-learning task than poor synchronizers, which can be due to the differences in brain measures mentioned prior. The aims of the present study were (1) to replicate the observed bimodal distribution in spontaneous speech synchronization performance and (2) to consider the relationship between spontaneous speech synchronization performance and more general measures of rhythmic ability. Participants at the University of Michigan and Michigan State University completed the spontaneous speech synchronization (SSS) task, as well as a battery of other more general rhythm measures. Preliminary data from this project will be discussed.

DOES ANGER APPEALS AFFECT BLACK AUDIENCES DIFFERENTLY THAN WHITE AUDIENCES?
Presenter(s): Ami Brooks (The University of New Orleans)
Social Sciences
Section: 1
Time and Location: 1:00 PM - 2:30 PM, 3202 STEM Facility
Presentation Number: 2206
Mentor(s): Monique Turner (Michigan State University)

In terms of political connotations, Black and white audiences react differently. . In this study we are the testing the intersectionality of feelings anger and resignation and the reactions between white and Black audience members. For example, members of different socio-economic and racial ethnic groups at a Black Lives Matter rally may feel differences of feelings as a speaker uses anger appeals to rail up action from the audience. Black members may feel more resigned than others as they are used to seeing disservice and mistreatment by the police and governmental force. White members may feel more angered and invigorated to create change by causing mischief as this does not directly affect them but want to create an impact. The diverse responses and emotional testaments they establish from these two socially different groups of people are imperative variables in this study and our research as they can determine where this data may head too. Anger is a strong predictor of behavior though one that is highly misunderstood and its effects on politics and political relations, as well as communications testifies to show where political communications will go soon. We hypothesize our research on anger and its intersectionality to political campaigns, specifically activism speeches will demonstrate the connection between anger and varied levels of efficacy. Our research will be the first to systematically examine this predictor.

BEYOND THE PALE: UNDERSTANDING INTERGROUP CONTACT IN 21ST CENTURY NORTHERN IRELAND
Presenter(s): Macken Keefe (Michigan State University)
Social Sciences
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2211
Mentor(s): John Waller (Michigan State University)

Northern Irish history is a story of two distinct, yet intertwined, groups of people: Catholic-majority Republicans, who have predominately supported a united, free Irish Republic, and Protestant-majority Unionists, who typically support membership in the United Kingdom. For hundreds of years, these groups have been socially, economically, and politically disenchanted, contributing to the formation of anxieties towards each other. Their sentiments came to a head during the Troubles, a 20th century conflict that killed over 3000 people and left thousands more traumatized. Although the 1998 Good Friday Agreement officially ended the Troubles, the relationship between Catholics and Protestants remains fractured. Northern Ireland is still highly segregated along Catholic-Protestant lines, particularly within its largest city, Belfast. This urban segregation is multi-dimensional, but residential and educational separation have remained particularly stable to date. "Intergroup contact" has become an increasing point of focus in peace and justice studies literature. Recent studies have demonstrated the potential for positive contact experiences between members of disenchanted people groups to ease anxiety in post-conflict regions,

thereby facilitating reconciliation. This research project applies intergroup contact theory to understand the causes, conduct, and consequences of group relations in Northern Ireland. It explores the development and present state of intergroup contact research, with an emphasis on contact between racial and ethnic groups. This project then discusses the evolution of the Catholic-Protestant relationship over time, and identifies opportunities for increased contact between these groups in both residential and educational arenas.

EXPLORING THE RELATIONSHIP BETWEEN BAKING, RESILIENCE, AND PSYCHOLOGICAL WELLBEING
Presenter(s): Tsz Yan Liane Kwong (Andrews University)
Social Sciences
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2212
Mentor(s): Harvey Burnett (Andrews University)

Research has shown engaging in cooking/baking behaviors has been associated with better mental health outcomes. The purpose of our study was to examine how resilience, happiness, self-efficacy, perceived stress and psychological distress are related to better mental health outcomes through baking (i.e., bread, cookies, cakes, etc.) satisfaction. Our study utilized a survey design. Data was collected from 233 subjects who were recruited through Amazon Mechanical Turk and were provided with a link to the study online through LimeSurvey. After giving informed consent, subjects completed a demographic questionnaire, the 10-item CD-RISC Scale, the Subject Happiness Scale, a 2-items Perceived Stress Scale, the Brief Symptom Inventory-18, the New General Self-Efficacy Scale, and a Benefit of Baking Scale. Subjects who completed the study were compensated $0.25. Our study received IRB approval (IRB protocol #21-131). Utilizing multiple regression analysis, we found baking satisfaction was significantly predicted by self-efficacy (beta = .43, $p < .000$), subjective happiness (beta = .33, $p < .000$), and resilience (beta = .20, $p < .000$). Our study suggests that individuals who enjoy engaging in baking activities have higher resilience, strong self-efficacy and are happier. Thus, engaging in baking behaviors may contribute to boosting one's resilience capacity.

CREATING A MEASURE OF POST-TRAUMATIC GROWTH IN ROMANTIC RELATIONSHIPS
Presenter(s): Jillian Lange (Michigan State University)
Social Sciences
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2213
Mentor(s): Mariah Purol (Michigan State University), William Chopik (Michigan State University)

Romantic relationships oftentimes provide people with care and support. Because of this, these relationships may be especially important when people are struggling with or healing from traumatic or adverse experiences. Prior studies have used the Posttraumatic Growth Inventory to assess whether survivors of trauma perceive any personal growth from their experience. However, to-date, there is no psychological measure that captures how trauma may influence growth within a romantic relationship. We sought out to create a new, revised inventory that allows individuals and their partners to assess whether any posttraumatic growth has occurred in their relationship--either as a result of their own trauma, their partner's trauma, or trauma occurring at the level of the relationship. The extent to which partner perceptions of growth and relationship growth are separable was also a question of interest. A relationship-level posttraumatic growth scale would be especially informative for marriage and family intervention. We designed and administered a large self-report survey asking about their life experience, perceptions of growth, and additional variables of interest. Factor solutions and convergent validity analyses will bring us close to an operationalization of post-traumatic growth at the relationship level.

IS OWNING A PET ASSOCIATED WITH WELL-BEING DURING THE COVID-19 PANDEMIC?
Presenter(s): Ayushi Patel (Michigan State University)
Social Sciences
Section: 2

Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2214

Mentor(s): Jeewon Oh (Michigan State University), Rebekka Weidmann (Michigan State University), William Chopik (Michigan State University)

The COVID-19 pandemic led to unprecedented lockdowns and social isolation. People often relied on pets as their companions because social interactions with humans were limited. It is unclear if pets have a significant effect on well-being and whether this might depend on the type of pet people own, how many pets they own, how close they felt to their pet, and the psychological characteristics of humans (e.g., personality). We examined these questions in a longitudinal study of 767 participants (Mage = 35.17, 81.7% women, 83.3% White) over the course of a month during the early stage of the pandemic. Pet ownership was associated with lower depression (r = -.084 [-.153, -.014]) but was otherwise not significantly associated life satisfaction, purpose in life, positive affect, negative affect, stress, loneliness, and overall well-being. Number of pets and human-pet relationship quality were mostly not significantly associated with outcomes. Owning a dog was associated with higher life satisfaction, higher purpose, more positive affect, and less depression. Personality mostly did not moderate the association between pet ownership and well-being. The few exceptions showed that, among people low in openness to experience, owning a pet was good for their feelings of purpose/meaning and positive affect. The current results provide a foundation for understanding the ways pet ownership is (or isn't) associated with well-being. Future research could examine how the pandemic influenced pet ownership over longer periods of time and more closely isolate a causal effect of pet ownership on well-being.

NO LOVE LOST: DOES RELATIONSHIP QUALITY PREDICT PARTNER PERCEPTIONS OF ATTACHMENT ORIENTATION?
Presenter(s): Emily Tetreau (Michigan State University)
Social Sciences
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility
Presentation Number: 2215
Mentor(s): William Chopik (Michigan State University)

People's attachment orientation can change over time and is linked with their relationship experiences. However, it is unclear whether perceptions of a partner's attachment track how partners change over time. Are people more accurate at judging their partners as they spend more time together? Further, if people are in an unhappy relationship, might they perceive their partner more negatively (i.e., insecure)? To address our research questions, we employed Truth and Bias Modeling (West and Kenny, 2011). People's perceptions of their partner consistently tracked the partner's own ratings of attachment (the truth force; bs < .14, ps < .005). However, these judgments were also based on people's own attachment orientation (assumed similarity bias; bs < .28, ps <.001) and how the relationship is going (i.e., relationship quality; bs < -.02, ps < .001). Specifically, among those in higher quality relationships, they perceived their partners as more secure. In addition, relationship quality moderated the links between the truth/bias force and attachment anxiety. The truth force was stronger for people reporting low relationship quality (i.e., people in unhappy relationships more accurately predicted their partner's attachment orientation). The assumed similarity bias was stronger for people reporting high relationship quality (i.e., people in happy relationships used their own attachment orientation in judging their partner's attachment orientation). For attachment avoidance, only people reporting lower relationship quality were using the truth force (i.e., were accurate). Results are discussed in the context of the antecedents and consequences of partners' perceptions in close relationships.

DOES TEASING MODERATE ASSOCIATIONS BETWEEN MALADAPTIVE PERFECTIONISM AND SHAPE/WEIGHT CONCERNS IN BOYS?
Presenter(s): Carolina Anaya (Michigan State University), Ziyu Zhao (Boston University)
Social Sciences
Section: 2
Time and Location: 3:00 PM - 4:30 PM, 3202 STEM Facility

Presentation Number: 2216
Mentor(s): Carolina Anaya (Michigan State University), Kelly Klump (Michigan State University)

Perfectionism, weight-based teasing, and competency-based teasing increase weight/shape concerns during adolescence. Research has focused on females rather than males, and has not examined interactions between teasing and perfectionism in predicting weight/shape concerns in either gender. Perfectionistic adolescent males may hold unrealistic self-standards that increase sensitivity to negative evaluations and weight/shape concerns. This study investigated this possibility in 94 male adolescents (ages 10-15) from the Michigan State University Twin Registry. Perfectionism was assessed by averaging Concern over Mistakes (i.e., becoming upset after making mistakes) and Doubts about Actions (i.e., having doubts about everyday actions) subscales from the Multi-Dimensional Perfectionism Scale. Shape/weight concerns (i.e., shape/weight dissatisfaction) were assessed by averaging Shape Concerns and Weight Concerns subscales from the Eating Disorders Examination Questionnaire. The Perception of Teasing Scale assessed weight-based (i.e., negative comments about weight/shape) and competency-based (i.e., negative comments about intellect or capabilities) teasing. Perfectionism, weight teasing, and competency teasing were all significantly and positively associated with weight/shape concerns. Competency teasing, but not weight teasing, significantly moderated associations between perfectionism and shape/weight concerns, even after controlling for BMI and pubertal status. Associations between perfectionism and shape/weight concerns strengthened with higher levels of competency teasing. Findings suggest perfectionism and all forms of teasing are associated with weight/shape concerns in males, but perfectionistic males may be particularly vulnerable to effects of competency-based teasing. The non-significant perfectionism × weight teasing interaction is surprising. Weight teasing's effect on shape/weight concerns may be stronger, more direct, and less dependent on higher levels of perfectionism for negative effects.

EXPLORATION OF ECO-GENTRIFICATION
Presenter(s): Alexander Lazard (University of New Orleans)
Social Sciences
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2221
Mentor(s): Phillip Warsaw (Michigan State University)

Communities that are in a state of disinvestment commonly experience poor quality of life. Insufficient access to fresh food, unsafe and un-programmed parks, and broken sidewalk connections to goods and services are just a few of the examples that plague the experience of a disinvested community. The response to these issues can be led by public agencies occurring on public property and public right of way. The projects that follow this are public park upgrades, streetscapes with new sidewalks, mid-block crossings, and bike lanes, just to name a few. These projects incorporate the unique, responsible, and sustainable use of landscape, grass, native plants, or environmental features – green infrastructure. Green infrastructure is often found in established communities, neighborhoods with moderate to high incomes, and in proximity to schools with positive reputations. Green infrastructure can attract residents that are not from the neighborhood receiving these new amenities and over time an influx of development can disrupt the neighborhood identity. According to the Environmental Protection Agency (EPA), gentrification is “the process of neighborhood change that occurs as places of lower real estate value are transformed into places of higher real estate value.” A systematic literature review was conducted to compare case studies of green infrastructure installations and whether it was followed by gentrification. This literature review comes from the problem that while disinvested neighborhoods should receive amenity installations, the implementation of those projects could lead to ratified neighborhood identity and resident replacement. A meta-analysis was conducted to identify and select relevant articles.

PERCEPTIONS AND SOCIAL NORMS AROUND VAPING/E-CIGARETTE USE AMONG MSU STUDENTS
Presenter(s): Shweta Adsul (Michigan State University)
Social Sciences
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online

Presentation Number: 2222
Mentor(s): Brendan Mullan (Michigan State University), Cara Ludlow (Michigan State University), John Waller (Michigan State University)

The CDC links vaping to the appearance of a severe lung disease called 'E-cigarette or vaping product use associated lung injury' or EVALI. According to the same source, a single JUUL refill contains as much nicotine as a packet of 20 cigarettes. Research shows that if students perceive e-cigarettes to be "relatively safer" and think smoking e-cigarettes is a social norm in college, they are more likely to vape. Abiding in social norms is a leading factor to adopt a behavior in college. In this context, having misinformation about behaviors like drinking and smoking can make students more likely to engage in these behaviors. Considering the growing population of MSU students who vape, data was collected to examine whether students' perceived typical use of e-cigarettes is greater than the actual use around campus.

RESILIENT COPING AND FAMILY FUNCTIONING ON THE PRESENCE AND SEVERITY OF PRESCRIPTION OPIOID MISUSE DURING THE COVID-19 LOCKDOWN
Presenter(s): Ashley Challenger (The University of the Virgin Islands)
Social Sciences
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2223
Mentor(s): Kaston Anderson-Carpenter (Michigan State University)

Opioid misuse continues to be a public health epidemic that has affected numerous countries, which was exacerbated by the COVID-19 pandemic. Although the literature suggests numerous health disparities worsened during the pandemic, few studies have examined disparities in prescription opioid misuse in an international context. Furthermore, even more limited research has identified potential mechanisms of reducing prescription opioid misuse during COVID-19 lockdown. As such, this study investigates the role of resilient coping and family functioning on the presence and severity of prescription opioid misuse during COVID-19 in an international sample. Cisgender adults from the United States, Italy, Spain, Saudi Arabia, and India (N = 2,482) completed an online survey via Qualtrics. Measures included the presence and severity of prescription opioid misuse (DAST; Skinner, 1982), Brief Family Functioning Scale (Mansfield et al., 2019), the Brief Resilient Coping Scale (Sinclair & Wallston, 2004), and sociodemographics such as country of residence, age, race/ethnicity, gender, sexual orientation, country of residence, educational attainment, employment status, and urbanicity. Data were analyzed using descriptive statistics, multivariable logistic regression modeling, and multivariable multinomial logistic regression modeling. The findings will inform the development and enhancement of COVID-related psychosocial programs to reduce prescription opioid misuse in culturally relevant contexts.
Key words: COVID-19; prescription opioid misuse; coping; international

TIPPING THE BALANCE: THEORY OF PLANNED BEHAVIOR IN ACTION WITH HEALTH APPS AND PUSH NOTIFICATIONS IMPACTING ATTITUDES TOWARDS HEALTHY BEHAVIORS
Presenter(s): Eve Vazquez (University of Central Florida)
Social Sciences
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2225
Mentor(s): Ruth Shillair (Michigan State University)

Health and fitness mobile applications make health improvement intervention more accessible to the public by providing tracking and goal-setting tools to individuals with smartphones. Despite this, health apps suffer from low user retention. Most apps send push notifications to remind users to complete in-app tasks, though many users fail to engage with them. Research suggests that notifications may be ignored due to a lack of perceived relevance to the user. Could notification customization settings combat non-engagement by allowing users to determine how and when to receive reminders? Our research is framed using the theory of planned behavior, which states that the intention to make behavioral change is predicated by beliefs that the behavior will have the expected outcome. Our research focuses on

understanding if having positive attitudes about health app use increase one's intention to continue use of a health app. Further, it asks if customizing notifications will increase a health app user's intention to engage with the app. Through an online survey (n=258) we inquired about attitudes, subjective norms and behavioral control relating to the use of health apps and push notification customization. We hypothesize that individuals with low subjective norms and/or low perceived behavioral control, will have lower intention of customizing notifications preferences. Additionally, we hypothesize that individuals who customize notifications will have higher intended engagement with health apps. The knowledge gained from this study will aid both app designers and users in understanding how to fully realize the potential of health apps.

COMPARING THE MEASUREMENT OF SOCIAL RESPONSIBILITY BETWEEN AFRICAN AMERICAN AND EUROPEAN AMERICAN HIGHSCHOOL AGED STUDENTS
Presenter(s): Adonaia-Ambition Patterson (Prairie View A&M University)
Social Sciences
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2226
Mentor(s): Ignacio Acevedo (Michigan State University)

Social responsibility is an individual's sense of caring about the issues impacting the various communities that they are part of. Measures of social responsibility are often used by organizations and communities alongside efforts to promote social justice and equity. That said, it is not yet fully clear how such measures function across different groups of people. In the current study, we will examine how one measure of social responsibility, the 10-item short form of the Youth Social Responsibility scale, functions across the racial identity. We will investigate this in 1,387 high school-age participants involved in the Anytown (TM) program, a youth development program focused on providing youth with the skills and experiences required to engage in efforts to create just and inclusive schools and communities. We will examine the configural, metric, and scalar invariance of the scale using multi-group confirmatory factor analysis using the structural equation modeling software AMOS. Preliminary results indicate some degree of configural invariance, suggesting that scale functions similarly across groups. Based on these results, future studies may further explore the equivalence of the scale in additional groups as well as the intersections between them.

THE ROLE OF REWARD PROCESSING AND FAMILIAL TRANSMISSION IN BEHAVIORAL OUTCOMES ACROSS CHILDHOOD & ADOLESCENCE
Presenter(s): Mohamad Khalaifa (Slippery Rock University)
Social Sciences
Section: 3
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2228
Mentor(s): Jason Moser (Michigan State University)

The Substance Abuse and Mental Health Services Administration reported that approximately 52.9 million U.S. adults suffered from a mental illness in 2020. Studies have shown that the onset and symptoms of psychological disorders emerge during childhood and adolescence. Researchers have started to investigate the role that event-related brain potentials (ERPs), neural signals in the human electroencephalogram (EEG), play in the development of psychopathology across the lifespan. As children age, ERPs generated by the anterior cingulate cortex - a region involved in reward and punishment related behaviors - have been associated with the development of psychopathology. The longitudinal associations between ERP responses during reward processing and different forms of psychopathology in children and adolescents over a four year follow up period will be examined. Contributions of parent ERP responses during reward processing and symptoms of psychopathology to offspring's reward processing and psychopathology outcomes will also be assessed. Participants were recruited through the Michigan Longitudinal Study (MLS), where data was collected on ~250 children ages 4 to 13 years old and their biological parents. Parents responded on a variety of questionnaires for both themselves and their offspring, including, but not limited to, mood and anxiety symptoms, and subjective perspectives of their child's temperament. Parents and children took part in an EEG, while

completing a task to assess reward and punishment sensitivity. We hypothesize that reward processing will be associated with behavioral symptoms cross-sectionally and longitudinally in both parents and children, and that a familial transmission between reward processing and psychopathology will be discovered.

COMPARING MOTIVATION AND ANXIETY IN STUDENTS WITH AND WITHOUT LEARNING DISABILITIES
Presenter(s): Walter Turner Jr (Siena Heights University)
Social Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2231
Mentor(s): Eunsoo Cho (Michigan State University)

Students with learning disabilities in grades 4 and 5 are suspected to be less motivated which is making it harder to find success in their daily lives. As a result of this, is alleged to the students have higher levels of anxiety. Having a lack of motivation and a heightened level of anxiety can play a factor in the student's academic achievements. Academic achievement and motivation are very closely related since having a lack of motivation can cause a student to have less academic achievement or more academic achievement the more motivated a student is. This research will investigate the differences between motivation and anxiety in fourth and fifth-grade students with and without learning disabilities. The participants are students in grades four and five from three different elementary schools in Texas. While looking at the differences between motivation and anxiety, this study will examine how those differences affect the students' academic achievement. This study will also compare different groups and populations of students to examine the differences between the populations. Students will be identified by their gender, free and reduced lunch status, race/ethnicity, English learner status, disability, and have an Individualized Educational Plan. Variables of interest include general anxiety, test anxiety, and mindset. The results of this study will further educational psychology research for schools to help students that need help get what they need so that they can get an equal opportunity at success as they deserve. Keywords: Learning disabilities, Academic Achievement, Motivation, Depression, Anxiety

THE EFFECT OF TEAM COMPOSITION AND COLLABORATION ON TEAM PERFORMANCE IN A HOSPITAL-CONSTRUCTION TEAM
Presenter(s): Aylin Garcia (University of Texas at El Paso)
Social Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2232
Mentor(s): Hanzhe Zhang (Michigan State University)

Collaboration nowadays is a key to economic and organizational success around the modern world. Most of today's companies use some association with "collaboration" or "teamwork" to describe how they conduct their business within their firms and engage their employees on how to get things done. Previous studies have shown a link between collaboration and team performance, which could also be factors that increase a firm's ability to generate new jobs by being profitable and efficiently allocating economic resources. Therefore, in this study, we seek to analyze the relationship (if any) between team composition and collaboration and its effect on team performance. We use data collected from 36 meetings between three different entities in the state of Michigan: a design agency, a construction enterprise, and the real estate building owners. This data set includes fifty-nine people between the ages of 30 and 69 looking forward to building a hospital by working together as a team. We use mixed methods, mainly utilizing two major research strategies: qualitative and quantitative approaches by running a linear regression, descriptive statistics, and hypothesis testing. This study aims to explore how the variables of age, gender, duration of an individual participating in a meeting, and work position correlate to a member's ability to collaborate and test the extent to which team demographics affect collaboration and, thus, overall team performance.

POLITICAL REPRESENTATION WON'T BE PROPORTIONATE FOR ANOTHER 30 YEARS.
Presenter(s): Isaiah Hawkins (University of Texas at San Antonio)
Social Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2233
Mentor(s): Eric Juenke (Michigan State University)

The percentage of minorities in office have grown in the last 20 years (Juenke et al. 2020). Still, with the current trend, it may take until 2050, another 30 years, for the percentage of demographics in congress to become proportionate to the percentage of demographics in the national population (Juenke et al. 2020). We ask the question “Who runs for office in the states and where do they run for office; where do we find racial and ethnic minority candidates?” We’re interested in measuring the growth in representation of different groups over time. In order to conduct this research, we have coded state candidates’ race, ethnicity, gender (and when they presented it) sexuality, religious preference and possible disabilities. We are documenting the growing racial/ethnic diversity of candidates for office and tracking where and when opportunities for new candidates appear. We are using Ballotpedia (a website designed to provide information about candidates) and candidates’ campaign websites to collect this information. No one else has collected this information, so we were able to fill a needed gap in representation research. The results will help us understand where representational gaps are occurring at the state level and to what extent these are linked to where women and candidates of color run for office.

EFFECTS OF A MINDFULNESS-BASED STRESS REDUCTION INTERVENTION ON EMOTION REGULATION AND MENTAL HEALTH
Presenter(s): Paloma Arriero (California State University - Fullerton)
Social Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2234
Mentor(s): Christopher Webster (Michigan State University), Jason Moser (Michigan State University)

Emotion dysregulation is associated with increased psychopathological symptoms. Mindfulness has shown to be a promising solution. Recent studies have found that mindfulness produced decreased psychopathological symptoms and reduced emotional arousal, indexed via late positive potential (LPP), an event-related potential used to measure emotional arousal. Less research has examined the long-term effects of mindfulness training on LPP and psychopathologies. This study aims to fill this gap by examining the effects of a 4-week Mindfulness-Based Stress Reduction (MBSR) intervention on emotional arousal using the LPP and self-reported symptoms of anxiety and depression in novice meditators. This study also aims to examine the effects of participants' trait mindfulness, on emotional arousal and symptoms of anxiety and depression. We predict that the MBSR group will exhibit lower LPP amplitudes and decreased anxiety and depression symptoms compared to the nutrition group. We predict stronger benefits in participants with higher trait mindfulness. Sixty women were randomly assigned to an MBSR group (n =30) or a nutrition control group (n=30). The MBSR course built mindful awareness of mental and sensory experiences. The nutrition program taught the application of nutritional health. We measured participants' emotional arousal, via LPP, in response to a picture viewing task before and after the interventions. We also measured pre and post self-reported symptoms of depression, anxiety, and levels of trait mindfulness. If the results provide support for our hypotheses, it would imply that mindfulness training reduces emotional arousal to negative stimuli and improves mental health, especially in participants with higher trait mindfulness.

HOME DELIVERED MEALS FOR OLDER ADULTS IN MICHIGAN: RESOURCES AND CHALLENGES
Presenter(s): Marie Huber (Michigan State University)
Social Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2235
Mentor(s): Paul Freddolino (Michigan State University)

Home Delivered Meal (HDM) Programs, also known as Meals on Wheels programs, deliver meals to homebound adults 60+ years old, and adults with disabilities, who cannot cook or shop for meals themselves. Nationally, approximately 5,000 providers serve more than 900,000 meals per day. In Michigan, responsibility for delivering meals rests with a network of 16 Area Agencies on Aging (AAAs) covering the whole state. These AAAs oversee 56 local programs delivering the meals using both volunteers and paid staff. The adults that these programs serve can become increasingly lonely. They are often resistant to embracing Information and Communications Technology (ICTs) because of feelings of mistrust. By providing training and access to modern ICTs we hope to help these adults become better connected. To help counter these adults' feelings of skepticism and mistrust of technology, our team is piloting a project with one Meals on Wheels program in a rural Michigan county to utilize the connection that their volunteer drivers already have with these isolated adults. I have been gathering information about HDM programs in Michigan including numbers of meals served, as well as the resources available to support technology instruction for meal recipients. The goal is to identify other HDM programs where the current pilot project can be replicated in larger and more diverse communities. Thus far 53 surveys have been returned, and follow-up phone calls are being conducted. The final report will provide details about HDM programs in Michigan and identify potential partners for replications.

STEREOTYPE THREAT IN THE WORKPLACE AND DIFFERENCES IN AGE
Presenter(s): Jalen Williams (Siena Heights University)
Social Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2236
Mentor(s): Angela Hall (Michigan State University)

Examining stereotype threat, closely related to implicit bias but with this phenomenon of stereotype threat, which is looking more in-depth on the person or the individual that has a generalized belief about a group that the individual is a part of and therefore the individual feels that pressure of conforming to that belief. Therefore, this study will examine stereotype threat in the setting of the workplace. But not only will this study look at stereotype threat in this environment but will look at the relationship between stereotype threat and age amongst minority workers. It is important to note that the workplace can be filled with all types of people in this study the underrepresented, marginalized, and minoritized groups of people which includes race, age, sex/gender identification, and sexual orientation who these stereotypes and bias are placed upon. In this project the question being asked is, Does the phenomenon of stereotype threat correlate with age for minority workers?

THROUGH THE LENS OF THE MEDIA: TRANS DEATH AND SEX WORK
Presenter(s): Cecilia Lopez (University of California - Berkley)
Social Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2237
Mentor(s): Christina DeJong (Michigan State University)

Social constructs form our public opinions which later inform our individual or collective actions. The current phenomena and growing violence against the LGBTQ+ community, specifically trans identities, raise questions of morality and autonomy in the United States. Trans individuals have always been a subject that incites contentious debates based on belief and/or morality. In 2018, the United States witnessed a peak in committed homicide cases of trans victims. The growing increase in violence towards trans individuals has not only highlighted the need for advocacy, but the role survival sex work plays in their livelihood. Due to the stigma surrounding both subjects, there is a lack of academic research studying the intersectionality of being trans and a sex worker. Through conducting a textual and descriptive statistics analysis, this study will evaluate the number of trans victims engaged in sex work in the United States during 2018 and the portrayal of sex work in the media? Did the media have a negative or positive outlook on sex work? Key methodological questions will ask: Did the victim engage in sex work? Is the article supportive of survival sex work? Is the victim ID'd as a prostitute or sex worker? and

Does the article engage in victim-blaming sex workers? The broader impact of this study is to oppose the stigma around being trans and a sex worker. In order to challenge this, we must commence a public discourse to demystify stereotypes and increase cultural visibility. By bridging the gap between the lack of research on both trans death and sex work, we can reach a greater awareness to then promote access to mental health resources, as well as legal rights and protections.

MORPHOMETRIC ANALYSIS OF GROWTH AND DEVELOPMENT AMONG POSTCLASSIC MAYA INDIVIDUALS EXHIBITING CRANIAL MODIFICATION
Presenter(s): Collin Sauter (Michigan State University)
Social Sciences
Section: 4
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2238
Mentor(s): Gabriel Wrobel (Michigan State University)

The goal of this research project was to use morphometric analysis techniques to examine how cranial modification practices among the Postclassic (AD 900 - 1500) Maya affected cranial growth and development. Forty-six crania were examined in this study, all of which are part of a collection that was recovered from Cenote Sagrado, a large water-filled sinkhole at the Maya Postclassic site of Chichen Itza, located in Mexico's northern Yucatan peninsula. This collection is well preserved and features twenty-five subadults, which offer a rare opportunity to study subadult morphology in the Maya area. Agisoft Metashape, a photogrammetry software, was used to create three-dimensional digital models of the crania being analyzed, then Stratovan Checkpoint was used to gather morphometric data from the models. The individuals were then seriated by age using tooth development, after which quantitative analysis techniques were used to examine the morphometric data.

UNDERSTANDING CRITICAL CONSCIOUSNESS IN DIVERSE YOUTH: A MULTIGROUP CONFIRMATORY FACTOR ANALYSIS OF THE CRITICAL CONSCIOUSNESS SCALE
Presenter(s): Jasmine Benner (North Carolina Central University)
Social Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2241
Mentor(s): Ignacio Acevedo (Michigan State University)

Critical consciousness attributes to an individual’s perception of oppressive factors within society. Critical consciousness is considered to be an important characteristic for an individual’s desire to bring social change. In the current study, we will examine how the Critical Consciousness Scale functions across two ethnic groups: African American and Latinx American. The critical consciousness scale is a 22 items scale used to assess critical consciousness in youth. Despite being a widely used measure there is limited literature on the how the scale functions across ethnic groups. Knowing how the scale functions across ethnic groups is particularly important for communities and organizations that promote social justice and equity. Using the responses from 550 participants in Anytown, a youth development program that focuses on equity and justice, this study will examine configural, metric, scalar invariance across ethnic groups using a structural equation modeling software (AMOS). Preliminary results suggest some degree of configural invariance across groups and metric non invariance in some groups. Alternate preliminary results also suggest scalar invariance. This suggests the Critical Consciousness scale may function differently across ethic groups. Future research could explore the function of the scale across other groups of youth. These other groups can include youth with intersectional identities.

ASSESSING INSTITUTIONAL AND INDIVIDUAL FACTORS IN CORRECTION OFFICER DEVIANCE: ADDRESSING CORRUPTION IN AMERICA'S MORAL KEEPERS
Presenter(s): Jayda Graham (North Carolina Central University)
Social Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online

Presentation Number: 2242
Mentor(s): Steven Chermak (Michigan State University)

The lack of professionalization within the corrections system contributes to inappropriate behaviors and violations of institutional policies by correctional staff. As the principle stewards barring inmates from participation in illicit schemes within penal institutions, it presents an ethical dilemma for correctional officers to engage in criminal activities. Most extant literature surrounding corruption within law enforcement agencies is exclusive to the deviance of police officers, leaving research on correction officer deviance scarce. Understanding the working conditions under which illicit behaviors by staff are fostered can provide the framework for updated training programs and regulatory policies to regiment deviance and increase professionalization. This study aims to determine whether prison corruption reflects isolated incidents of deviance by corrupt individuals or exemplifies more significant and profound systemic issues. The key phrase, “correction officer arrested” will be searched on Google News to produce cases of corruption by law enforcement officers within the past ten years. A comprehensive list of twenty-one variables will be utilized as a comparative tool to underscore characteristics of typical deviance cases. We anticipate that results will indicate that organizational norms and dissolute administration are the primary factors contributing to correction officer deviance. Overall, the study aims to illuminate how organizational structure contributes to officer deviance, thereby providing correctional administrators with a framework to better their recruitment and training standards. Refining standards during the hiring process and underscoring institutional policies would beget a secure facility and an optimal institution, producing a safe work environment incompatible with deviant behaviors.

WORK-RELATED COPING MECHANISMS AMONG AFRICAN AMERICAN WORKERS
Presenter(s): Judy McDowell (Roosevelt University)
Social Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2243
Mentor(s): Angela Hall (Michigan State University)

The sample subjects in the organizational sciences research have mainly been male and white. As such, past studies do not adequately represent the experiences of African American workers. As such, we cannot be sure that African American employees experience or react to the work environments similar to their White counterparts. This study will address the following question: Do African American workers utilize the same work-related coping mechanisms as majority employees? I hypothesize that discrimination, culture, and history may affect minority experiences at work. To test the hypothesis, this study will collect survey data from 250 respondents through Amazon MTurk. SPSS software will be used to analyze the data and statistical results. The test will consist of Mean Comparison, T-test, ANOVA, and Post-Hoc tests. The current study will use a political skill inventory (Ferris et al., 2005) and political power tactics scale (O’Reilley et al., 2021). This research proposes to understand the experiences of African American workers better and provide them with potentially increased organizational and managerial support

EFFECT OF ILLICIT DRUG USE AND LIFE SATISFACTION ON PSYCHOLOGICAL DISTRESS AMONG ARAB ADULTS DURING COVID-19
Presenter(s): Jaleel King (John Jay College of Criminal Justice)
Social Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2244
Mentor(s): Kaston Anderson-Carpenter (Michigan State University)

The Covid-19 pandemic brought about many psychological changes in the way people cope with their mental health. Specifically, the lockdown in the year 2020 caused people to adapt and live in conditions that were detrimental to their well-being. This study examines different factors that contributed to the psychological distress prevalence and severity among Arab, Middle Eastern, and North African (MENA) adults during the COVID-19 lockdown. A total of 2509 adults across the United States, Italy, Spain, India,

and Saudi Arabia completed an online questionnaire between July and August 2020. Psychological distress will be measured using the Generalized Anxiety Disorder-7 scale and anxiety will be measured using Patient Health Questionnaire-9. We will be looking at how the country of residence, age, gender, sexual orientation, country of residence, educational attainment, employment status, and urbanicity impacted the psychological distress. We expect Arab/MENA sexual minority adults (i.e., lesbian, gay, bisexual, and pansexual) will report significantly greater levels of psychological distress during the COVID-19 lockdown compared to their heterosexual peers. We expect to see a main effect of gender such that women are more likely to report psychological distress during the COVID-19 lockdown compared to men, even after accounting for other sociodemographics and social determinants. This study informs the public about the importance of spreading awareness and creating mental health support systems in these countries.

DIGITAL LITERACY AMONG SYSTEM-INVOLVED INDIVIDUALS
Presenter(s): Abbi Koshoshek (Michigan State University)
Social Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2245
Mentor(s): Kaelyn Sanders (Michigan State University), Merry Morash (Michigan State University)

In a digitally advancing world, it is important that individuals are familiar with how to use technology to meet their needs. For certain populations, familiarity with technology may be more challenging than for others. One population that suffers from a lack of digital literacy is system-impacted individuals. Therefore, this project will focus on system-impacted individuals experiences using technology and the challenges they face as it relates to their employment. The goal is to better understand how digital literacy impacts their employment experiences and how to better assist them.

CHARACTERISTICS OF SUCCESSFUL PREDICTIVE POLICING
Presenter(s): Georgeanna Flook (Chaminade University)
Social Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2247
Mentor(s): Steven Chermak (Michigan State University)

This research intends to obtain a deeper understanding of success, or lack thereof, in predictive policing through the comparison of 12 distinct police departments and their respective communities. The current literature is void of analysis on the social and criminal environments where predictive policing is most efficient. Most literature that addresses specific predictive methods yields mixed results. Some studies show a statistically significant reduction in crime following implementation while others reveal little to no changes. Inharmonious research conclusions have occurred within the same time frame as each other, but seldom within the same geographic area. This research hypothesizes that these inconsistencies are a product of the inevitable variations throughout communities, crime patterns, and police departments across the nation. By measuring identical variables that pertain to the application of predictive policing and the characteristics of the 12 communities, it is expected that similarities will be present amongst jurisdictions where predictive policing is regarded as successful. Similarities amongst jurisdictions where predictive policing is either ineffective or has been disbanded completely are also expected. Should a pattern be found, it would be of great use to the fields of policing and criminology by aiding in resource deployment, sustainable policing, and further knowledge of crime trends.

EFFECTS OF OPPORTUNITY ZONES IN MICHIGAN
Presenter(s): Trenton O'Bannon (University of California - Berkley)
Social Sciences
Section: 5
Time and Location: 8:30 AM - 10:00 AM, Online
Presentation Number: 2248
Mentor(s): Jeffrey Wooldridge (Michigan State University)

Created by the Tax Cuts and Jobs Act in 2017, the Opportunity Zone program was designed to encourage investment in distressed communities across the U.S. In this project, we try to answer the question: what are the economic and societal impacts of opportunity zones in Michigan? Specifically focusing on variables such as employment, earnings, poverty, education, and crime in 2012, 2015, and 2019 we examine the early impacts of the Opportunity Zone program on residents of targeted areas. Using U.S. Census data, we use difference-in-differences statistical analysis to study the economic and societal impacts of opportunity zones in Michigan over time. We are testing the hypothesis that the implementation of Opportunity Zones created by the 2017 tax act leads to positive societal and economic benefits. Previous research would suggest that Opportunity Zones have had little to no positive effects. Still, seeing as Opportunity Zones are a fairly new policy, a need for follow-up research was expressed. We plan to further the field by providing more recent research on Opportunity Zones and by focusing on a wider variety of indicators. Results from this study could have many broad implications. By measuring the way Opportunity Zones perform now, future policymakers could learn from any mistakes and maximize any successes from this policy to make better place-based job policies in the future. Not only would this research exemplify how Opportunity Zones are performing in Michigan, but the findings could also be generalizable to Opportunity Zones all over the world.

Research Mentors

Many thanks to the dedicated research mentors who guided and supported the undergraduate research and creative activities presented throughout this program book.

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Presenters are listed alphabetically by last name.


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