Mid SURE

Mid-Michigan Symposium for Undergraduate Research Experiences

July 23, 2025

ACKNOWLEDGEMENTS

The goal of the 15th annual Mid-Michigan Symposium for Undergraduate Research Experiences (MidSURE) at Michigan State University (MSU) is to provide a forum for undergraduates to share their research and creative activities with the university community and beyond. Over 300 undergraduate students from over 80 different institutions presented their outstanding research and creative endeavors at MidSURE on July 23, 2025. These students are mentored by more than 280 faculty, staff, post-doctoral fellows, and graduate students.

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 2025:

- Biomedical Research for University Students in Health Sciences (BRUSH)
- Building Bridges
- Developmental Sciences Recruitment and Retention Program (DSRRP)
- Early Engagement in Semiconductor Materials and Technologies (EESMT)
- Entomology Research and Outreach Fellowship (EROF)
- Kellogg Biological Station (KBS) Undergraduate Research Experiences and Internships
- Plant Genomics Research Experience for Undergraduates
- Research Experience for Undergraduates in Structural and Functional Neural Biology (ASPET SURF)
- Summer Research Opportunities Program (SROP)

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 support staff: Caroline Crago, Jaini Gandhi, Marena Haidar, Nidhi Kumaraguru, Lowell Monis, Shuban Nagarkar, Grace Stys, and Martina Yen
- Casie Chunko, Administrative Assistant for Academic Initiatives
- Heather Dover, Coordinator for Undergraduate Research and lead Mid-SURE organizer
- Brittany Guercio Finch, Assistant Director for Undergraduate Research
- Brian Keas, Director for Undergraduate Research
- Korine Wawrzynski, Senior Associate Dean, Academic Initiatives

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 was designed by Guiliana Rose Seide, ‘25 BFA in Graphic Design with an Emphasis in Experience Architecture from the College of Arts & Letters.

Artist Statement: This design marks the 15th anniversary of MidSURE by visually representing innovation, mentorship, and discovery. Geometric lines and circuit-inspired elements highlight the interconnected nature of undergraduate research. A bold, cohesive color palette brings a sense of celebration, energy, professionalism, and clarity. The result is a visual system that celebrates curiosity and academic achievement.

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Agriculture and Animal Science

Kanon Nishijima

College Affiliated: Michigan State University

Category: Agriculture and Animal Science

Mentors: Jenifer Fenton

Presentation Number: 101

Title: MORE THAN JUST GRASS: CARCASS TRAIT VARIATION FROM PASTURE-BASED, SUPPLEMENTED, AND CONVENTIONAL FINISHING SYSTEMS

Abstract: Consumer's sensory perception of beef is primarily influenced by the intrinsic quality of the meat, which can be determined by the content of intramuscular fat, reflected through its marbling. Grain-finished beef tends to exhibit more desirable characteristics of tenderness, juiciness, flavor, and color. However, rising consumer interest in health- and environmentally-conscious choices has led to increased demand for grass-finished beef. For producers, grass-finished practices are often more resource-intensive, expensive, and have a more limited yield compared to conventional feedlot methods. Supplemented grass-fed beef may be strategic in bridging the gap between providing a product that consumers want - meeting steak quality markers that grass systems don't typically produce - while also improving efficiency, reducing costs, and optimizing production for producers. The objective of this research was to investigate the effects of different finishing systems on total gain and marbling of beef carcass. Sixty steers were randomly assigned to four diets 1 pasture, 2 pasture and distiller's grain 3 pasture and finishing grain diet, 4 feedlot grain. Steers were weighed at the farm, then slaughtered in a USDA facility at 18-20 months of age. Ribeye samples were collected between the 12th and 13th rib on the left side of the carcass and evaluated by trained personnel 48 hours after slaughter. The findings suggest a significant difference in total weight gain and marbling scores between pasture and feedlot groups, while no significant difference was found between the supplemented groups. Continued research in cattle management is key to support market appeal while preserving beef quality.

Caden Wade

College Affiliated: Michigan State University

Category: Agriculture and Animal Science

Mentors: Soni Kumari Younsuk Dong

Presentation Number: 103

Title: COMPARATIVE ASSESSMENT OF THE SOLUBILITY KINETICS OF UREA, DIAMMONIUM PHOSPHATE (DAP, AND POULTRY MANURE IN SANDY LOAM SOIL

Abstract: Intensive fertilization of farms has caused extreme nutrient leaching and pollution in many of the world's streams, lakes, and aquifers and requires an increased understanding of the solubility and release of fertilizer nutrients in soils. In addition, precise fertilizer management is needed as climate change has impacted agriculture through irregular and intense rainfall during the growing season. This study focuses on evaluating three common fertilizers and how each fertilizer releases nutrients in saturated soil conditions, aided by Teros 12 soil sensors to track the moisture and nutrient movement in soil. Weigh dishes of sandy loam soil were administered with one of four treatments (non-fertilized, prilled urea, diammonium phosphate, and organic-based poultry manure and left to set for a pre-determined interval (from 30 minutes to 7 days before testing the fertilization site (core and the bordering soil (ring for N concentrations in mg/L and comparing against the control soil and predicted application based on advertised concentration rates. Columns containing saturated bare soil as a medium for nutrient leaching were watered after a fertilizer application for typical corn development and was tracked with METER Group Teros 12 sensors that monitor soil moisture, temperature, electrical conductivity, and by proxy nitrogen movement. The leachates and soil from each column were tested for total nitrogen and dissolved reactive phosphorus. The relationship between electrical conductivity and nitrate was observed. Trends concerning nutrient diffusion were discovered for each fertilizer type.

Araya Pore

College Affiliated: Michigan State University

Category: Agriculture and Animal Science

Mentors: Amanda Lorenz

Presentation Number: 104

Title: DEVELOPMENT OF A SILKWORM MOTH (BOMBYX MORI EXHIBIT FOR THE MSU BUG HOUSE)

Abstract: Despite their ubiquity and ecological importance, insects and other terrestrial arthropods commonly provoke strong emotional reactions in humans. Negative attitudes toward insects can lead to negative outcomes for insect biodiversity, which is already threatened by habitat loss and pesticide overuse. Thus, it is important to provide the public with opportunities to learn about the positive aspects of insects in order to reduce negative attitudes and behaviors toward them. The Bug House at Michigan State University is an outreach and education center for members of the community to visit and learn about a variety of insects and other arthropods as a means of curating positive interactions. Facilitating positive impressions with insects is more impactful if the specimens are visually appealing to the spectator, and this study's area of focus was centered around the fully domesticated silk moth. The domestic silk moth, also known as Bombyx mori, is a prominent species of the order Lepidoptera and is a prime example of the longitudinal effects of insect biotechnology. Utilized for their small stature, unique silk production, and accessible genetic code for engineering endeavors, these specimens represent continuous and consistent efforts to promote the many benefits that come with research efforts in biotechnology. The purpose of this study was to create enclosures for each of the different life stages of the Bombyx mori to be observed as they develop and grow into adult moths.

Rylee Stocks

College Affiliated: University of Maryland Eastern Shore

Category: Agriculture and Animal Science

Mentors: Danielle Hoffmann

Presentation Number: 105

Title: THE EFFECT OF SEED PRIMING ON GERMINATION RATE AND SEED YIELD IN FIELD PENNYCRESS UNDER WELL-WATERED AND DROUGHT CONDITIONS

Abstract: In the Midwest, corn and soybean rotation is a common agricultural practice. Farmers rotate these crops because soybeans replenish nitrogen in the soil, improving fertility. However, during the off-season between rotations, issues such as soil erosion, nutrient leaching, and increased weed and pest pressure can arise due to fallow fields. To address these challenges, winter cover crops can be used. Cover crops are typically grown during the off-season for soil health benefits rather than for harvest. Pennycress is particularly promising because it serves as a biofuel feedstock, as it is a winter annual oilseed crop. As an oilseed, pennycress can be harvested to produce biodiesel, adding economic benefits for the farmer. Despite this potential, pennycress is still being developed for agricultural use, particularly in improving its resilience to abiotic stresses such as drought. Previous research has shown that seed priming can enhance germination, stress tolerance, and early seedling vigor. We are investigating whether seed priming improves pennycress resilience to drought during seed germination and vegetative stages. To test this, we primed seeds using various concentrations of polyethylene glycol (PEG, water, and a no-priming control. Following priming, we grew pennycress for 2.5 weeks under drought and well-watered conditions. Additionally, we are testing whether combining priming with stratification improves germination rates. Seed priming is a low-cost, simple technique that could help enhance crop performance under stress. Research like this supports the development of pennycress as a viable cover crop, offering both environmental and economic benefits to growers.

Dylan Minor

College Affiliated: Michigan State University

Category: Agriculture and Animal Science

Mentors: Amanda Lorenz

Presentation Number: 106

Title: BUGS AT THE BROAD: A SURVEY OF ARTHROPOD DIVERSITY AROUND THE MSU BROAD

Abstract: Insects and other arthropods are a key factor in the environments humans reside and work in. Understanding the arthropods present on Michigan State University's grounds can help predict potential pests and document the current state of biodiversity on campus. In this study, we are using pan and pitfall traps to conduct monthly surveys of the insects and other arthropods living around the exterior of Michigan State University's Broad Art Museum. Over the course of the study, we hope to highlight the current state of arthropod biodiversity around this iconic structure. By understanding more about the arthropods living in close proximity to us, we can gain insights into the complex ecosystems of Michigan State University's campus.

Hieu Mai

College Affiliated: Michigan State University

Category: Agriculture and Animal Science

Mentors: Martin Brubaker

Presentation Number: 108

Title: DETERMINING THE ABILITY OF APHIDIUS COLEMANI AND APHIDIUS ERVI TO PARASITIZE ROSY APPLE APHIDS AND WOOLLY APPLE APHIDS

Abstract: Exclusion nets are commonly used in apple orchards to protect against hail and sun damage. Netting also provides protection against damage from birds, and the primary apple pest codling moth. However, rosy apple aphid (RAA (Dysaphis plantaginea Passerini, Homoptera: Aphididae and woolly apple aphid(WAA (Eriosoma lanigerum (Hausmann , Homoptera: Aphididae populations have increased dramatically under the nets. These aphids are difficult to control without the use of conventional insecticides. RAA feeding on leaves results in bunching, stunting, and malformation of the fruit, rendering it unmarketable. WAA feeding can kill roots, cause reduced growth and crop yield.While there is some natural biological control for these aphids, they have not been shown to completely control outbreaks under the nets. This problem presents an opportunity. Exclusion nets are similar to greenhouses in that they reduce the ability of augmentative natural enemies to escape the target area. Being able to supplement this natural enemy with generalist parasitoid wasps could be an important tool in reducing outbreaks under netted apple trees. However, little is known about whether commercially available parasitic wasps can parasitize RAA or WAA.To assess this, we will have 10 bioassays with each containing one Aphidius Colemani and 10 RAA, and 10 containers with Aphidius ervi and repeat with WAA. We will then conduct hour-long observations on the containers to determine if they target the aphids. After 24 hours, wasps will be removed. Then over the course of a week, we will observe and count how many aphids were parasitized.

Kenna Morgan

College Affiliated: Michigan State University

Category: Agriculture and Animal Science

Mentors: John Zubek

Presentation Number: 109

Title: OPTIMIZING XENOPUS LAEVIS MODEL WELFARE: INSIGHTS FROM OUR ENVIRONMENTAL PARAMETER EXPERIMENTS

Abstract: Xenopus laevis is a crucial model organism in biomedical research, yet species-specific husbandry guidelines remain lacking and inconsistent. Existing recommendations, such as the Xenopus Resource Guidelines (2018, emphasize general care standards but may lack specificity for diverse research settings such as those utilizing static tank environments and differing water quality. This project sought to define critical thresholds for water pH, stocking density, and other water quality parameters to enhance welfare and standardize care practices. By addressing these gaps, the project aims to evaluate growth, activity, and behavior levels as a proxy for health outcomes of Xenopus laevis in institutional environments. Preliminary results indicate that while consistent water quality was of benefit to the overall health outcomes of the frogs, there were enhanced activity, growth and feeding responses at higher stocking densities (5x greater than recommended and lower pH levels than existing guidelines suggest (6.0-6.2 vs. 6.8-7.5. These results were statistically significant when normalized for individual activity (0.001 and serve to challenge existing assumptions regarding animal welfare throughout the research process. This project provides insight into further specifying model environmental conditions for Xenopus laevis while in institutional environments.

Arts and Humanities

Katie Simonson

College Affiliated: Michigan State University

Category: Arts and Humanities

Mentors: Heather Brothers

Presentation Number: 201

Title: A WORKING ANALYSIS OF CELESTE EICHLING GARDNER NEUFFER'S SCRAPBOOKS

Abstract: Celeste Eichling Neuffer was a part of the United Service Organization in a roller-skating troupe that entertained the troops. During her time with the USO, she kept extensive scrapbooks of photos, newspaper clippings, and other media. These scrapbooks have been digitized by the National World War Two museum, but they have never been studied in depth. I will be creating spreadsheets of the pieces of media in these scrapbooks to create an analysis of what Neuffer felt was important to record and why these pieces were of particular importance. These pieces of media are a personal collection of the war, which can be used to learn how people lived through the war and what the lives of those involved with the USO were like. Her clippings from newspapers and magazines also allow one to see what parts of published media particularly resonated with people. Neuffer gives a particularly valuable perspective as someone who travelled extensively during the war and saw things firsthand, while still having the perspective of a citizen and not a member of the armed forces. Her scrapbooks give a fascinating view into what life was like during the war, and exploring this could give new insights to better understand the culture during the war, particularly the cultural aspect of recording one's memories.

Kayla Coats

College Affiliated: Grand Valley State University

Category: Arts and Humanities

Mentors: Daniel Brown

Presentation Number: 202

Title: THE RURAL MID-MICHIGAN DIALECT: AN EXPLORATION OF PERCEPTION AND IDENTITY

Abstract: Speakers typically perceive a distinction between "city" and "country" talk. Country speakers are often thought of as being located in the southern U.S., but "country talk" still seems to exist to some extent outside of the South as language depends largely on identity (Hall-Lew Stephens, 2012. While research has focused heavily on the diverse linguistic landscapes of cities, there has been an absence of research in rural areas, which have equal linguistic significance and more diversity than commonly considered (Britain, 2012. To further develop an understanding of rural varieties in the U.S., this study focuses on rural Mid-Michigan's speech patterns and the perceptions that its speakers have on their language use. To begin, surveys were administered to collect demographic information and speakers' perceptions of their own speech and how they are viewed by others. Then, interviews were conducted to analyze spoken language, asking similar perception questions.The results depict that rural areas are complex and linguistically diverse based on identity. Differences were observed in how speakers view their dialect based on various aspects (age, proximity from hometown, etc. Additionally, some speakers from this region believe that they speak standardly, and others show linguistic self-stigmatization (due to grammar, pronunciation, etc.

Savannah Smith

College Affiliated: John Jay College of Criminal Justice

Category: Arts and Humanities

Mentors: Terry Flennaugh

Presentation Number: 203

Title: BEYOND THE LENS: PHOTOGRAPHIC NARRATIVES OF BLACK IDENTITY EMPOWERMENT

Abstract: Photography has long been a powerful medium for capturing the complex experiences of Black communities, serving as both a tool of historical documentation and a means of cultural resistance against racialized media misrepresentation. This research project will explore how Black photographers systematically use visual storytelling to challenge stereotypical narratives, represent and document the complexity and authenticity of Black life culture and identity. This study will use a qualitative approach by bringing together a collective of about three to four contemporary Black photographers in a series of facilitated semi-structured open dialogue group sessions. These sessions will involve critical engagement with historical photographs by Black photographers, discussion of key themes, their cultural significance, and reflections on the participants personal and collective understandings of Black identity based on their own work. The discussions will be recorded and transcribed and themes will be identified to explore how participants' own photographic practices are influenced by historical legacies and ongoing struggles for representation. By centering lived experience and collaborative community discussions, this study contributes to the role that Black photographers have played throughout time in shaping Black identity, culture, consciousness and empowerment. This research matters to the field because it not only fills a critical gap in the visual and cultural documentation of Black life but also offers a transformative, community-centered methodology that redefines how identity, history, and representation are studied through photography.

Orion Davis

College Affiliated: Grand Valley State University

Category: Arts and Humanities

Mentors: Elizabeth Arnold

Presentation Number: 204

Title: 'ASS'ESSING EQUID MANAGEMENT AT THE ARCHAEOLOGICAL SITE OF TEL DAN, ISRAEL.

Abstract: The archaeological site of Tel Dan (Tel el-Qadi, Israel, is a known pilgrimage site in the Levant throughout the Iron Age, and particularly in biblical times. The temple complex at the site contains evidence of animal sacrifice. It was originally hypothesized that as people from across the region made the pilgrimage to the site, they brought with them sacrificial animals, such as sheep and goats. However, previous isotopic analyses of carbon, oxygen, and strontium from the tooth enamel of these sheep and goats showed that these animals were raised locally. Using identical isotopic techniques, our new research aims to again test the hypothesis of the pilgrims' movement into the city. Equids are a well-known mode of transportation that could have been ridden to the city. Multiple teeth from a donkey were excavated and are analyzed here as a proxy for human pilgrimage to the site.

Biochemistry and Molecular Biology

Kobe Lott

College Affiliated: Ferris State University

Category: Biochemistry and Molecular Biology

Mentors: Konara Kollalpitiya

Presentation Number: 301

Title: COCAINE ON PAPER CURRENCY

Abstract: Globally, paper currency is used in public and private transactions. Advancing research to detect illicit drugs on currency benefits determining drug presence in a region. Liquid Chromatography-Mass Spectrometry/Mass Spectrometry (LC-MS/MS was utilized to detect and quantify cocaine on paper currencies from ten regions of the world: the United States (USD, Sri Lanka, Colombia, the European Union, Albania, Canada, India, Nepal, Italy, and Mexico. Various amounts of cocaine were detected on all the banknotes from all countries except one, supporting the use of this method by law enforcement and health agencies.

Abby Vandecar

College Affiliated: Michigan State University

Category: Biochemistry and Molecular Biology

Mentors: Sophia Lunt

Presentation Number: 302

Title: TARGETING PKM2 ACTIVITY AND CYSTINE METABOLISM TO PROMOTE CELL DEATH IN PANCREATIC DUCTAL ADENOCARCINOMA

Abstract: Pancreatic ductal adenocarcinoma (PDAC is the third leading cause of cancer-related deaths in the U.S., mainly due to late detection and poor treatment response. Current treatments, such as surgery, chemotherapy, and immunotherapy, have limited success and often cause harmful side effects due to their non-specific, cytotoxic nature. Our lab utilizes metabolic differences between healthy and cancerous cells to find more personalized targets to treat PDAC. One such difference involves pyruvate kinase (PK, an enzyme responsible for the energy pay-off step of glycolysis. PDAC cells predominantly express the PK muscle isoform 2 (PKM2, while most healthy tissues express PKM1 or other isoforms. PKM2 changes cancer cell metabolism to encourage rapid cell growth, making it a promising cancer-specific target. We previously found that PKM2 knockout (KO PDAC cells resist cystine starvation-induced cell death compared to PKM2-expressing cells. Cystine, the oxidized dimer of cysteine, is important for antioxidant defense against reactive oxygen species (ROS. Cystine starvation has been linked with ferroptosis, a form of cell death caused by iron-dependent lipid peroxidation. We have also discovered that altering PKM2 activity in wild-type PDAC cells affects sensitivity to cystine starvation. Specifically, combining a PKM2 activator (TEPP-46 with a cystine-starvation-inducing drug (IKE results in greater cancer cell death than either treatment alone. To build on these findings, we will use trypan blue viability assays to assess PDAC cell survival under different nutrient conditions. This research may lead to new metabolic combination therapies that are more effective and selective for pancreatic cancer, ultimately improving patient outcomes.

Maya Mitts

College Affiliated: Michigan State University

Category: Biochemistry and Molecular Biology

Mentors: Sophia Lunt

Presentation Number: 303

Title: IDENTIFYING ENZYMES INVOLVED IN PKM2 ACTIVITY-INDUCED METABOLIC REWIRING UNDER CYSTINE STARVATION USING QPCR AND WESTERN BLOT

Abstract: Pancreatic cancer is the third deadliest cancer in the U.S. and has the lowest 5-year survival rate among the top five deadliest cancers, just 12%. About 50% of patients are diagnosed at Stage 4, where the 5-year survival drops to 3.2%. While treatment options include surgery, radiation, and chemotherapy, most patients are ineligible for surgery, making chemotherapy the standard approach. Common chemotherapy regimens, such as FOLFIRINOX, are non-specific and cytotoxic, often causing severe side effects. Cancer cells have altered metabolism that supports their growth and survival. One enzyme central to this metabolic shift is pyruvate kinase M2 (PKM2, which is highly expressed in cancer cells compared to normal tissue. Our lab investigates PKM2 as a therapeutic target to exploit this metabolic vulnerability in pancreatic cancer. We previously found that PKM2 knockout (KO cells resist cystine starvation-induced cell death, compared to PKM2-expressing cells, due to their lower PK activity. We also found that combining cystine starvation with PKM2 activation leads to pancreatic cancer cell death both in vitro and in vivo. We hypothesize that PKM2KO or low-PKM2 activity cells survive by increasing NADPH production through enzymes like malic enzyme 1 (ME1, which helps quench lipid peroxides under cystine starvation. To test this, I will use qPCR and western blotting to measure ME1 and other NADPH-producing enzymes in these cells. This research could identify new metabolic targets for combination therapies that selectively kill pancreatic cancer cells and improve outcomes for patients with few treatment options.

Kate Darrow

College Affiliated: Michigan State University

Category: Biochemistry and Molecular Biology

Mentors: Tommy Vo

Presentation Number: 304

Title: DETERMINING THE GENOMIC LOCALIZATION OF ELONGATOR PROTEIN 1 IN YEAST

Abstract: Elongator Protein 1 (Elp1 is a highly conserved protein, from yeast to human, that is responsible for human diseases and disorders including Riley-Day syndrome and medulloblastomas. It is well-known that Elp1 is an important subunit of the larger Elongator complex, which mediates tRNA modifications. However, it remains unclear whether the functions of Elp1 is only in tRNA modifications. Our lab recently discovered that Elp1 in a fission yeast model Schizosaccharomyces pombe (S. pombe is involved in the making of an epigenetic chromatin state called heterochromatin. When Elp1 is deleted from this yeast, heterochromatin from a region known as the sub telomeres are drastically reduced. It is not known whether Elp1 binds to these heterochromatin regions that it regulates. My project is to genetically tag the yeast Elp1 protein and to use Chromatin Immunoprecipitation (ChIP to determine where Elp1 localizes on the yeast genome. I hypothesize that Elp1 associates with heterochromatin regions that it regulates by binding somewhere on the DNA.

Angel Zoulek, Rita Bhattar

College Affiliated: Grand Valley State University, Grand Valley State University

Category: Biochemistry and Molecular Biology

Mentors: Agneiska Szarecka

Presentation Number: 305

Title: INVESTIGATING BINDING MODES OF AN EXPERIMENTAL ALLOSTERIC INHIBITOR, BIBR1532, TO HUMAN TELOMERASE

Abstract: Due to its ability to synthesize new telomeric repeats, telomerase (TERT allows cells to proliferate beyond the Hayflick limit. A majority of cancer cells exploit this mechanism to continue dividing by overexpressing TERT. Thus, inhibiting TERT could be a part of anti-cancer therapies. To date, no allosteric inhibitor of human TERT (hTERT has passed clinical trials, but an experimental compound, BIBR-1532, has been shown to inhibit hTERTin vitro. The binding mode of BIBR to hTERT has not been conclusively established. In this project we have identified 43 cavities on the surface of all four subdomains of hTERT and the TPP1 regulatory protein bound to hTERT. We then docked BIBR-1532 to these pockets to predict its binding affinities and poses, and to identify sites with the greatest inhibitory potential. Attracting Cavity and Autodock Vina algorithms, both consistently predicted two pockets within the RNA Binding Domain (RBD, to be of high affinity. These two pockets are located at the interfaces between RBD and Fingers and RBD and Thumb, respectively. Amino acid residues forming these pockets interact with the RNA molecule in the 7TRE ribonucleoprotein complex. Autodock Vina also predicts a high affinity binding site at the interface between TEN and the regulatory TPP1 protein. Ultimately, we aim to use our docking results to inform a design of modifications to the BIBR structure which will improve the binding affinity and pharmacokinetic parameters.

Amanda Fonseca-Irizarry

College Affiliated: Inter American University of Puerto Rico - Aguadilla

Category: Biochemistry and Molecular Biology

Mentors: Jens Schmidt   Madison Turley

Presentation Number: 306

Title: DEFINING THE MOLECULAR MECHANISM OF TELOMERASE ASSEMBLY

Abstract: DNA replication is an essential process for many of the body's cells, ensuring that cells can proliferate and that its function is uninterrupted. To prevent DNA damage each time the genome is replicated, chromosomes contain a set of repeated DNA sequences on their ends, called telomeres, that are also replicated during cell reproduction. Telomeres shorten with each division, which eventually halts cell division. In continuously proliferating cells such as stem cells and cancer cells the enzyme telomerase lengthens telomeres to allow for subsequent cell replication. In telomere syndromes, or premature aging diseases, telomeres shorten at a faster rate due to reduced telomerase activity. This reduction can be attributed to mutations in any one of the cofactors involved in telomere maintenance, such as Telomerase Cajal body 1 (TCAB1, GAR1, NAF1 and Telomerase RNA (TR. To investigate the cofactors and their mutations, 3' RACE, mutational profiling, and live cell imaging will be performed using edited cell lines. In addition, most human cancers rely on the maintenance of telomerase activity for cancer cell proliferation. Understanding the chronological order and sub-cellular localization in which telomerase cofactors are assembled and in which RNA folding occurs during telomerase biogenesis may give insight into how inhibiting or inducing telomerase expression would aid in telomere syndrome and cancer patients.

Avery Vaas

College Affiliated: West Shore Community College

Category: Biochemistry and Molecular Biology

Mentors: Polly Hsu

Presentation Number: 311

Title: CHARACTERIZATION OF SMALL PEPTIDES DERIVED FROM SMALL OPEN READING FRAMES ON PRIMARY TRANSCRIPTS OF MIR163 AND MIR169L IN ARABIDOPSIS THALIANA

Abstract: MicroRNAs (or miRNAs are small RNA sequences of 21-23 nucleotides that play a crucial role in regulating gene expression. They are derived from longer primary transcripts (pri-miRNAs that are cleaved and processed into the mature miRNAs. Recent findings have identified open reading frames on pri-miRNAs that encode for peptides (miPEPs. miPEPs that have been previously studied, including miR858a and miR165a, have been shown to increase expression of their associated pri-miRNA and miRNA. This can lead to changes in phenotype, such as increased root length. The goal of our research is to elucidate the function of two novel miPEPs from primary transcripts of miR163 and miR169l, which were recently discovered as potential miPEPs based on ribosome profiling data. We hypothesize miPEP163 and miPEP169l will increase the expression of their respective pri-miRNAs. To test this, we will treat Arabidopsis seedlings with the peptides and measure the pri-miRNA and subsequent targets' expression via RT-qPCR. We will also record and observe the phenotypic changes, such as root length and germination rates. If these peptides function as hypothesized, they may have potential agronomical applications due to their role in regulating miRNAs and thus downstream gene expression.

Cameron Liu

College Affiliated: Okemos High School

Category: Biochemistry and Molecular Biology

Mentors: Tommy Vo

Presentation Number: 312

Title: INVESTIGATING THE ROLE OF RNAI AND TELOMERE-BINDING PROTEINS IN ELP1-DEPENDENT HETEROCHROMATIN CONTROL

Abstract: A trademark of successful life is the ability to regulate gene expression. A key way organisms regulate gene expression is through epigenetic changes, which are chemical modifications to DNA or histones that change gene expression. In Schizosaccharomyces pombe, we found that Elp1, a part of the Elongator complex, has a function outside of modifying tRNAs regulating subtelomeric siRNAs and H3K9me3. To explore this further, we will explore the RNAi and Taz1 pathways, as they are known to regulate heterochromatin at the subtelomeric region. Genetic interactions between single and double deletion mutants will help us find how Elp1 functions through these pathways. Then, we will perform chromatinimmunoprecipitation (ChIP experiments to measure levels of H3K9me3 among the various mutants. This project will provide insight into a novel function of Elp1. This will further our understanding of disorders such as Riley-Day syndrome, medulloblastoma, and other neurodevelopmental disorders.

Francesca Badalamenti

College Affiliated: University of Michigan-Dearborn

Category: Biochemistry and Molecular Biology

Mentors: Kalyan Kondapalli

Presentation Number: 313

Title: THE ROLE OF NHE9 IN SHAPING TUMOR-ASSOCIATED MACROPHAGE PHENOTYPE AND MODULATING IMMUNOSUPPRESSIVE EXOSOME RELEASE

Abstract: Tumor-associated macrophages (TAMs are a key component of the tumor microenvironment. These immune cells infiltrate tumors and are often "re-educated" to support tumor growth instead of combating it. However, the molecular mechanisms underlying this "re-education" process are not fully understood. To address this, we first used cancer cell-derived exosomes to induce the differentiation of non-activated macrophages into a TAM-like phenotype. We confirmed this differentiation by measuring markers CD163, CD206, and Arg1 using Western blotting. Upon differentiation, we observed a 2.5-fold increase in the expression of the sodium-proton exchanger NHE9. Located on endosomes, NHE9 alkalizes the lumen by exchanging protons for sodium or potassium ions. To investigate the role of NHE9 in TAMs, we created macrophage cell lines with stable NHE9 overexpression (NHE9+ and knockdown (NHE9-. Additionally, we developed a stable line with an NHE9 functional mutant (NHE9+S438P defective in endosomal pH modulation. Given our previous findings that NHE9 is a crucial regulator of exosome biogenesis, we quantified the exosomes released from NHE9+ cells. Nanoparticle tracking analysis revealed a significant increase in the number of exosomes released from NHE9+ cells. Furthermore, consistent with an immunosuppressive role, we observed changes in the levels of programmed death-ligand 1 (PD-L1 per exosome, a protein known for promoting immune suppression. Ongoing studies aim to elucidate the mechanisms underlying altered PD-L1 levels in exosomes from NHE9+ cells and to further characterize exosomes from NHE9- and NHE9+S438P cells.These efforts seek to provide deeper insights into TAM-mediated immune suppression and inform future therapeutic strategies.

Erik Howe

College Affiliated: MSU

Category: Biochemistry and Molecular Biology

Mentors: Tommy Vo

Presentation Number: 314

Title: INVESTIGATING THE INTERACTIONS OF ELP1 AND ELP3 IN EPIGENETIC REGULATION

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

Jayadeep Yedla

College Affiliated: Michigan State University

Category: Biochemistry and Molecular Biology

Mentors: Masako Harada

Presentation Number: 315

Title: MOLECULAR CLONING OF DONOR PLASMIDS FOR CRISPR/CAS9-MEDIATED GENOME EDITING FOR ENDOGENOUS EXPRESSION OF ENGINEERED EXTRACELLULAR VESICLES

Abstract: Extracellular Vesicles (EVs are nanoparticles endogenously secreted by cells that play a vital role in intercellular communication through the transportation of biomolecules such as nucleic acids, proteins, and other metabolic components. The biocompatibility of EVs and their ability to perform targeted delivery make them promising vehicles for therapeutic applications. Prominently, EV surfaces can be genetically engineered to display proteins that enable targeted delivery to specific cell types. Transient transfection can be used to generate engineered EVs (eEVs, but suffers from. Short lived and inconsistent protein expression. To over come this, stable cell lines can be created by targeting the AAVS1 genomic "safe harbor" for robust and stable expression of transgenes. This study aims to generate donor plasmid to target the AAVS1 locus for CRISPR/Cas9 mediated genome editing for endogenous expression of eEVs. To achieve this, a donor plasmid containing the desired transgene flanked by homologous arms was designed to target the AAVS1 locus. Molecular cloning techniques were used to introduce the desired selection markers and the EV surface display proteins to be encoded in the plasmid, transformed into bacteria, isolated using MiniPrep, and sequenced using whole plasmid sequencing. This work lays foundation for the generation of plasmid for the creation of stable cell lines that reliably secrete eEVs.

Carlos González

College Affiliated: University of Puerto Rico R□□o Piedras campus

Category: Biochemistry and Molecular Biology

Mentors: Olorunseun Ogunwobi   Rachel Bonacci

Presentation Number: 316

Title: POF1B, A DOWNSTREAM EFFECTOR OF PVT1 EXON 9, BINDS TO THE ANDROGEN RECEPTOR IN NEUROENDOCRINE PROSTATE CANCER

Abstract: Neuroendocrine prostate cancer (NEPC is an aggressive and poorly understood subtype of prostate cancer that most commonly arises in later stages as a mechanism of treatment resistance. We have recently found that the long non-coding RNA Plasmacytoma Variant Translocation 1 exon 9 (PVT1 exon 9, located at the 8q24 locus, is overexpressed in a subset of NEPC cell models. Our most recent publication suggests that PVT1 exon 9 overexpression contributes to a reduction in androgen receptor (AR expression, and that the loss of PVT1 exon 9 re-sensitizes NEPC cells to enzalutamide, an androgen deprivation therapy. The underlying molecular mechanism by which PVT1 exon 9 contributes to AR suppression remains unclear. We recently observed that PVT1 exon 9 does not directly bind to AR, which suggests a mediating protein is likely contributing to AR downregulation in PVT1 exon 9-overexpressing NEPC cell models. Based on these recent data, we hypothesize that POF1B, a PVT1 exon 9-controlled gene, directly mediates AR expression via PVT1 exon 9. To test this hypothesis, we employed RT-qPCR, Western blotting, immunofluorescence, RNA immunoprecipitation, and RNA pull-down assays to examine the interactions among PVT1 exon 9, POF1B, and AR expression. We expect to observe that PVT1 exon 9 overexpression alters POF1B expression, which in turn contributes to the suppression of AR. These findings provide new insight into the regulatory pathway of PVT1 exon 9, POF1B, and AR, offering potentially novel strategies for NEPC intervention.

Landen Christensen

College Affiliated: Michigan State University

Category: Biochemistry and Molecular Biology

Mentors: Heather Murdoch   Lexi Vu

Presentation Number: 317

Title: ANALYZING METHODOLOGY REGARDING HPV

Abstract: HPV consists of 5% of all cancers. Although the HPV vaccine can prevent viral infections, it cannot treat patients with established cancer. While many patients have a positive response to the initial treatment, many tumors will become metastatic. One cause of the driver of this is our cancer stem cells, put definition of a cancer stem cell compared to normal stem cells. These marker for cancer stem cells includeSOK2, OCT4, C-MYC, NANOG. I hypothesize that the stem cell factors will be higher in HPV+ head and neck cancer cells compared to normal epithelial cells. To test the hypothesis, I determined the gene expression of the four genes in an HPV+ head and neck cancer cells in two sperate cell lines by qPCR. The two cell lines I experimented involved SCC152 and N/Tert-1. The results showed that in the expression in all four genes showed was significantly higher in the SCC152 cells compared to the N/Tert-1 cells. This higher gene expression shows that these stem cell factors possess a stem cell phenotype, with further studies are necessary to determine if higher expression of these stem cell factors promote metastasis

Dominique Weatherall

College Affiliated: Northeastern Illinois University

Category: Biochemistry and Molecular Biology

Mentors: Olorunseun Ogunwobi Seidu Adams

Presentation Number: 321

Title: IDENTIFICATION OF PVT1 ONCOGENIC ASSOCIATED TRANSCRIPT IN PROSTATE CANCER TISSUES FROM MEN OF AFRICAN ANCESTRY

Abstract: Prostate cancer demonstrates marked racial disparities in the U.S., with Black men exhibiting significantly higher incidence (220.9 per 100,000 and mortality (36.9 per 100,000 rates compared to White men (134.2 and 18.4 per 100,000, respectively. These disparities suggest underlying molecular differences that may contribute to divergent clinical outcomes. The long non-coding RNAPlasmacytoma Variant Translocation 1 (PVT1, particularly exon 9, has been implicated in oncogenic signaling and prostate tumor progression. We hypothesized that alternatively spliced, exon 9-containing transcripts are differentially expressed between racial groups. To test this, we performed gene-level differential expression analysis using DESeq2 (|log?FC| 1.0, adjustedp 0.05 on RNA-seq data from both The Cancer Genome Atlas - Prostate Adenocarcinoma (TCGA-PRAD and Sequence Read Archive (SRA project PRJNA237581 datasets, stratified by race and tumor status. Transcript-level analysis was conducted exclusively using SRA data, leveraging variance-stabilized transformed (VST counts and Wilcoxon rank-sum testing. This analysis identified transcript variant ENST00000666076, as significantly upregulated in Black tumor samples (p = 0.019. This transcript represents a potential molecular contributor to prostate cancer disparities.

Ethan Main

College Affiliated: Monmouth College

Category: Biochemistry and Molecular Biology

Mentors: April Kaneshiro

Presentation Number: 322

Title: HETEROLOGOUS EXPRESSION AND CHARACTERIZATION OF PLASTOGLOBULE PROTEIN KINASE ABC1K9

Abstract: Previously dismissed as mere "lipid trash cans", plastoglobules (PGs are now recognized as dynamic compartments critical for supporting photosynthetic life. Found ubiquitously throughout all plastid-containing photosynthetic organisms, PGs are monolayered lipid droplets that bud out from the outer leaflet of the thylakoid membrane. Previous studies have determined that PGs have a distinct proteome of ~32 proteins. The most abundant enzyme family of this proteome is the Activity of bc1 complex protein kinase (ABC1K family of which six members are found to associate to PGs. As no other protein kinases have been identified, this family is believed to play a central regulatory role within the extensively phosphorylated PG proteome. Little is known about this family due to difficulties in expression, purification, and establishing in vitro kinase activity. Here, we investigate the most abundant member of this family, ABC1K9, to determine the optimal conditions and cofactors required for protein kinase activity. Additionally, we are determining the oligomerization state of ABC1K9 and whether it forms complexes with other members of the PG proteome. Our results contribute to furthering our understanding of the ABC1K family and the role(s PGs play in supporting photosynthetic life.

MohamedEyed Ammari

College Affiliated: University of Michigan Dearborn

Category: Biochemistry and Molecular Biology

Mentors: John Abramyan

Presentation Number: 323

Title: THE EFFECT OF BISPHENOL S ON THE SEX-DETERMINATION OF THE VERTEBRATE EMBRYO

Abstract: Bisphenols are chemicals found in common household plastics that can act as endocrine disruptors, influencing the hormonal profiles of otherwise healthy organisms. It is well documented that Bisphenol A (BPA - a chemical used in the manufacturing of hard plastics - acts as a reproductive, developmental, and systemic toxicant. After plastic-producing manufacturers became aware of the negative effects of BPA on human physiology, they began to seek alternative chemicals, including Bisphenol S (BPS, Bisphenol F (BPF, and Bisphenol AF (BPAF. Products containing these alternative bisphenols are often labeled "BPA-Free" to signal their safety to consumers; however, the safety of these alternatives has not yet been verified. Here, we present a study of how exposure to BPS affects gonad and brain development in vertebrate embryos, using the chicken as a model organism. We show that BPS does not cause morphological changes in the gonads of chicken embryos-males still produce testes and females produce ovaries, as expected. Furthermore, we use molecular methods (quantitative polymerase chain reaction, or qPCR to study how the expression of "female genes," which are normally active in ovary development (Cyp19A1 and FoxL2, and "male genes," active in testis development (Dmrt1 and Sox9, are affected in both sexes after exposure to BPS. Historically, BPA has been known to cause gonads to shift toward a female gene expression profile in male embryos, and we expect BPS to have a similar effect.

Melanie Quiñones-Llanos

College Affiliated: Interamerican University of Puerto Rico

Category: Biochemistry and Molecular Biology

Mentors: Robert Quinn Sarah VanDiepenbos

Presentation Number: 324

Title: COMPARATIVE ANALYSIS OF LIPASE ACTIVITY OF PLA? IN CORAL SYMBIONTS DURUSDINIUM AND CLADOCOPIUM

Abstract: Coral reefs are among the most biodiverse and important ecosystems on Earth, supporting an estimated 25% of all marine species. However, these ecosystems face significant threats, primarily due to climate change. Corals maintain a symbiotic relationship with microscopic algae. High temperature stress causes corals to expel their symbionts, resulting in coral bleaching. Bleaching susceptibility is affected by the type of symbionts present, where symbionts of the genus Durusdinium generally provide higher thermal tolerance to the coral than those of the genus Cladocopium. A major biomarker that distinguishes Durusdinium symbionts is their high abundance of lyso lipids. Moderate heat stress has been shown to increase lyso lipid abundance in Cladocopium, leading to a lipid profile more closely resembling Durusdinium. The mechanism by which lyso lipid synthesis contributes to thermal tolerance is still unclear, necessitating further research to characterize the lyso lipid synthesis pathway.Lyso lipids are synthesized by enzymes with phospholipase A2 activity (PLA?. The aim of the current study is to investigate differences in the activity of phospholipase A2 activity (PLA? between corals hosting Durusdinium and Cladocopium symbionts using the model coral Galaxea fasicularis. This analysis will allow for the quantification of PLA? activity and provided insight into the differences in lipase activity between the two types of coral symbionts. This study will generate crucial data to deepen the understanding of coral bleaching and support the development of improved conservation strategies for coral reef ecosystems. Studying coral reefs is crucial, as they serve as foundational species that support biodiversity and marine ecosystems.

Jared Finkel

College Affiliated: Michigan State University

Category: Biochemistry and Molecular Biology

Mentors: Tommy Vo

Presentation Number: 325

Title: UNDERSTANDING THE FUNCTION OF HUMAN GENES THROUGH HUMANIZED YEAST

Abstract: The human POLR2I gene encodes for a subunit of RNA polymerase II and is important in multiple cancers including colorectal, ovarian, head and neck. However, its molecular functions are not understood. To begin exploring its functions, I wondered if yeast would be a suitable test model. Through protein structure analyses, I found an extensive overlap between the structures of human POLR2I and of the homologous fission yeast Rpb9 (RMSD= 1.519Å(685atoms, suggesting that the yeast and human proteins might share molecular functions. To empirically test this, we created a humanized fission yeast model where the human POLR2I gene replaced the native yeast rpb9 gene. Through growth analyses, I found that POLR2I could regulate epigenetics, aging, and tolerance to environmental stresses. However, POLR2I was dispensable for yeast resistance against the drug 6-azauracil (6-AU, an inhibitor of transcriptional elongation. I conclude that POLR2I can perform at least two distinct molecular functions, where only one is conserved between human and fission yeast. In the future, I will further investigate the mechanistic basis behind how POLR2I promotes tolerance to the environmental stressor, 5-fluorouracil (5-FU, because it is a known anti-cancer drug for which resistance has proven deadly in human patients. My studies will reveal novel insights into how POLR2I could function in normal and diseased human biology.

Mandy Murphy

College Affiliated: Michigan State University

Category: Biochemistry and Molecular Biology

Mentors: Masako Harada

Presentation Number: 326

Title: CLONING DONOR PLASMIDS TO CONSTRUCT A NON-BINDING CONTROL FOR EV RESEARCH

Abstract: Extracellular vesicles (EVs are cell-derived nanoparticles that mediate intercellular communication and are increasingly used for therapeutic delivery. Through transient transfection with DNA plasmids, EVs can be modified to express surface proteins that recognize and bind to target cells. Their internal cargo can also be altered to deliver therapeutic agents to cells impacted by disease. To produce engineered EVs consistently, CRISPR/Cas9 genome editing is used to create stable cell lines. In EV therapeutics research, it is critical to ensure that any observed cell binding results from the intended surface protein and not another EV component. Therefore, as a negative control, we cloned a donor plasmid to create a stable cell line expressing RDG, a non-binding monobody. Any binding observed with RDG-expressing EVs would indicate nonspecific interactions, confirming the need for proper controls in EV targeting studies. In this project, we constructed the donor plasmid via cloning. The plasmid backbone pDNR_AAVS1-EF1a was chosen to ensure robust expression of the insert gene RDG-C1C2. The vector and insert were prepared using standard restriction digestion and PCR. Seamless Ligation Cloning Extract (SLiCE was performed to ligate the insert into the vector, yielding the final construct, pDNR_AAVS1-EF1a-RDG-C1C2. This was followed by transformation into E. coli via heat shock, plasmid extraction after bacterial growth, and sequence verification.

Ariel Block, Linux Heller

College Affiliated: Michigan State University, University of Waterloo

Category: Biochemistry and Molecular Biology

Mentors: Khoi Nguyen

Presentation Number: 327

Title: BIOLOGICAL INTERLOCKING MYCELIUM JOINTS

Abstract: The concrete industry is one of the largest contributors to the climate crisis, driving a push for a sustainable alternative. Engineered living materials that combine mycelium grown on lignocellulosic materials and biodegradable deposits can self-heal and form complex networks and structures, making them a promising alternative. In this study, we report new methods of manipulating the molding process to build small-scale, self-healing models of various structures through the method of modular assembly. Formulas using mycelium and various deposits were molded into interlocking joints and assembled into complex structures. The material's mechanical properties were determined using bending, tensile, and compression tests. Our results demonstrate the potential of biocomposite molding and the applications of mycelium on the development of engineered living materials.

Samantha Velasquez Rivertte

College Affiliated: Michigan State University

Category: Biochemistry and Molecular Biology

Mentors: Hyojin Kim

Presentation Number: 331

Title: STRUCTURE-GUIDED MUTAGENESIS STUDY OF LARC, NICKEL-INSERTING CYCLOMETALLASE

Abstract: The lactate racemase (Lar pathway in bacteria facilitates the interconversion of L-lactate and D-lactate, a critical process for maintaining cell wall integrity, metabolic flexibility, and adaptation to environmental lactate levels. Within this pathway, LarA is the primary enzyme that directly catalyzes the racemization between L-lactate and D-lactate. LarC, another key enzyme in this pathway, plays a critical role in the biosynthesis of the nickel-pincer nucleotide (NPN cofactor required for LarA's lactate racemase activity. The bacterial lactate racemase (Lar pathway interconverts L-lactate and D-lactate, essential for cell wall integrity, metabolic flexibility, and adaptation to environmental lactate. The primary enzyme, LarA, directly catalyzes this racemization, while LarC, secondary enzyme, is crucial for bio synthesizing the nickel-pincer nucleotide (NPN cofactor required for LarA's activity. However, LarC's precise mechanism in NPN cofactor biosynthesis remains poorly understood. In this study, we aimed to elucidate the functional roles of specific residues in LarC through structure-guided mutagenesis and biochemical characterization. Based on the previously solved cryo-EM structure of LarC, we identified residues potentially important for nickel binding and substrate (P2TMN binding. We generated twenty mutant variants of LarC, targeting these residues. The impact of these mutations on LarC's function was assessed indirectly by measuring LarA activity, which depends on the NPN cofactor synthesized by LarC. Our results identified several residues essential for LarC's activity in NPN cofactor biosynthesis, providing insights into their potential roles in substrate binding, nickel insertion, or catalysis. These findings advance our understanding of the molecular mechanism underlying NPN cofactor formation and highlight key structural features of LarC that may be critical for its function. Our findings lay the groundwork for future structural and functional investigations of LarC and its role in nickel-pincer cofactor biosynthesis. Given the importance of lactate racemization in bacterial cell wall integrity, the knowledge gained from this study contributes to the development of novel antibiotics targeting bacterial lactate metabolism.

Caitlin Dougherty, Rebecca Brew

College Affiliated: Michigan State University

Category: Biochemistry and Molecular Biology

Mentors: Ian Nelson , Joseph Gair

Presentation Number: 332

Title: POSITIONAL ANALOG SCANNING VIA BORYLATED INTERMEDIATES

Abstract: In developing new therapeutic compounds, medicinal chemists follow a recursive method of design, synthesize, and test. One major challenge emerges when generating analogs of candidate compounds to optimize efficacy. The addition of common small groups or "bumps" such as chlorine, fluorine or methyl often requires resource intensive and time-consuming multistep synthesis. Positional Analog Scanning (PAS is a method commonly used to systematically substitute each aromatic C-H bond with those three common bumps to assess which analogs may improve efficacy. However, traditional PAS is resource intensive and time-consuming, as each analog requires multi-step synthesis. Our research aims to streamline PAS by utilizing one-pot C-H borylation and supercritical fluid chromatography (SFC to separate borylated regioisomers which can eventually be replaced by chlorine, fluorine, or methyl additions. This is termed the "tag-and-separate strategy". The broader research aims at developing methods for preparing libraries of positional analogs using this strategy. Recent work in the Gair Group has demonstrated that iridium-catalyzed C-H borylation promoted by ligands with complementary regioselectivity produces useful distributions of borylated regioisomers. By leveraging indiscriminate C-H functionalization followed by regioisomer separation, this strategy significantly reduces synthetic effort while maintaining access to a broad range of positional analogs.

Edgar Cedillo Aguilar

College Affiliated: Grand Valley State University

Category: Biochemistry and Molecular Biology

Mentors: Josie Mitchell

Presentation Number: 333

Title: INVESTIGATING THE FAS APOPTOSIS INHIBITORY MOLECULE (FAIM IN DROSOPHILA MELANOGASTER

Abstract: Protein aggregation is characteristic of neurodegenerative diseases including Alzheimer's, Parkinson's, and Amyotrophic Lateral Sclerosis (ALS. The ability to disrupt or prevent protein aggregation could open ways to combat these diseases. The evolutionarily conserved Fas Apoptotic Inhibitory Molecule (FAIM inhibits formation and disrupts protein aggregates including amyloid-beta and mutant SOD1, which are involved in Alzheimer's and ALS, respectively. The FAIM gene is conserved across species throughout evolution and Drosophila melanogaster (fruit flies have one faim gene whose amino acid sequence is 38% similar to human FAIM and structural models generated by AlphaFold suggest highly similar tertiary structure. We generated a complete FAIM knockout in flies using CRISPR-Cas9 and found that flies lacking FAIM are homozygous viable. Other studies have found that FAIM plays a role in protein homeostasis during cellular stress. Our study seeks to examine the lifespan of flies lacking FAIM under various stressors, including heat-stress, starvation, and oxidative stress. Additionally, we expressed and purified the Drosophila FAIM protein and will test its function against aggregating proteins in vitro. Further investigation of the localization and function of FAIM in Drosophila will increase our understanding of the unique biochemistry and cellular function this protein plays in protein homeostasis and protein aggregation.

Rachel Passage

College Affiliated: Lake Superior State University

Category: Biochemistry and Molecular Biology

Mentors: Hazel McGuffin

Presentation Number: 334

Title: INNER MEMBRANE PROTEIN, YAJC, IS ESSENTIAL FOR CERTAIN PODOVIRIDAE INFECTION

Abstract: Podoviridaeare the least studied morphology of bacteriophage (1. Podoviridaeare also one of the few phage that have a known inner membrane target. Inner membrane proteins are used in early infection. Ongoing experiments within the lab have shown some podophages are significantly hindered, or incapable of infecting a host without the presence of an inner membrane protein known as YajC (2. We have a growing library of Shigella flexneri infecting environmental isolates that are yet to be characterized but seem to interact with YajC. Characterization of their infection mechanism includes cryogenic imaging and genomic annotation. YajC's function in a host is not widely understood (2. YajC's location on the inner membrane of our hosts of interest is unknown. We can combine YajC with pmCherry, a protein known to fluoresce, within a plasmid and transfer it to our bacterial strains. Via transformation and expression, the newly introduced construct in strains of Salmonella, Shigella flexneri, and Escherichia coli will display the potential site of infection through fluorescent microscopy. Continuing these efforts to understand this protein and the phages' interaction may demonstrate a widespread use in nature among Podoviridae.1. Casjens, S., and Grose, J. (2016 Contributions of P2- and P22-like prophages to understanding the enormous diversity and abundance of tailed bacteriophages. Virology. 496, 255-276.2. Bohm, K., Porwollik, S., Chu, W., Dover, J., Gilcrease, E., Casjens, S., McClelland, M., et al. (2018 Genes affecting progression of bacteriophage P22 infection inSalmonellaidentified by transposon and single gene deletion screens. Mol. Microbiol. 108, 288-305.

Alan Savoy

College Affiliated: Southern Illinois university Edwardsville

Category: Biochemistry and Molecular Biology

Mentors: Xuefei Huang

Presentation Number: 335

Title: CHEMICAL SYNTHESIS OF ENTEROBACTERIAL COMMON ANTIGEN

Abstract: All Enterobacteriaceae family members display a conserved surface polysaccharide enterobacterial common antigen (ECA offering a single, universal target for next-generation immunotherapies aimed at combating multidrug-resistant infections. In this study, we will synthesize a well-defined ECA-derived oligosaccharide and conjugate it to a carrier protein to create a targeted immunogen. Our primary objective is to confirm that this synthetic molecule binds specifically and avidly to native ECA structures and triggers a robust immune response. To achieve this, we will conduct a series of in vitro assays, including surface plasmon resonance or ELISA-based binding studies, antigen-specific antibody quantification, and T-cell activation assays. Candidates that demonstrate high specificity and immunogenicity in these screens will then enter rat studies, where we will assess safety, dosing tolerability, immune response magnitude, and protective efficacy against Enterobacteriaceae challenge. By validating both the biochemical targeting and in vivo protective potential of our ECA based conjugate, this work aims to establish a universal immunotherapeutic platform capable of reducing the global burden of Enterobacteriaceae infections.

Brianna Rhodea

College Affiliated: Grand Valley State University

Category: Biochemistry and Molecular Biology

Mentors: Josie Mitchell

Presentation Number: 336

Title: EXPLORING DIETARY EFFECTS ON RENAL STONE FORMATION IN DROSOPHILA MELANOGASTER

Abstract: Kidney stones affect millions of people worldwide and cause excruciating pain, obstruction, and infection. Most kidney stones are composed of calcium oxalate, however little is known about their formation due to the complexity of the human renal system. Drosophila melanogaster (fruit flies have a simplified renal system that consists of transparent Malpighian tubules, which filter and excrete, functioning like the human nephron. Others have found that genetic mutants and dietary oxalate cause flies to develop calcium oxalate crystals in the Malpighian tubules. Drosophila are a compelling model in which to study renal stones due to their short life cycle, genetic tools, and conservation of disease-causing genes and key pathways in humans. Our study aims to explore dietary causes of stone formation in Drosophila renal tubules, including high-oxalate and high-protein diets. We replicated the finding that a high-oxalate diet induces stone formation in Drosophila using polarized light microscopy to image the Malpighian tubules from flies fed a sodium oxalate diet. Future work will test other dietary additions, as well as study conserved transporters, which will help to gain a better understanding of stone formation and oxalate transport mechanisms to identify potential targets for prevention and treatment of renal stones.

Biosystems and Agricultural Engineering

Josie Cayen

College Affiliated: Michigan State University

Category: Biosystems and Agricultural Engineering

Mentors: Evangelyn Alocilja

Presentation Number: 401

Title: ASSESSING ANTIBIOTIC RESISTANCE IN E. COLI, K. PNEUMONIAE, AND E. CLOACAE USING ZETA POTENTIAL

Abstract: Antimicrobial Resistance (AMR is a developing issue in public health where infectious bacteria, viruses, parasites, and fungi no longer respond to certain antimicrobials [1]. This has created a problem where microbial infections can become difficult to treat, which increases disease spread and death rates. In 2019 alone, AMR contributed to 4.95 million deaths [1]. The rapid determination of a bacterium's antibiotic resistance profile is critical in reducing the clinical and agricultural overuse of last-resort carbapenem antibiotics which select for Carbapenem Resistant Enterobacterales (CRE. One of the areas lacking in the current development of rapid diagnostics for AMR bacteria is the difference in cell surface potentials between AMR and drug-susceptible bacteria [2]. Thus, the aim of this work is to develop a database of zeta potential measurements to support a phenotypic rapid diagnostic method in determining drug susceptibility. The zeta potential of bacterial samples was measured to differentiate Carbapenem-susceptible Escherichia coli (E. coli from Carbapenem-resistant E. coli samples. This process was repeated with Klebsiella pneumoniae(K. pneumoniaeand Enterobacter cloacae(E. cloacaesamples. The experimental samples were clinical isolates DNA sequenced and identified as E. coli, K. pneumoniae,or E. cloacae samples with at least one of the following Carbapenem-resistant genes: blaKPC, blaNDM, blaOXA-48, blaVIM, or blaIMP. Preliminary results distinguish the zeta potential of meropenem-resistant E. coli samples from meropenem-susceptible E. coli controls. Likewise, the zeta potential of meropenem-resistant K. pneumoniae and E. cloacaesamples was distinct from the zeta potential of meropenem-susceptible K. pneumoniae and E. cloacaestrains.

Finnian James

College Affiliated: Michigan State University

Category: Biosystems and Agricultural Engineering

Mentors: Anthony James Franco Evangelyn Alocilja

Presentation Number: 402

Title: RAPID ESTIMATION OF SALMONELLA CONCENTRATION USING MAGNETIC NANOPARTICLES

Abstract: Salmonella is a leading global bacterial cause of foodborne illnesses. Each year, approximately 160 million contract a Salmonella-related illness, of which 60,000 cases result in death. The transmission of Salmonella can originate from contact with contaminated water, poultry, dairy, eggs, and raw fruits and vegetables. Rapid detection plays a crucial role in controlling and preventing the emergence and spread of such infections. Despite advancements in detection techniques, challenges remain in achieving cost-effectiveness, simplicity, and speed.This study presents a novel approach to estimating the Salmonella concentration of a suspension using glycan-coated magnetic nanoparticles (gMNPs. The gMNPs attaches to Salmonella, allowing it to drag the bacteria when the suspension is subjected to an external magnetic field. On the inner surface of the container, the gMNP forms a spread pattern dependent on the bacterial concentration, which can be interpreted through image analysis. The image analysis algorithm determines the presence of gMNP through differences in grayscale values of pixels in photographed containers. Results revealed that incubation and magnetic separation time influence the correlation between the gMNP spread pattern and Salmonella concentration. Ongoing experiments focus on optimizing the experimental conditions and validating the results of image analysis in estimating bacterial concentration. This approach offers an accessible and cost-effective means of estimating bacterial concentration in uncomplicated matrices.

De'Lon Nowell

College Affiliated: Winston-Salem State University

Category: Biosystems and Agricultural Engineering

Mentors: Evangelyn Alocilja

Presentation Number: 403

Title: ZETA POTENTIAL AS A RAPID DIAGNOSTIC INDICATOR FOR CARBAPENEM RESISTANCE IN ENTEROBACTER STRAINS

Abstract: The development of antimicrobial resistance (AMR in infectious bacteria remains a significant threat to public health resulting in 4.95 million deaths worldwide. Carbapenems represent some of the last-resort treatment of severe bacterial infections. However, the emergence of carbapenem-resistant Enterobacter strains has been documented in clinical settings. The delay in identifying resistance due to the lengthy antimicrobial susceptibility testing highlights the need for a more rapid approach. This study explores using zeta potential, a measure of surface charge, to differentiate carbapenem-susceptible strains ofEnterobacter from resistant strains. The degree of resistance to meropenem, a carbapenem antimicrobial, will be determined through disk diffusion assay. The measured zeta potential of the strains will be compared to the disk diffusion assay result to investigate the relationship between surface charge and antimicrobial susceptibility. Findings from this study will inform the development of rapid diagnostic tools that may offer faster alternatives to standard methods such as disk diffusion, ultimately improving the speed and accuracy of clinical decision-making.

Tawsif Imam Nadif

College Affiliated: Michigan State University

Category: Biosystems and Agricultural Engineering

Mentors: Daniel Morris

Presentation Number: 404

Title: AUTOMATED TRACTOR: AUTO-STEERING AND CROP ROW DETECTION

Abstract: This project focuses on developing an automated tractor system that combines GNSS-based autosteering with camera-based crop row detection for precision agriculture. A Teensy microcontroller handles real-time steering using input from a wheel angle sensor and RTK-enabled GNSS for accurate positioning. A camera system integrated with computer vision detects crop rows to guide the tractor through fields with greater accuracy. The system aims to improve efficiency and reduce manual effort in farming operations.

Stewart Tucker

College Affiliated: Michigan State University

Category: Biosystems and Agricultural Engineering

Mentors: Younsuk Dong

Presentation Number: 405

Title: MODELING OF SOIL WATER DISTRIBUTION UNDER DIFFERENT IRRIGATION TYPES AND TECHNIQUES FOR IMPROVING BLUEBERRY IRRIGATION MANAGEMENT

Abstract: Growers often use drip irrigation to improve water use efficiency in fruit and vegetable production. Blueberry plants grown in sandy soil typically have a shallow root system. Maintaining an optimal soil moisture level for shallow root system in sandy soil is a challenge. In addition, climate variability has more complicated growers to manage irrigation. Thus, optimization of irrigation system and management practice using HYDRUS 2D were the focus in this paper. The field soil and environmental conditions were monitored using Sentek Drill Drop soil moisture monitoring system. HYDRUS model was calibrated using field data. In calibration, Nash-Sutcliffe Efficiency (NSE, Index of Agreement (IA, Root-Mean-Squared-Error (RMSE were 0.92, 0.98, and 0.041, respectively. Multiple scenarios were simulated to optimize drip irrigation system and management practice. Scenarios include observing the impact of irrigation application system (single, double, emitter spacing (15-, 30-, 45-, 60-cm, duration (1-, 0.5-, 0.25-hour, and flow rate (0.89 L/hr, 1.89 L/hr. Overall, the results recommend using single drip lines with 45- or 60-cm emitter spacing and 1.89 L/hr for 0.5 hour to maximize water use efficiency and minimize a risk of leaching water below the root zone. The study concludes that HYDRUS can be used to optimize designing irrigation system and management practices.

Cell Biology Genetics and Genomics

Layla Raye

College Affiliated: Xavier University of Louisiana

Category: Cell Biology Genetics and Genomics

Mentors: Margaret Petroff

Presentation Number: 602

Title: ANALYZING SPERM DNA MATURATION IN AIRE DEFICIENT MICE

Abstract: Global rates of male infertility have increased by 76.9% between 1990 and 2019. Immunological factors can contribute to male infertility; however, the correlation between autoimmune disease and infertility remains unclear. With global rates of male infertility rising by 76.9% between 1990 and 2019, there is growing interest in potential underlying causes. Immunological factors can contribute to male infertility; however, the correlation between autoimmune disease and infertility remains unclear.The Autoimmune Regulator (AIRE gene encodes a transcriptional regulator that is critical for T cell development and the establishment of immune tolerance. Individuals with Autoimmune polyglandular syndrome type 1 (APS-1, resulting from mutations in AIRE, exhibit autoimmunity of various tissues that can often lead to infertility. Evidence in mice suggests that in the absence of functional Aire, the epididymis becomes a site of T cell infiltration, fibrosis, and epididymitis. As sperm move through the epididymis, they mature, are stored, and gain the ability to successfully fertilize oocytes. We hypothesize that increased T cell presence within the epididymis alters the genetic stability of the sperm, impairing their fertilization potential causing infertility. To test this, we will analyze sperm isolated from epididymal tissue collected from Aire knockout (Aire-/- mouse models. Each of the three epididymal regions will be assessed separately to compare regional differences seen in Aire-/- mice with wild-type (WT controls. Aniline blue (AB staining will be used to assess sperm maturity by detecting retained histones. We anticipate that there will be an increase in histone retention and DNA fragmentation in the sperm isolated from Aire-/- mice.

Ian Loeffler

College Affiliated: Michigan State University

Category: Cell Biology Genetics and Genomics

Mentors: Julia Ganz

Presentation Number: 603

Title: USING CRISPR-CAS9 TECHNOLOGY TO IDENTIFY CANDIDATE GENES RESPONSIBLE FOR GASTROINTESTINAL DYSFUNCTION IN ZEBRAFISH.

Abstract: A significant number of adults worldwide suffer from constipation or diarrhea-common symptoms of gastrointestinal dysfunction-yet the underlying genetic basis remains unclear. To close this gap, a genome-wide association study (GWAS identified four candidate genes with strong correlation to these gastrointestinal symptoms: BRAT1, LFNG, NFASC, and CDK18. To assess each gene's role in gut transit, we performed CRISPR-Cas9 gene editing in zebrafish (Danio rerio. Gene-specific guide RNAs were used to individually knock out each candidate gene, along with slc24a5a, whose loss-of-function produces a "golden" pigmentation phenotype-a visible marker of injection efficiency. As a positive control, we knocked out sox10, critical for development of the enteric nervous system (ENS - the intrinsic gut nervous system - resulting in ENS absence and impaired gut motility. We monitored for viability over time and assessed "golden" phenotypes at 2 days post-fertilization (dpf. At 5 and 6 dpf, larvae were fed green fluorescent food and screened for ingestion. At 7 dpf, a gut transit assay was conducted to assess food transit. DNA was extracted from larvae with and without food retention, and CRISPR-targeted areas were amplified by PCR and analyzed via Sanger sequencing to confirm loss-of-function. Loss-of-function of lfng results in significantly reduced gut transit, whereas brat1 showed no significant change. We are currently investigating cdk18 and nfasca/b. To better understand lfng's role, we are performing CRISPR knockouts to assess changes in ENS and gut development. Our work will contribute to identifying the gene(s responsible for gastrointestinal dysfunction symptoms in humans and investigate their function.

Treyton Grigg

College Affiliated: Michigan State University

Category: Cell Biology Genetics and Genomics

Mentors: Tony Zhou

Presentation Number: 604

Title: CONSERVED CODE: TRACING TBX18 THROUGH VERTEBRATE FISH GENOMES

Abstract: How hastbx18evolved in vertebrates? The T-box transcription factor 18 (tbx18 gene is highly conserved across vertebrate lineages and plays a crucial role in the development of the heart, blood vessels, somites, fins, and other structures. Using the spotted gar (Lepisosteus oculatus, a basal representative of ray-finned fishes, as a reference species, we analyzed thetbx18genome region of more than 70 vertebrate fish species by extracting and performing sequence alignments. The spotted gar's genome is especially useful for comparative genomic analyses because it is slow-evolving and predates a whole-genome duplication seen in the modern teleost fishes, offering a more ancestral and evolutionarily informative genomic architecture. Genomic sequences surroundingtbx18 genes were extracted from public genome databases and aligned using MVISTA algorithms to identify conserved non-coding elements (CNEs. Furthermore, we used MEME software to predict sequence motifs located in predicted CNEs to gain an understanding of protein binding motifs that are shared among species. Furthermore, the gene order, or synteny, surroundingtbx18may give us insight into how thetbx18gene evolved and is regulated in divergent vertebrate lineages. We projected sequence conservation and motif prediction information onto an existing phylogenetic tree to detect underlying evolutionary signals specific to diverse vertebrate lineages. Our updated tree highlights conservation and lineage-specific changes that contribute to species evolution. These patterns help clarify how genetic regulation oftbx18 has diversified over time across vertebrate lineages. This approach offers new insights into vertebrate evolution and the utility of developmental genes in phylogenetic analysis.

Nayeema Siraj, Tiffany Rennells

College Affiliated: Michigan State University, Michigan State University

Category: Cell Biology Genetics and Genomics

Mentors: Masako Harada

Presentation Number: 605

Title: ENGINEERING EXTRACELLULAR VESICLES (EVS FOR DELIVERY OF THERAPEUTIC MICRORNA CARGO IN TYPE 1 DIABETES

Abstract: Type 1 diabetes (T1D is an autoimmune disease characterized by T cell-mediated destruction of insulin-producing pancreatic beta cells. Current treatments, such as glucose monitoring and insulin therapy, provide short-term management but do not address the underlying autoimmune response.This highlights the need for a delivery system that can selectively transport therapeutics to pancreatic beta cells. Extracellular Vesicles (EVs are natural nanoparticles that facilitate intercellular communication by transporting biological molecules, such as proteins, RNA, and lipids. Their ability to be surface-engineered and loaded with biomolecules make them a promising platform for targeted drug delivery. Our research aims to modify EVs with a surface protein that enables selective binding to pancreatic beta cells. Specifically, we use the single-chain variable fragment (scFv antibody SCA B1, recognized for its strong beta cell affinity, fused to the EV-binding domain of lactadherin (C1C2 to achieve targeted drug delivery. At the same time, we are investigating microRNAs (miRNAs as potential therapeutic cargo for T1D. miRNAs are small non-coding RNAs that suppress gene translation and regulate key signaling pathways involved in T1D pathogenesis, including NF-B and JAK/STAT. Several miRNAs such as miR-200, miR-7, miR-21, and miR-31 have been linked to beta cell dysfunction. Using tools like miRNA sponges, we aim to inhibit these miRNAs in beta cells, thereby promoting their survival and regeneration. Overall, this study will evaluate the targeting effectiveness of SCAB1 engineered EVs to pancreatic beta cells and explore the therapeutic potential of miRNAs on improving beta cell health.

Kyle Wolf

College Affiliated: Michigan State University

Category: Cell Biology Genetics and Genomics

Mentors: Aitor Aguirre

Presentation Number: 606

Title: MFGE8-DRIVEN LACTADHERIN IN EXTRACELLULAR VESICLE SIGNALING: IMPLICATIONS FOR HUMAN HEART ORGANOID MATURATION AND CONGENITAL HEART DEFECTS

Abstract: Congenital heart defects (CHDs affect nearly 1% of live births, making them the most common birth defect in humans. Human heart organoids (hHOs provide a more accurate model of human heart development compared to traditional monolayer cultures or animal models. We use hHOs to study how extracellular vesicles (EVs mediate cell-to-cell communication during heart development. EVs are lipid-bound nanoparticles that transport bioactive molecules-such as DNA, RNA, and proteins-between cells, playing a crucial role in cellular signaling. Our research focuses on understanding the role of EVs in fetal heart development by analyzing their expression and content in hHOs. Early results indicate that hHO-derived EVs are highly dynamic, evolving throughout development and carrying essential proteins contributing to cardiac maturation. Notably, lactadherin, a protein primarily derived from epicardial cells, emerges as a key player in EV-mediated communication. Lactadherin, encoded by the MFGE8 gene, phenotypic importance is the primary focus of this discussion. The concentration of the MFGE8 gene is manipulated via a knockdown using Lentivirus to quantify the phenotypic qualities of the EVs and hHOs facilitated by the presence of lactadherin in the developing model. These findings provide valuable insights into the role of MFGE8 in heart development and may have implications for understanding congenital heart defects.

Chemical Engineering and Materials Science

Ali Khan

College Affiliated: Eastern Michigan University

Category: Chemical Engineering and Materials Science

Mentors: Philip Rufe

Presentation Number: 701

Title: FROM NATURE TO ENGINEERING: TENSILE ANALYSIS OF ARMADILLO-INSPIRED STRUCTURES USING 3D PRINTING AND SIMULATION

Abstract: This study investigates the potential of biomimetic, segmented systems inspired by armadillo shells, which naturally maintain structural integrity across their hexagonal segments. The research aims to support the development of high-strength, lightweight materials by comparing the mechanics of hexagonal structures against their circular and rectangular counterparts. Initial prototypes were designed in SolidWorks and 3D printed, followed by extensive computational simulations to evaluate the tensile strength and stress distribution across materials like polymers and metals. Through this approach, the research seeks to establish a new, adaptable method of designing materials with superior tensile properties, with broad applications in infrastructure and consumer product design.

Asmaa Hasbini

College Affiliated: Michigan State University

Category: Chemical Engineering and Materials Science

Mentors: Daniel Woldring

Presentation Number: 702

Title: BATTLING FUNGAL PATHOGENS USING PLANT DEFENSE PROTEINS DEVELOPED IN YEAST SURFACE DISPLAY

Abstract: Fungal pathogens such as Botrytis cinerea, known for causing gray mold, rely on virulence factors to infect plant hosts. Among these virulence factors are cell wall-degrading enzymes (CWDEs, which break down structural components in plant cell walls to facilitate invasion into tissues. In response, plants have evolved protein inhibitors that neutralize CWDE activity. This study focuses on two such inhibitors: polygalacturonase inhibitory protein (PGIP2 and rice-induced xylanase inhibitor (RIXI, which target the CWDEs, endo-polygalacturonase (endoPG and xylanase, respectively. The expression and binding ability to their targets was investigated for the modern and ancestral sequences of these inhibitors. To do this, yeast surface display was paired with flow cytometry, to detect the level of protein expression and interaction using epitope tags and antibodies. High expression of PGIP2 and RIXI was confirmed using the BD Accuri C6 cytometer, while binding trials are ongoing using the Cytek Aurora cytometer. This work aims to characterize and improve recombinant plant defense proteins against fungal pathogens.

Jack Quinn

College Affiliated: Hamilton College

Category: Chemical Engineering and Materials Science

Mentors: Alexandra Zevalkink

Presentation Number: 703

Title: THERMAL TRANSPORT AT GRAIN BOUNDARIES IN GE1-XSNXTE

Abstract: A thermoelectric material is most efficient if it is both a strong electrical conductor and a weak thermal conductor. Thermal conductivity (in these materials has main components of electrical thermal conductivity (E and lattice thermal conductivity (L, where E is linearly proportional to electrical conductivity. Thus, to maintain strong electrical conductivity while improving thermoelectric performance, a focus is put on minimizing L. It has been observed that grain boundaries (GBs in a material will scatter phonons, decreasing the phonon mean free path of a material and lowering L in consequence. To examine this, a promising thermoelectric material Ge1-xSnxTe of compositions x = 0.6, 0.7, and 0.8 was synthesized and will be analyzed both at bulk and on the microscale at GBs. The samples were alloyed in a furnace and have been characterized using powder x-ray diffractometry (XRD. They were then polished in preparation for scanning electron microscope (SEM followed by Electron Backscatter Diffraction (EBSD to map and analyze grain boundary distributions and orientations. Eventually, the materials will be examined through Frequency Domain Thermoreflectance (FDTR by our collaborators at Northwestern University to map the thermal transport characteristics at GBs. This study aims to assess if GB engineering is a viable strategy for lowering L and increasing the thermoelectric efficiency of Ge1-xSnxTe.

Matthew Serrano

College Affiliated: Los Angeles City College

Category: Chemical Engineering and Materials Science

Mentors: Weiwei Xie

Presentation Number: 704

Title: CRYSTAL GROWTH AND STRUCTURE-PROPERTY RELATIONSHIP IN NOVEL RARE EARTH- TRANSITION METAL QUANTUM MATERIAL

Abstract: Rare earth elements (REEs exhibit strong magnetic and electronic properties that are essential in modern technologies, including permanent magnets, catalysts, and energy materials. However, the global supply chain of REEs is heavily reliant on extraction and processing in China, resulting in high costs and supply uncertainties for domestic research and development. To address this challenge, it is critical to investigate the magnetic and transport properties of REEs and explore analogous behaviors in materials derived from more locally abundant 3d and 4f elements. This study aims to expand our understanding of crystal-structured quantum materials through the synthesis, structural characterization, and property measurements of selected compounds. Single crystals are synthesized via the flux growth method, followed by phase identification using X-ray diffraction and elemental analysis via scanning electron microscopy. Magnetic and transport properties are probed using a Physical Property Measurement System (PPMS under variable temperature conditions. The results include diffraction pattern analysis, crystal structure models, and temperature-dependent magnetization and resistivity data, contributing to the broader search for functional quantum materials beyond conventional REE systems.

Katherine Turner

College Affiliated: Michigan State University

Category: Chemical Engineering and Materials Science

Mentors: Shalin Patil Shiwang Cheng

Presentation Number: 705

Title: IONIC TRANSPORT AND POLYMER DYNAMICS IN A PEO-PPO RANDOM COPOLYMER/LITFSI ELECTROLYTE

Abstract: Solid polymer electrolytes (SPE have many advantages over small molecular liquid electrolytes, including their large electrical stability window, nonflammability, and good mechanical properties. However, SPEs suffer from a low ionic conductivity and small transference numbers that prevent its large-scale industrial applications. In this study, we design new types of polyether electrolytes based on a random copolymer of ethylene oxide (EO and propylene oxide (PO with 25% PO to suppress the crystallization of PEO. In particular, we examine the influence of LiTFSI concentrations on the ionic conductivity, thermal transitions, and polymer dynamics. Differential Scanning Calorimetry was employed to assess changes in the thermal transitions such as crystallinity and glass transition temperatures. At the same time, Broadband Dielectric Spectroscopy was used to characterize ionic conductivity and polymer dynamics over a range of temperatures and frequencies. The results reveal a strong influence of the salt concentration on glass transition and polymer dynamics, which in turn affect their ionic conductivity. These insights contribute to the future design of high-performance polymer electrolytes for batteries and other electrochemical devices.

Qingchu Yang

College Affiliated: Michigan State University

Category: Chemical Engineering and Materials Science

Mentors: Juncheng Zheng

Presentation Number: 706

Title: CRYSTALLIZATION AND MECHANICAL PROPERTIES OF SEMICRYSTALLINE POLYMER NANOCOMPOSITES UNDER COLD DEFORMATION

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

Ava Erickson

College Affiliated: Michigan State University

Category: Chemical Engineering and Materials Science

Mentors: Christina Chan , Kevin Chen

Presentation Number: 707

Title: DNA DAMAGE REPAIR PROTEIN MGMT IS UPREGULATED BY PALMITATE INDUCED IRE1 ACTIVATION THROUGH XBP1 IN THE UNFOLDED PROTEIN RESPONSE

Abstract: Obesity is associated with an increased risk of cancer development and reduced effectiveness of chemotherapy treatments. One proposed reason for this involves palmitate, a saturated fatty acid that exhibits elevated levels in obese individuals. Notably, palmitate activates the inositol requiring enzyme 1 (IRE1- X-box binding protein 1 (XBP1 branch of the unfolded protein response (UPR, inducing endoplasmic reticulum (ER stress. Self-association of IRE1 dimers activates its RNase domain that splices the mRNA of XBP1. The spliced XBP1 form functions as a transcription factor that upregulates genes involved in ER stress relief, including DNA repair proteins. O6-methylguanine-DNA methyltransferase (MGMT is a DNA repair enzyme that has been found to reduce double stranded break accumulation when upregulated, potentially contributing to chemotolerance in cancer cells. In this study, we investigated whether the IRE1-XBP1 pathway regulates MGMT expression. Using IRE1 KO breast cancer cells, we observed reduced MGMT protein and mRNA expression compared to wild-type controls, indicating that IRE1 expression correlates with MGMT expression. Further analysis on cells transfected with siRNA targeting XBP1 confirmed that XBP1 also contributes to MGMT regulation. Our findings suggest that IRE1 regulates MGMT through spliced XBP1 in the UPR, highlighting a potential mechanism by which obesity-driven UPR activation may promote chemotolerance in cancer cells.

Xavier Maple

College Affiliated: Morgan State University

Category: Chemical Engineering and Materials Science

Mentors: Ismail Buliyaminu , Jose Mendoza Cortes

Presentation Number: 711

Title: AUTOMATED HIGH-THROUGHPUT DISCOVERY OF FUNCTIONAL 2D MATERIALS USING DFT AND WORKFLOW MANAGEMENT TOOLS

Abstract: Accelerating the discovery of functional 2D materials can lead to advances in clean energy, next generation electronics, and nanotechnology. We aim to discover promising 2D materials (especially carbon allotropes with exotic properties (tunable band gaps, high conductivity, mechanical strength. Prove that automation frameworks can significantly reduce human error, improve reproducibility, and scale computational materials design. We aim to demonstrate that such workflows can efficiently classify materials into use-cases like semiconductors, battery electrodes, and sensors. We use High-Performance Computing Clusters (HPCC for running large-scale DFT simulations on CRYSTAL23. In addition to the previously listed tools we also use other workflow tools such as Snakemake and Python. The discovery and optimization of novel 2D materials has the potential applications in electronics, energy storage, and catalysis. However, the traditional approach to screening these materials is slow, error-prone, and manually intensive. This study's purpose is to build an automated, reproducible, and scalable workflow for high-throughput screening of 2D materials using Density Functional Theory (DFT and Snakemake, accelerating materials discovery. We have designed some materials and performed the DFT calculations manually, but we are planning to develop an automated workflow to make the process faster and more efficient.

Hatim Saeed

College Affiliated: Kenyon College

Category: Chemical Engineering and Materials Science

Mentors: Shannon Nicley

Presentation Number: 712

Title: SPECTROSCOPIC ANALYSIS OF SUBSTITUTIONAL NITROGEN CONCENTRATION IN DOPED DIAMOND

Abstract: Substitutional nitrogen plays a critical role in shaping the electronic and optical behavior of diamond, impacting its performance for quantum sensing and optoelectronic applications. Accurate quantification of these defects is essential for optimizing growth conditions for synthetic diamond; however, their extremely deep donor level complicates electronic quantification, and mass spectroscopy methods do not distinguish between substitutional nitrogen and other forms of incorporation, such as clusters or nitrogen-vacancy (NV centers. Developing a non-invasive method for quantifying substitutional nitrogen is particularly valuable for improving spatial resolution of quantum sensors manufactured using deterministic multiphoton laser writing of NV centers. This project explores a spectroscopic approach for determining substitutional nitrogen concentrations using Fourier-transform infrared (FTIR and Ultraviolet and Visible (UV-Vis spectroscopy. This method focuses on the prominent nitrogen-related absorption features in the infrared region, which are linked to substitutional nitrogen and related defect complexes. A Python-based fitting algorithm was developed to process and deconvolve FTIR spectra using Gaussian peak profiles, applying baseline correction, thickness normalization, and iterative fitting routines. UV-Vis spectroscopy was used in parallel to identify similar defects to support FTIR results. These defects were compared with literature to determine the type of defect present. As well as the effect on the substitutional nitrogen concentration by varying growth conditions for homoepitaxial deposition of single-crystal diamond by microwave plasma-enhanced chemical vapor deposition.

Charlie McAdoo III

College Affiliated: Howard University

Category: Chemical Engineering and Materials Science

Mentors: Seokhyoung Kim

Presentation Number: 713

Title: SYNTHESIS AND CHARACTERIZATION OF NOVEL DARK CESIUM COPPER BROMIDE CRYSTALS

Abstract: Dark crystalline materials that exhibit strong, broadband optical absorption are of significantinterest for a variety of optoelectronic applications, including solar energy harvesting,photodetection, and thermal sensing. Additionally, such materials hold promise for use incamouflaging paints or coatings. In this work, we report a simple, solution-phase synthesis routefor producing dark cesium copper bromide crystals. The resulting crystals are characterizedusing optical microscopy and scanning electron microscopy (SEM to investigate theirmorphology, while energy dispersive x-ray spectroscopy (EDS provides insight into elementalcomposition. X-ray diffraction (XRD is used to determine the crystalline structure and phaseidentity of the synthesized material. Preliminary findings suggest the emergence of a potentiallynovel phase or crystal structure within the cesium copper bromide family, distinct frompreviously reported compositions. Ongoing and future studies will focus on detailed structuralanalysis, optical measurements, and evaluation of the material's performance in optoelectroniccontexts.

Tessa Monroe

College Affiliated: The University of Tampa

Category: Chemical Engineering and Materials Science

Mentors: Ruth Smith

Presentation Number: 714

Title: USING HILDEBRAND SOLUBILITY PARAMETERS TO SELECT SUITABLE SOLVENTS FOR EXTRACTION OF IGNITABLE LIQUIDS FOR FIRE DEBRIS APPLICATIONS

Abstract: Ignitable liquids are commonly used as accelerants to set intentional fires and are extracted from the resulting debris to aid in forensic investigations. The ASTM E1618 standard defines eight ignitable liquid classes based on the chemical compounds present. Given that different compounds have different solubilities, it is conceivable that different solvents may be preferable for the extraction of ignitable liquids depending on the specific ignitable liquid class. In our laboratory, dichloromethane (DCM was the preferred solvent for the analysis of ignitable liquids due to its ability to extract compounds of various polarities. However, in May 2025, the U.S. Environmental Protection Agency recognized adverse health effects resulting from the use of DCM; thus, there is a need to identify alternative solvents for fire debris analysis. The goal in this research is to identify solvents that are effective for the extraction of ignitable liquids representing the chemical classes defined by ASTM. Eight liquids, representing five of the eight ignitable liquid classes, were prepared using pentane as the solvent and analyzed by gas chromatography-mass spectrometry (GC-MS following standard procedures. Hildebrand solubility parameters were then calculated for the observed compounds within each liquid. Subsequentially, suitable solvents with similar parameters were identified. Each liquid was then prepared in the selected solvents and analyzed by GC-MS. Chromatograms were then compared to those previously collected using DCM and pentane as solvents. Differences in the chromatograms were evaluated and used to identify an appropriate substitution for DCM for the analysis of ignitable liquids representing different chemical classes.

Tanvi Satoor

College Affiliated: Michigan State University

Category: Chemical Engineering and Materials Science

Mentors: Shalin Patil , Shiwang Cheng

Presentation Number: 715

Title: IONIC TRANSPORT AND POLYMER DYNAMICS IN PROPYLENE OXIDE-ETHYLENE OXIDE RANDOM COPOLYMER/LITFSI ELECTROLYTES

Abstract: Tanvi Satoor, Shalin Patil , and Shiwang ChengDepartment of Chemical Engineering and Materials Science, Michigan State University, East Lansing 48824, United StatesWe investigate ion transport and polymer dynamics in solid polymer electrolytes based on Poly(propylene oxide (PPO and poly (ethylene oxide (PEO random copolymer, PEO-r-PPO, doped with lithium bis(trifluoromethanesulfonyl imide (LiTFSI. The interplays between polymer segmental motion and ionic conductivity have been explored for PEO-r-PPO/LiTFSI at different molecular weights and different salt concentrations. Differential Scanning Calorimetry (DSC was employed to assess changes in the glass transition temperature (Tg, providing insights into how LiTFSI affects the glass transition and the phase behaviors. Broadband Dielectric Spectroscopy (BDS was used to probe the response of the material to an alternating electric field, offering information on both ionic motion and polymer relaxation processes across a wide time scales. These findings aim to identify optimal blend conditions that balance composition and ionic mobility, advancing the development of more effective solid-state electrolyte materials.

Dylan Serie

College Affiliated: Grand Rapids Community College

Category: Chemical Engineering and Materials Science

Mentors: Marcos Conde

Presentation Number: 716

Title: THE INTERACTIONS OF ORGANOPHOSPINES WITH ARYL BENEZE TRIFLOUROMETHANES VIA RARE EARTH METALS.

Abstract: Organophosphine oxides are a very stable and effective molecule for reactions with rare earth metals. Our research involved aryl bromides combined with a grignard reaction then catalyzed with a molybdenum catalyst to produce a phosphine oxide. The 2 aryl bromides used were 3-bromobenzotrifluoride and 4-bromobenzotrifluoride. In order to confirm that the oxide was actually produced, the use of fluorine and phosphorus NMR was frequent; however, mass spectroscopy and infrared were also utilized. Whilst the main goal was to produce a solid, it wasn't the result. For almost all of the aryl bromides, the grignard reaction would result in an oil, and not the desired solid. This also carried over into the reaction involving the 3-bromobenzotrifluoride with the molybdenum catalyst. The end product was solid, yet the consistency was that of a sticky putty.

Elaf Mahmoud

College Affiliated: New Jersey Institute of Technology

Category: Chemical Engineering and Materials Science

Mentors: Rebecca Anthony

Presentation Number: 717

Title: ENGINEERING SEMICONDUCTOR NANOSTRUCTURES USING PLASMAS

Abstract: Plasma reactors offer a versatile platform for synthesizing carbon-based nanomaterials, enabling the production of functional nanoparticles with customizable optical, electrical, and structural properties for use in energy, sensing, and optoelectronic applications. This research investigates two approaches to synthesizing and characterizing carbon-based nanoparticles, with an emphasis on analyzing and characterizing the functional forms of carbon nanoparticles that result from each approach in different conditions. The first approach utilizes the Advanced Manufacturing with Atmospheric Pressure Plasma (AMAPP and focuses on characterizing the photoluminescent particles that remain in the reactor's quartz tube and comparing them to their non-photoluminescent carbon deposit counterparts. Such findings could offer insight into their growth mechanisms and guide future efforts in tuning plasma conditions to produce photoluminescent carbon nanoparticles using the AMAPP. The second approach utilizes the Low pressure Advanced Manufacturing Plasma (LAMP and explores the effects of varying hydrogen and methane concentrations on carbon nanoparticle formation. By adjusting gas ratios, I assess how these parameters influence particle composition, structure, and the formation of functional forms of carbon. Both approaches analyze photoluminescence measurements and employ characterization techniques such as Raman spectroscopy, Fourier-Transform Infrared Spectroscopy (FTIR, X-ray Diffraction (XRD, X-ray Photoelectron Spectroscopy (XPS, Transmission Electron Microscopy (TEM and Scanning Electron Microscopy (SEM to evaluate chemical bonding and crystallinity of the nanoparticles. Together, these studies provide a comparative framework for understanding how reactor conditions and gas-phase chemistry impact the formation, structure, and functional properties of carbon nanomaterials with potential applications in optoelectronics, sensing, and energy devices.

Gabriel Martinez

College Affiliated: Southwestern Community College

Category: Chemical Engineering and Materials Science

Mentors: Jose Mendoza Cortes , Marcus Djokic

Presentation Number: 721

Title: ENHANCING SUSTAINABLE ENERGY MATERIAL DISCOVERY BY INTEGRATING CONVEX HULL STABILITY ANALYSIS

Abstract: Materials discovery is a critical area of research with vast applications in renewable energy. One major challenge lies in discovering stable and efficient semiconductor materials for photocatalytic water splitting, a process capable of generating clean hydrogen fuel as a storable alternative to traditional solar power.An effective discovery process called SALSA (Substitution,Approximation, evoLutionarySearch, andAb initio calculations integrates machine learning and Density Functional Theory (DFT, a type of quantum-mechanical simulation, to predict the stability of structures and identify promising candidate materials. However, the initial high-throughput predictions generated by SALSA require rigorous validation.The objective of this research is to reevaluate the candidates identified by SALSA and verify their thermodynamic stability. To accomplish this, we employ quantum-mechanical simulations to calculate the formation energies of each candidate material and their competing phases.By analyzing this energy-composition relationship, we will construct a convex hull, a plot of the lowest possible energy for a material system. The results will be displayed in this convex hull plot, in which compounds that lie on or below the hull line are predicted to be stable and thus are promising for experimental synthesis.

Quincy Scott

College Affiliated: Prairie View AM University

Category: Chemical Engineering and Materials Science

Mentors: Carl Boehlert , Teddy Mageto

Presentation Number: 722

Title: UNDERSTANDING THE EFFECT OF ACOUSTOPLASTICITY ON THE MICROSTRUCTURAL EVOLUTION AND HARDNESS OF TITANIUM

Abstract: Acoustoplasticity refers to the phenomenon in which the application of ultrasonic vibrations to a material, typically metals or polymers, temporarily enhances its plasticity, facilitating deformation without altering external conditions such as temperature or applied force. These high-frequency vibrations directly influence the material's internal deformation mechanisms. In this study, we investigated the effects of varying ultrasonic power, downforce, and feed rate on the deformation behavior of commercially puretitanium. Using an ultrasonic horn, each of the three above-mentioned parameters was changed. The resulting samples were analyzed to determine the optimal conditions for achieving enhanced formability. Our findings contribute to a better understanding of the process parameters that govern acoustoplastic behavior and can inform future applications in precision forming and advanced manufacturing.

Anish Pravin Jadhav

College Affiliated: Michigan State University

Category: Chemical Engineering and Materials Science

Mentors: Ben Dolgikh Daniel Woldring

Presentation Number: 723

Title: INTEGRATING EXPERIMENTAL AND COMPUTATIONAL TECHNIQUES TO INVESTIGATE PLANT IMMUNITY

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

Osman Tholley-Braxton

College Affiliated: Morgan State University

Category: Chemical Engineering and Materials Science

Mentors: Mercy Okezue

Presentation Number: 724

Title: ADDITIVES WITH LDPE FOR MEDICAL PACKAGING

Abstract: Effective pharmaceutical packaging plays a vital role in preserving drug safety, potency, and shelf life. This study investigates the degradation behavior of low-density polyethylene (LDPE films with different additives, analyzing thermal stability using Thermogravimetric Analysis (TGA and mechanical performance via tensile testing. Additionally, the paper examines the critical need for protecting pharmaceuticals from UV and artificial light degradation, supported by data showing up to 70% potency loss for light-sensitive drugs. The study further explores the integration of zirconium-based UiO-67 metal-organic frameworks (MOFs into polymer matrices as an emerging strategy for advanced barrier properties. Results demonstrate that consistent thermal degradation points across additives confirm formulation reliability, while tensile testing reveals the influence of sample uniformity on mechanical performance. Findings highlight the necessity for robust, light-protective, and mechanically resilient packaging to ensure drug efficacy and reduce product recalls.

Brooklyn Nash

College Affiliated: Prairie View AM University

Category: Chemical Engineering and Materials Science

Mentors: Ruigang Wang   Saksham Mamtani

Presentation Number: 725

Title: USING ELECTROCATALYSTS TO MITIGATE THE POLYSULFIDE SHUTTLE EFFECT IN LITHIUM-SULFUR BATTERIES.

Abstract: Metal-sulfur batteries, including lithium-sulfur (Li-S systems, have emerged as promising alternatives to conventional lithium-ion batteries due to their superior theoretical energy densities, material abundance, and lower cost. While lithium-ion batteries typically achieve energy densities around ~570 Wh/kg, Li-S batteries offer a theoretical energy density as high as 2600 Wh/kg, owing to redox reactions involving the reversible conversion of sulfur to lithium polysulfides. However, the practical performance of metal-sulfur batteries remains hindered by sluggish redox kinetics and the polysulfide shuttle effect, which causes active material loss, electrode degradation, and poor cycling stability. This study explores molybdenum diselenide (MoSe? as a promising electrocatalyst to address these limitations. MoSe? enhances electrochemical kinetics by accelerating the redox reactions of polysulfides and improving charge transport at the sulfur cathode interface. Additionally, MoSe? exhibits strong chemical interactions with soluble polysulfides, effectively suppressing their migration to the anode and mitigating the shuttle effect. These dual catalytic and adsorptive functionalities contribute to significantly improved sulfur utilization and extended cycle life. To further enhance the catalytic activity pure MoSe?, this work investigates doped MoSe? systems, specifically magnesium doped MoSe? (Mn@MoSe?. Doping is introduced to modulate the electronic structure and increase the density of active sites on MoSe?, thereby optimizing its electrocatalytic behavior. Manganese doping introduces and promotes moderate binding with polysulfide intermediates. Comparing these doped variants to pristine MoSe? allows us to understand the electrochemical and stability differences in electrocatalyst design. Through a combination of hydrothermal synthesis and electrochemical performance testing in both Li-S cells, this study evaluates the comparative effectiveness of MoSe? and Mn@MoSe? as polysulfide electrocatalysts. Results reveal that doping not only enhances the adsorption energy and catalytic efficiency of MoSe? but also leads to substantial improvements in capacity retention, Coulombic efficiency, and cycling stability. This work provides critical insight into the design of high-performance electrocatalysts for sulfur-based batteries and demonstrates the potential of doped MoSe? systems as next-generation materials for efficient and durable energy storage applications.

Ruihao Lu

College Affiliated: Michigan State University

Category: Chemical Engineering and Materials Science

Mentors: Shaoting Lin

Presentation Number: 726

Title: A STRETCHABLE ADHESIVE HYDROGEL WITH ROBUST MECHANICS AND HUMAN SKIN-COMPATIBLE PERFORMANCE

Abstract: We present a tissue adhesive hydrogel designed for soft, deformable skin tissues. The hydrogel is engineered with a dual-network structure: an entangled adhesive polymer network and a sacrificial dissipative network. This architecture enables strong wet adhesion (interfacial toughness ~500J/m2, high stretchability (1500%, and excellent mechanical toughness (~3000J/m2. Together, this hydrogel adhesive offers a promising platform for strain-insensitive, skin-conformal applications where mechanical robustness and biological integration are critical.

Computer Science and Engineering

Connor Neiheisel

College Affiliated: Michigan State University

Category: Computer Science and Engineering

Mentors: Nicholas Panchy

Presentation Number: 901

Title: USING EASYBUILD TO ACCELERATE RESEARCH

Abstract: This poster presents the successful documentation of the GitHub Integration process to streamline EasyBuild software downloads to allow any user to successfully use software on the HPCC. The documentation was designed to guide users through downloading and configuring integration tools independently. Clear, step-by-step instructions were provided to enable users to complete the setup of the EasyBuild environment on their personal device. As a result, the final documentation improves accessibility and allows users to perform research on ICER's HPCC.

Ze Hao He

College Affiliated: Oakland University

Category: Computer Science and Engineering

Mentors: Lanyu Xu

Presentation Number: 902

Title: ADVERSARIAL ATTACKS AND DEFENSES FOR PANOPTIC PERCEPTION MODELS IN AUTONOMOUS DRIVING

Abstract: Panoptic perception models in autonomous driving use deep learning models to interpret their surroundings and make real-time decisions. However, these models are susceptible, carefully designed noise can fool models all while being imperceptible to humans. In this project, we investigate the impact of black-box adversarial noise attacks on three core perception tasks: drivable area recognition, lane line segmentation, and object detection. Unlike white-box attacks, black-box attacks assume no knowledge of the model's internal parameters making them a more realistic and challenging threat scenario. Our goal is to evaluate how such an attack affects the model's predictions and explore countermeasures towards such attacks. In response to our implemented attack, we have tested various defense methods, including denoising filters, image preprocessing, diffusion models, and general adversarial networks (GANs. With each defense method we have assessed the recovery on prediction accuracy. This research aims to provide valuable insights into the vulnerabilities of panoptic perception models and highlights strategies for enhancing their resilience against adversarial manipulation within real-world scenarios.

Hamsini Gupta

College Affiliated: Oakland University

Category: Computer Science and Engineering

Mentors: Yao Qiang

Presentation Number: 903

Title: IMPROVING RETRIEVAL-AUGMENTED GENERATION IN MEDICAL QUESTION ANSWERING

Abstract: Large Language Models (LLMs are advanced AI models trained on extensive datasets of text that have strong capabilities in determining semantic relationships between words to answer general questions. While they perform well across various domains, these models have a few common issues, particularly in the medical field. LLMs struggle with hallucinations, incorrect or misleading responses, and having outdated knowledge due to static training data. This project explores Retrieval Augmented Generation (RAG, which is a framework designed to tackle these issues. RAG enhances the performance and accuracy of LLMs by retrieving up-to-date data from external sources relevant to the user's question. It incorporates this information along with the query as input to the LLM, which generates a response based on its training set along with this additional information. Our focus is to apply this framework in the biomedical domain by utilizing RAG with datasets such as PubMedQA, which consists of biomedical question answering compiled from PubMed abstracts. This helps us achieve our goal of evaluating and improving the model's ability to answer complex biomedical questions accurately, making LLMs more practical for clinical and scientific scenarios.

Joshua Quintano

College Affiliated: Oakland University

Category: Computer Science and Engineering

Mentors: Huirong Fu   Yao Qiang

Presentation Number: 904

Title: PA-JJAMA: A LLM-BASED INTRUSION DETECTION SYSTEM FOR CONTROLLER AREA NETWORK

Abstract: The CAN Bus provides a quick, efficient method of communication for electronic control units with a vehicle's inner network. It does not provide any method of authentication or encryption however, leaving it vulnerable to many types of attacks. Large language models have been trained on extremely large datasets and able to communicate with individual prompting them, providing reasoning and explanation for decision making. Due to their ability to process high volumes of information and provide reasonings, LLMs hold the potential to not only be used for intrusion detection, but also a tool for learning. The LLM can be prompted with a message and label it as malicious or benign and its attack type if applicable. Beyond this, the LLM can also provide its reasoning based on what it observed in the message fields given. This work explores the use of LLMs not only for feature based attack detection, but also evaluates the use of these LLMs for the purpose of explaining their reasoning and why they labeled messages as malicious.

Elias Zheng

College Affiliated: University of Arizona

Category: Computer Science and Engineering

Mentors: Darrin Hanna

Presentation Number: 905

Title: BBOB: OPEN, ADAPTIVE, OBJECT DETECTION FOR EDGE SYSTEMS WITH A VISION-LANGUAGE TINYLLM

Abstract: Large Language Models (LLMs offer remarkable capabilities for vision-language tasks, however, their large size and computational demands mean that they are often deployed on cloud environments, which presents additional data and network security risks for critical tasks. In this work, we investigate the feasibility of object detection with TinyLLMs. We present BBOB, a LLaVa-style, novel TinyLLM architecture optimized for object detection at the embedded scale. BBOB leverages a novel vision projector with learned spatial embeddings to better enable TinyLLMs to perform fine-grained object detection tasks on edge devices.

Joey Wagner

College Affiliated: Michigan State University

Category: Computer Science and Engineering

Mentors: Emily Dolson

Presentation Number: 911

Title: BENCHMARKING ALGORITHMS FOR LINEAGE TRACKING IN MANY-PROCESSOR EVOLUTION SIMULATIONS

Abstract: Simulating evolution provides critical insights into evolutionary dynamics, adaptation, and optimization, with applications spanning biological research and computational problem-solving. A central component of these simulations is phylogenetic data- ancestry trees among organisms, which interpret evolutionary processes. However, in large-scale, many-processor digital evolution simulations, maintaining complete phylogenetic records is computationally expensive, demanding efficient data stream algorithms to compress lineage history in real time. This work benchmarks such algorithms under varying scaling factors, including population size, mutation rate, and lineage retention policies, with a focus on downstream computational efficiency. Specifically, we evaluate a suite of fixed-capacity "DStream" algorithms that curate rolling subsamples of phylogenetic data streams while maximizing temporal coverage under strict memory constraints. These algorithms support steady, stretched, and tilted coverage criteria, with O(1 data ingestion enabled by concise, low-overhead operations-suiting them to resource-constrained, performance-critical simulations. By systematically timing downstream computations, we assess trade-offs in lineage tracking accuracy, memory usage, and computational throughput. Our benchmarks provide a foundation for understanding algorithmic behavior and identifying opportunities to enhance scalability in evolutionary simulations. Optimizing these workflows is essential to enabling reliable and efficient phylogenetic reconstruction across the immense data volumes generated by massively parallel, agent-based models of evolution.

Austin Toma

College Affiliated: Oakland University

Category: Computer Science and Engineering

Mentors: Mahdi Moghaddami , Mohammad-Reza Siadat

Presentation Number: 912

Title: THE EFFECTIVENESS OF USING RS-FMRI FOR PREDICTION OF COGNITIVE IMPAIRMENT STAGE CONVERSION

Abstract: Alzheimer's Disease is a neurodegenerative disease that affects over 7 million Americans alone. Alzheimer's Disease currently has no cure but there are ways to delay the progression of it if caught early enough. Our goal is to show whether resting-state fMRI images can be used as an effective tool in order to predict the progression of the disease. For this we took 303 patients with rs-fMRI images and preprocessed them in fMRIPrep. We then converted the preprocessed fMRI images into Functional Connectivity (FC Matrices to get the correlation of BOLD signals from the patients fMRI. Finally the FC Matrices are turned into graphs to be passed through our Graph Neural Network (GNN model, where it predicts if the patient will remain stable or convert to the next stage. The stages we are considering are Cognitively Normal (CN, Mildly Cognitively Impaired (MCI, and Alzheimer's Disease (AD. From our current testing we reported an accuracy score of about 68% for the prediction of stable versus converter patients. With our results it is clear that fMRI scans can be used effectively in the prediction of Alzheimer's Disease progression and may provide greater results when combined with other modalities of medical data.

Taylor Murrell

College Affiliated: Virginia Tech

Category: Computer Science and Engineering

Mentors: Darrin Hanna

Presentation Number: 913

Title: CRYPTOGRAPHIC EMBEDDINGS IN LANGUAGE MODELS: STEGANOGRAPHY UNDER SURVEILLANCE

Abstract: What if a dictator bans encryption and forces all communication to be public? Is private communication still possible? We explore a cryptographic framework that enables secure messaging through hiding in plain sight-embedding encrypted messages into natural-sounding text generated by large language models (LLMs. To casual observers, these outputs appear indistinguishable from typical LLM generations.Building on the work of Gligoroski et al., we extend their cryptographic embedding scheme by improving its resistance to known-position attacks-threat scenarios where an adversary knows the exact locations of embedded characters. Our modified encoding strategy ensures that even with positional knowledge, the adversary gains minimal advantage in distinguishing ciphertext from innocuous text.To improve coherence and embedding success rates, we introduce a novel tree-based decoding framework that recursively backtracks through LLM generations, selecting token paths that best align with the encrypted message while preserving fluency and meaning. This method significantly enhances the quality of the cover text without compromising the stealth of the embedding.Finally, we present an early investigation into context-based attacks, an underexplored threat model wherein adversaries exploit thematic or topical patterns to detect hidden content. We assess how context may unintentionally betray the presence of cryptographic embeddings and propose mitigation strategies within our framework.Our work advances the field of steganography in generative models, offering a path toward resilient, high-quality covert communication in adversarial environments.

Tapanga Witt

College Affiliated: Grand Valley State University

Category: Computer Science and Engineering

Mentors: Kylie Jacobsen

Presentation Number: 914

Title: DESIGNING AN INTERACTIVE EXIT TICKET SYSTEM TO ENHANCE LEARNING IN ENGINEERING EDUCATION

Abstract: Within Grand Valley State University's Padnos College of Engineering, many courses consistently see pass rates below 60%, signaling a need for stronger academic support. This project will design and develop a website-based exit ticket system for engineering students at GVSU. Under the guidance of a GVSU faculty mentor who specializes in User Experience (UX research, I will apply research-based design principles to create a user-centered platform that supports student reflection and instructor feedback. Students will complete a self-reflection form once a week. Based on their responses, the system can automatically suggest support resources like tutoring, office hours, or study groups. To keep students engaged, the platform could include gamification features such as progress tracking or reflection streaks, helping make self-reflections feel more rewarding. This keeps instructors informed and gives students semi-personalized support that encourages them to take action. I will apply UX research principles to create a platform that is intuitive, interactive, and easy to navigate. The project will take place during the spring and summer semesters and include prototype development, web implementation, and usability testing with students. Future work will collect feedback from instructors and refine the system. The final product will be a functional website that improves classroom communication and supports more effective learning.

Estevan Rendon Jr., Illya Gordyy, Niful Islam

College Affiliated: Oakland Univerity, California State University of Sacramento, Oakland University

Category: Computer Science and Engineering

Mentors: Mohammad Wardat

Presentation Number: 915

Title: CAN A LARGE LANGUAGE MODEL WIN A KAGGLE COMPETITION?

Abstract: Large Language Models (LLMs have demonstrated exceptional capabilities across diverse application domains. However, their potential in solving intricate problems within competitive environments, such as Kaggle competitions, remains relatively unexplored. This paper presents the first investigation into leveraging LLMs to autonomously build deep learning solutions specifically for Kaggle competitions. Our proposed method, CompeteRAG, employs a Retrieval-Augmented Generation (RAG framework, utilizing top-voted Jupyter notebooks as exemplary templates to construct targeted solutions. If initial code-generation attempts result in incomplete or erroneous outputs, CompeteRAG dynamically analyzes these errors and iteratively refines the generated code. We rigorously evaluate CompeteRAG's efficacy using two state-of-the-art (SoTA LLMs specialized in code generation: GPT-04-mini-high and DeepSeek-R1. Additionally, we introduce a comprehensive dataset comprising highly-rated Jupyter notebooks that build DNN solutions for Kaggle competitions. Our study provides critical insights into the strengths and inherent limitations of current LLM methodologies when confronting complex structured-data tasks common in competitive environments. Experimental results underscore CompeteRAG's robust capability in generating effective deep neural network (DNN solutions within Kaggle's competitive landscape. Additionally, we introduce a comprehensive dataset comprising highly-rated Jupyter notebooks that build DNN solutions for Kaggle competitions. This dataset serves as a valuable resource for enhancing future code-generation techniques. Our study provides critical insights into the strengths and inherent limitations of current LLM methodologies when confronting complex structured-data tasks common in competitive environments.

Carter Ostrowski

College Affiliated: Michigan State University

Category: Computer Science and Engineering

Mentors: Bige Unluturk , Hakan Burak Karli

Presentation Number: 916

Title: CORRECTING PULSE OXIMETER BIAS USING PERSONALIZED MODELS

Abstract: Pulse oximeters are essential in neonatal care for monitoring blood oxygen saturation; however, their accuracy can be affected by skin pigmentation. The discrepancy between arterial oxygen saturation (SaO? and saturation measured by pulse oximeters (SpO? is more pronounced in individuals with darker skin tones, increasing the risk of occult hypoxemia. This study introduces a personalized machine learning approach aimed at reducing SpO? measurement bias by incorporating objective, non-invasive skin pigmentation metrics alongside individual physiological parameters. We also evaluate the model's effectiveness across data from different pulse oximeter devices.Using the OpenOximetry Repository, several evaluation sets were constructed to compare the performance of various machine learning models. XGBoost consistently achieved the lowest root mean square error (RMSE and was selected for further analysis. The model demonstrated improved SpO? accuracy, yielding corrected values that more closely aligned with actual SaO? levels across a range of skin pigmentation groups. The best results were observed when device-specific data were used to correct readings from the same device. These findings support the potential of personalized models to improve measurement accuracy, reduce disparities in clinical monitoring, and highlight the importance of device-specific training for optimal performance.

Tasmia Rahman

College Affiliated: Michigan State University

Category: Computer Science and Engineering

Mentors: Dirk Colbry , Hui-Chia Yu

Presentation Number: 921

Title: ACCELERATING BATTERY MODELING WITH PYTHON INTERFACES TO BESFEM

Abstract: Modern cutting-edge battery simulations take days or even weeks to fix and clean elements to generate 3D meshes or other complex geometries. To combat this problem, researchers at Michigan State University, with funding from the National Science Foundation (NSF, have developed the Battery Electrode Simulation Finite Element Methods (BESFEM. This novel approach requires nearly no time spent on mesh generation and produces functionally identical results. BESFEM uses an open source software package builts upon a Finite Element Method (FEM library called MFEM. The BESFEM team has worked with MATLAB, Fortran and C++ to simulate multiple prototypes. To make this work accessible, this work is building a Python wrapper of the C++ code using SWIG interface to take advantage of the flexibility of the python language allowing users to leverage other matlab capabilities such as , matplotlib, to plot the visualize the mesh in different dimensions, e.g. 2D, 3D surf and 3D. Development of these Open Source Python wrappers will significantly increase adoption of the software to a wide range of researchers.

Richard Nelson

College Affiliated: University of Michigan Dearborn

Category: Computer Science and Engineering

Mentors: Chineme Uba , Zheng Song

Presentation Number: 922

Title: FOCUS: AN AGENTIC AI FRAMEWORK FOR HELPING ADHD STUDENTS LEARN MORE EFFECTIVELY

Abstract: Approximately 7 million U.S students(1 in 9 have Attention Deficit and HyperActive Disorder (ADHD. ADHD makes it harder for students to study, especially for long periods of time. This harms students' educational outcomes, leading to a life of learning struggles and low economic mobility. Existing software-based ADHD solutions fail to dynamically adjust to individual students' features. Similarly, existing in-person accommodations such as extra in-class time on exams also fail to address difficulties with learning. As a result, students with different ADHD-profiles are not adequately supported with regards to learning course materials. In this paper, we propose FOCUS: An Agentic AI Framework for Helping ADHD Students Learn More Effectively. FOCUS operates based on agentic ai architecture: Perception - via active monitoring to detect distractions, Reasoning - via local SLM models, Action - Users are automatically given encouragements, quizzes, and breaks, lastly Memory - Users' study behaviors are learned over time. FOCUS is designed to be modular, to allow educational professionals together with AI experts to adapt the system to meet students' needs. We implemented a FOCUS prototype with Ollama's llama3.2:3b, hosted via Open-WebUI. To demonstrate sensing we used PythonGazeFaceTracker and GazeTracker.

Rohan Banerjee

College Affiliated: Michigan State University

Category: Computer Science and Engineering

Mentors: Nicholas Panchy

Presentation Number: 923

Title: OPTIMIZING DOMAIN-SPECIFIC QUESTION ANSWERING USING HYBRID EMBEDDING RETRIEVAL AND LLM INTEGRATION

Abstract: We present a lightweight, domain-specific question-answering (QA system built on a hybrid retrieval-generation architecture. Applied to the ICER FAQ corpus at Michigan State University, the system combines semantic retrieval using Sentence-BERT embeddings with contextual answer generation via a locally hosted large language model (LLM. User queries are semantically matched against scraped FAQ data, and the most relevant match is used to ground the LLM's response. This modular pipeline is efficient, deployable on local machines with GPU acceleration, and entirely independent of external APIs, making it a scalable solution for institutional QA tasks. The retrieval component ensures high recall, while the generation component maintains response fluency and contextuality. By decoupling embedding-based matching from language generation, the system balances speed and accuracy without needing full fine-tuning.Initial evaluations demonstrate improved response relevance and domain alignment compared to baseline QA approaches. We also outline promising future directions, including LLM fine-tuning for increased specificity, cross-encoder re-ranking to improve retrieval precision, and the integration of feedback loops for continual learning. This work contributes to applied natural language processing by offering a resource-efficient, reproducible framework for question answering in specialized domains. It is particularly useful for academic, enterprise, and research-based information portals.

Collins Otieno

College Affiliated: Ramapo College of New Jersey

Category: Computer Science and Engineering

Mentors: Qiben Yan

Presentation Number: 924

Title: AUDIO-VISUAL AND ENVIRONMENTAL SENSOR DATA INTEGRATION FOR ANOMALY DETECTION IN SMART HOMES

Abstract: This research project develops a scalable multimodal anomaly detection framework for smart home IoT environments. It focuses on fusing audio, visual, and sensor data to detect critical events such as falls and abnormal behavior patterns in real time. Traditional single-modal approaches and early fusion strategies often miss context or fail under noisy conditions, limiting their effectiveness in real-world home deployments.The proposed system integrates visual, audio, and environmental sensors. It employs a hybrid machine learning pipeline combining autoencoders for feature compression and LSTM networks for modeling temporal dependencies, optimized for edge deployment through pruning and quantization.A novel contribution of this work is the confidence-weighted adaptive fusion mechanism, which dynamically adjusts the influence of each modality based on input reliability and sensor status. Unlike traditional attention-based fusion with static or uniform weights, this method improves robustness by prioritizing trustworthy data sources during inference, even in the presence of missing or corrupted inputs.The framework will be evaluated using the Cardiff University Smart Home dataset, which includes audio-visual fall detection benchmarks and smart home multimodal sensor logs. Evaluation metrics include accuracy, F1-score, false alarm rate, and latency. Preliminary results show a 25-30% reduction in false positives compared to single-modal and static fusion baselines.The framework also incorporates differential privacy and federated learning to ensure data confidentiality. By enabling early detection of health anomalies and compromised device behaviors, this research provides a scalable blueprint for secure, context-aware H-IoT systems. It advances the field by bridging theoretical modeling with real-world constraints, supporting resilient healthcare infrastructure, and intelligent decision support in smart homes.

Srisruth Karanam

College Affiliated: Michigan State University

Category: Computer Science and Engineering

Mentors: Kevin Liu

Presentation Number: 925

Title: IMPACT OF TAXA COUNT, SEQUENCE LENGTH, AND TREE HEIGHT ON THE ACCURACY AND EFFICIENCY OF PHYLOGENETIC INFERENCE.

Abstract: This research investigates the effects that taxon count, sequence length, and height of the model tree can have on phylogenetic estimation. The goal is to establish a concise relationship between the accuracy and efficiency of phylogeny estimation under different sample sizes of taxa, sequences, and heights. The metric used to measure the accuracy is called Robinson-Foulds (RF distance, which is the sum of false negatives and positives between the model tree and the inferred tree. Non-ultrametric model trees were generated under the JC69 substitution model, and sequence alignments were simulated accordingly. The Phylogeny inference was done using FastTree, which uses a combination of NJ and Maximum likelihood, along with heuristic optimization. For each parameter setting, over 100 model trees were evaluated. The experiments revealed consistent trends in RF distance, memory usage, and runtime, providing insight into how taxon count, sequence length, and tree height influence phylogenetic reconstruction accuracy and computational cost.

Electrical and Computer Engineering

Sharvayu Chavan

College Affiliated: Michigan State University

Category: Electrical and Computer Engineering

Mentors: Chunqi Qian

Presentation Number: 1301

Title: COMPACT ANTENNA DESIGN FOR WIRELESS ENERGY HARVESTING IN ELECTROPHYSIOLOGICAL MICROSENSORS

Abstract: Wireless energy harvesting provides a promising solution to powering self-contained microsensors, especially in medical applications where invasiveness must be minimized. Design and optimization of small-size antennas that can harness ambient WiFi signals at 2.4 to 5 GHz to power electrophysiological sensing microsystems is investigated in this study. Two antenna geometries -Planar Inverted-F Antennas (PIFAs and microstrip patch antennas - have been proposed because of their small sizes and efficient wireless energy collection. The research includes simulating and designing such antennas with COMSOL to make them more energy-harvesting, efficient, and resonant. A circuit to convert and step-up energy harvested using RF to usable power to be utilized in microsensor applications has also been designed with Advanced Design System. The initial results show that MSP designs have a good efficiency-compactness balance and therefore good potential to be incorporated into wireless sensing platforms. This study offers a foundation for developing autonomous, lightweight electrophysiological monitoring systems in the future. Using miniature antenna technology, this study aims to make biosensing noninvasive without being limited by wire-bound power supplies to advance medical diagnosis and wearable bioelectronics.

Chase Deselle

College Affiliated: Michigan State University

Category: Electrical and Computer Engineering

Mentors: Tim Hogan

Presentation Number: 1302

Title: MEASURING THERMAL AND ELECTRICAL PROPERTIES USING SINUSOIDAL HEAT WAVES AND ELECTRICAL TRANSPORT

Abstract: This study investigates measuring thermal and electrical properties using sinusoidal heat waves and electrical transport. To achieve this, we are building a thermoelectric measurement system to measure electrical conductivity, thermoelectric power, and thermal diffusivity on samples as a function of temperature. Our method of testing uses both AC and DC signals. We used LabVIEW programming for instrument control and data collection. The AC method involves the application of sinusoidal heat waves to generate periodic thermal gradients, allowing for high-precision extraction of thermal diffusivity by analyzing the phase and amplitude of the thermal response, and for thermoelectric power measurements. The system will also accommodate a DC method to measure steady-state thermal gradient for thermal conductivity measurements. Our setup was fully automated and controlled via LabVIEW, which facilitates real-time data acquisition, instrument control, and analysis. The results contribute valuable insights into the thermal and electrical behavior of thermoelectric materials and provide a foundation for further optimization in energy conversion applications.

Adeline Noyes

College Affiliated: Rose-Hulman Institute of Technology

Category: Electrical and Computer Engineering

Mentors: James Siegenthaler

Presentation Number: 1303

Title: DEVELOPMENT OF HIGH-QUALITY SILICON OXIDE FILMS FOR BDD DEVICES

Abstract: In electrochemical sensing applications, Boron-doped Diamond (BDD devices benefit from a low background current and a large electrical potential window that allows for high sensitivity. These devices require a silicon oxide encapsulation layer to protect components of the sensors, especially when submerged during water testing applications. Pinholes, delamination, over-etching, and other defects in this layer can compromise a device. In this project, we establish plasma enhanced chemical vapor deposition (PECVD processes that minimize pinholes in the oxide during deposition, and develop a reactive ion etching (RIE process to etch both diamond and silicon oxide without unwanted delamination or over-etching of the silicon oxide layer.

Ainsley Bronk

College Affiliated: Michigan State University

Category: Electrical and Computer Engineering

Mentors: Shanelle Foster

Presentation Number: 1304

Title: IMPROVED EXPERIMENTAL TESTBED TO QUANTIFY ANISOTROPY LEVELS IN ADDITIVELY MANUFACTURED IRON-SILICON SAMPLES

Abstract: Additive manufacturing (AM of soft magnetic materials presents new opportunities for designing custom electromagnetic components, but understanding the magnetic anisotropy introduced during the printing process is critical to their effective application. Here, the experimental testbed used to quantify anisotropy is redesigned to improve accuracy. The flux density distribution is compared for several designs using Finite Element Analysis (FEA. The optimal design is capable of capturing flux pathways and directional dependencies in magnetic behavior enabling more informed electromagnetic system design. This work demonstrates a methodology for linking printed material properties with system-level performance, offering insights for optimizing magnetic devices fabricated through additive methods.

Dhruv Kekin Toprani

College Affiliated: Michigan State University

Category: Electrical and Computer Engineering

Mentors: Vaibhav Srivastava

Presentation Number: 1305

Title: ALIGNING HUMAN PREFERENCES WITH TASK ALLOCATION

Abstract: When robots join human teams in high-stakes missions like search and rescue, assigning the right tasks to the right agents becomes more than just a math problem. It becomes a question of trust, intuition, and alignment. Traditional optimization methods often overlook human preferences, leading to friction and reduced performance.Our work explores how task allocation can evolve when human behavior isn't treated as noise but as signal. Through a modular simulation framework, we model uncertain rescue scenarios and test adaptive algorithms that learn from human choices over time. We compare these against standard strategies, revealing how preference-aware systems lead to higher task acceptance and more cohesive teams.What emerges is a compelling insight: human-robot teams perform better not when robots are simply efficient, but when they understand what humans want and why. This project lays the groundwork for more effective collaboration in domains where stakes are high and coordination is critical.

Arya Rukadikar, Nirav Kumar Batlada

College Affiliated: University of Michigan, Michigan State University

Category: Electrical and Computer Engineering

Mentors: Amirhossein Taaghi

Presentation Number: 1306

Title: DESIGN AND IMPLEMENTATION OF HYDROSTATIC SYSTEM IN VEHICLE

Abstract: This project aims to develop a lab-scale electric-hydraulic hybrid vehicle, along with a hydrostatic dynamometer, to serve as a test platform for future control research. While recent advances in rechargeable battery technologies have accelerated vehicle electrification, the widespread adoption of fully electric powertrains in heavy-duty vehicles, such as long-haul trucks, remains limited due to constraints in driving range and battery lifespan. As a promising alternative, electric-hydraulic hybrid vehicles (EHHVs integrate hydraulic components of high power density, enabling effective torque modulation and efficient regenerative braking through the recovery and reuse of kinetic energy. Despite the potential, these systems present substantial control challenges due to the need for coordinated operation of electric and hydraulic subsystems, which exhibit different physical behaviors. If successful, the test platform will contribute to advancing the understanding of these dynamics and facilitating the development of advanced control strategies. As part of this project, the presentation will detail the mechanical and electrical design and integration, highlighting the underlying engineering principles. In particular, it will describe the design of a coupling cap that connects the electric motor and hydraulic pump, as well as support brackets, which have been modeled and validated using CAD software. Special attention is given to transmission efficiency and noise, vibration, and harshness (NVH. In addition, the control system will be developed through preliminary data collection and analysis for system identification of the hydraulic pump, motor, and proportional valve. Finally, the presentation will briefly outline the planned future work to complete the development of the test rig.

Gray Pingston

College Affiliated: Oakland University

Category: Electrical and Computer Engineering

Mentors: Weichen Chen

Presentation Number: 1307

Title: DEVELOPMENT OF A LAB-SCALE ELECTRIFIED EXCAVATOR FOR CONTROLS AND DIAGNOSTICS RESEARCH

Abstract: This project aims to develop a lab-scale electrified excavator that serves as a platform for advanced research in controls and diagnostics. Hydraulic systems are widely used in industrial automation and mobile machinery due to their high power density and load-handling capabilities. However, their efficiency and reliability are often compromised by substantial energy losses and vulnerability to various faults. As a result, there is a growing need for optimal control strategies and robust fault diagnostic techniques that address these fundamental limitations. As part of this effort, the current presentation focuses on the design of a novel hydraulic circuit and the development of a control system, with an emphasis on the hardware build. A pump-controlled hydraulic circuit with flow regeneration capability has been designed to reduce pumping losses and recirculate high-pressure oil, thereby recovering hydraulic energy that would otherwise be wasted. The core hydraulic components, including a double-sided asymmetric hydraulic cylinder, proportional valves, gear pump and motor, and a hydro-pneumatic accumulator-are integrated with AC motors which is a primary mover. All components are modeled and assembled using CAD software. Custom adapters and supporters are also designed in CAD and machined in-house. Sensors are incorporated to provide feedback signals for control and diagnostics, including a cylinder displacement sensor, swing angle encoder, and manifold pressure sensors. An Arduino Due micro-controller is employed for communication, data acquisition, and real-time signal processing. The presentation concludes with an overview of ongoing and future tasks such as open-/closed-loop controls and incorporation of controlled faults, aimed at completing and refining the system for experimental research.

Shota Nishida

College Affiliated: Michigan State University

Category: Electrical and Computer Engineering

Mentors: Bige Unluturk

Presentation Number: 1308

Title: CHANNEL IMPULSE RESPONSE IDENTIFICATION FOR MACROSCALE MOLECULAR COMMUNICATION.

Abstract: Molecular Communication (MC is an emerging method of information transfer that uses chemicals and molecules instead of electromagnetic waves. While MC has traditionally been explored at the microscale, recent interest has grown in macroscale MC (spanning distances from millimeters to meters for environments where conventional wireless systems are unreliable due to signal degradation and high noise.In this presentation, we introduce a macroscale MC system designed to operate in a controlled environment using ethyl alcohol vapor as the signaling medium. The setup features a 4x4 array of fans to manipulate airflow, an alcohol atomizer that generates aerosolized chemical pulses, and a 4x4 array of alcohol sensors for signal detection.This experimental platform is important for studying channel characteristics, specifically channel impulse response, path loss, and noise behaviors, which is all critical for developing accurate channel models and decoding strategies.This configuration enables controlled experimentation and analysis of chemical signal propagation in macroscale channels, laying the groundwork for future development of robust communication systems in challenging environments.

Health Sciences

Chloe Stewart

College Affiliated: Dillard University

Category: Health Sciences

Mentors: James Dearing

Presentation Number: 1601

Title: DEMONSTRATION PROJECTS IN PUBLIC HEALTH: A DIFFUSION APPROACH

Abstract: This analysis examines prior literature to identify how demonstration projects can best be designed so that visitors to those demonstrations will gain knowledge and make decisions more rapidly than they otherwise would about the innovations being demonstrated, resulting in diffusion. Public health innovations are of particular interest given the numerous health challenges that confront America's disadvantaged communities. Diffusion theory, by integrating lessons learned from thousands of studies in many countries concerning many innovations, offers actionable steps that change agents can take to heighten the likelihood of innovation diffusion. Especially for large, expensive, or complex innovations, demonstrating how they work and how implementation challenges have been successfully solved can help observers form opinions about a new practice, program, technology, or policy. Such experiential exposure helps observers-whether health professionals, policymakers, or community stakeholders-form informed opinions and make more rapid decisions about adoption. To investigate these dynamics, we conduct a scoping review of both theoretical and empirical literature, including peer-reviewed articles, case studies, and evaluation reports. The review focuses on how key attributes of innovations, such as relative advantage, observability, and trialability are communicated during demonstrations, and which strategies most effectively enhance participants' understanding, foster positive attitudes, and increase intentions to adopt new public health practices. Findings from this analysis will inform the best practices for designing demonstration projects that maximize learning and motivation among potential adopters. By leveraging evidence from both diffusion research and real-world public health demonstrations, this study aims to accelerate the adoption of effective innovations and contribute to improved health outcomes, particularly in underserved populations.

Kaleb Elam

College Affiliated: Michigan State University

Category: Health Sciences

Mentors: James Dearing

Presentation Number: 1602

Title: SOUTH LANSING HEALTH NEEDS AND SOCIAL DETERMINANTS OF HEALTH: A MIXED-METHODS COMMUNITY HEALTH ASSESSMENT

Abstract: This study explores health disparities in South Lansing, Michigan, with a focus on food insecurity, transportation barriers, and mental health challenges among underserved populations. A mixed-methods community health assessment was conducted to determine whether regional health trends reflect conditions in South Lansing, a community often overlooked in broader Lansing or Ingham County reports. To fill this gap, interviews were conducted to gather localized insights from directly engaged community members. Nineteen individuals from twelve community organizations, including the Greater Lansing Food Bank, CATA, Cristo Rey Church, and McLaren Health Plan, participated in 30-to 90-minute interviews conducted both onsite and virtually. An AI qualitative coding simulation was used to analyze the compiled interview notes and systematically identify the most frequently cited health concerns. Community members consistently emphasized three intersecting issues. First, food insecurity remains widespread, despite strong grassroots efforts; respondents cited unreliable transportation, rising demand, and major reductions in federal food aid as barriers to consistent nutrition. Second, mental health needs remain unmet due to stigma, insurance gaps, and limited culturally appropriate care, especially for youth, families in crisis, and immigrant communities. Finally, transportation was seen as a structural barrier to nearly every form of care, with current transit systems failing to meet community needs. Several community members advocated for expanding mobile services to bring food, healthcare, and support directly to neighborhoods. Drawing on community expertise and evidence-based practices, the study recommends coordinated investments in mobile care delivery, transit access, and community-centered mental health support to advance health equity in South Lansing.

Anna Reichert

College Affiliated: Eastern Michigan University

Category: Health Sciences

Mentors: Heather Silander

Presentation Number: 1603

Title: THE IMPACT OF FACILITY DOGS ON COLLEGE STUDENTS' STRESS MANAGEMENT AND EMOTIONAL REGULATION

Abstract: College is a demanding transitional time where students experience new friendships and personal growth. During this time, mental health issues can surface, which impact emotional well-being. Studies have shown that dogs reduce stress, anxiety and depression, encourage exercise, lower blood pressure, and raise oxytocin and dopamine levels (American Heart Association, 2021. Eastern Michigan University introduced their own facility dog, Tinker, a two-year-old golden retriever. Since Fall 2024, she has provided emotional comfort and relief to students and the campus community. Students were surveyed on stress levels and if and how Tinker made an impact. Survey results show Tinker's effect on stress management and ability to regulate emotions for EMU students.

Kierra Jursch

College Affiliated: Michigan State University

Category: Health Sciences

Mentors: Alexandra Yaw   Hanne Hoffmann

Presentation Number: 1604

Title: TUNING THE PLACENTA'S CLOCK: INVESTIGATING DRUG EFFECTS ON CIRCADIAN RHYTHMS

Abstract: Close to 4 million women are diagnosed with preeclampsia (PE a year, a hypertensive condition that is a leading cause of maternal and fetal mortality. Placental dysfunction is a central factor in PE, and delivery of the placenta is currently the only way to resolve PE. PE is associated with disrupted placenta circadian rhythms, biological processes that follow a roughly 24-hour clock. We previously established a protocol to study placental circadian rhythms during mid pregnancy (gestation day (GD 11, late pregnancy (GD14 and close to term pregnancy (GD18. We hypothesized that epidermal growth factor (EGF, a chemical central to PE and placenta function, could modulate placenta circadian rhythms. Using circadian Per2::Luciferase reporter mice we prepared placenta explants representing the maternal decidua, the maternal-fetal combined junctional zone and the fetal labyrinth at GD14. GD14 is an important time point for trophoblast migration, which is modulated by EGF, and its dysfunction is implicated in the etiology of PE.EGF treatment was found to shorten the circadian period in all layers of the mouse placenta and no significant differences between fetal sex were observed. This work establishes a foundation for studying placental circadian function and the susceptibility to pharmacological intervention, with implications for understanding PE-related clock gene dysregulation.

Rachel Roberts, Sonia Hadar

College Affiliated: Michigan State University, Michigan State University

Category: Health Sciences

Mentors: Destiny Kanning

Presentation Number: 1605

Title: STERILIZATION REVOLUTION: CAN AUTOCLAVES REDUCE MEDICAL WASTE IN HEALTHCARE?

Abstract: The expansion of healthcare has led to a sharp increase in medical waste, much of which consists of single-use plastics, disposable equipment, and pharmaceutical byproducts. The reliance on disposable materials, including gloves, syringes, and packaging, poses significant environmental challenges. A large portion of this waste is non-biodegradable, necessitating incineration, which releases harmful chemicals into the environment. Identifying sustainable alternatives to current disposal methods is crucial to reducing healthcare's ecological impact. This literature review examines the potential role of autoclaves in reducing medical waste and mitigating environmental harm. By systematically analyzing peer-reviewed research from 2010 through 2025, we assess the effectiveness of autoclaving in sterilizing and repurposing medical materials, its feasibility as a large-scale waste management solution, and its environmental impact compared to incineration. Our findings highlight key takeaways regarding the performance of autoclaves, barriers to implementation, and proposed solutions for integrating sustainable waste processing into healthcare systems. Understanding the role of autoclaves in waste reduction can inform policy changes, improve hospital protocols, and support innovations in sustainable medical waste management. This review provides insight into how healthcare institutions can adopt autoclaving as a viable alternative to incineration, ultimately contributing to a more environmentally responsible approach to medical waste disposal.

Alejandra Brenes

College Affiliated: Grand Valley State University

Category: Health Sciences

Mentors: Lisa Kenyon

Presentation Number: 1606

Title: EM-POWER: POWER WHEELCHAIR SKILLS CAPACITY OUTCOMES OF CHILDREN WITH CEREBRAL PALSY

Abstract: Children with severe cerebral palsy (CP often experience significant limitations in independent mobility and areunable to functionally walk or self-propel a manual wheelchair. For these children, functional mobility is often impossible without a powered wheelchair (PWC. PWC use has been associated with multiple functional benefits, but to meet the criteria for third party funding of a PWC, children must first demonstrate safe and effective PWC skills.PWC skills take time and training to master and only a small percentage of children are given the opportunity to 'qualify' for a PWC. As such,many children with severe CP are denied access to PWC training and use. Our National Institutes of Health funded 2-arm, single blinded, pre-test-post-test randomized controlled trial (RCT seeks to bridge this gap and tests our central hypothesis that an 8-week PWC skills training intervention will produce greater improvements in children's PWC skills capacity as compared to a waitlist control group.Within this RCT, blinded student raters assess PWC skills capacity outcomes via video using the Assessment of Learning Powered mobility use (ALP and the Wheelchair Skills Checklist (WSC. The purpose of this presentation is tooutline our assessment of PWC capacity outcomes at three key time points in the study: baseline (T-0, T-1 (8 weeks after T-0, and T-2 (8 weeks after T-1 and detail our methods for establishing rater reliability. Our research highlights the importance of inclusive outcome measures in pediatric rehabilitation and contributes to efforts to expand access to PWC skills training interventions.

Abdurrahman Ehsan, Zarrar Chauhdri

College Affiliated: Wayne State University, Wayne State University

Category: Health Sciences

Mentors: Ameen Suhrawardy

Presentation Number: 1607

Title: AI VS HUMAN EXPERTISE: MEASURING SQUAT JOINT ANGLES ACROSS CLINICAL TRAINING LEVELS

Abstract: This study evaluated the accuracy of ChatGPT and individuals with varying levels of clinical training in measuring joint angles from patient squat images to explore how clinical experience influences image interpretation. Images from 25 patients performing assisted and unassisted squats were assessed by four cohorts: Orthopaedic Residents, Medical Students, Undergraduates, and ChatGPT. All groups used DetroitBoneSetter.com to manually measure hip, knee, and ankle angles. A Wilcoxon signed-rank test assessed statistical differences between groups, and coefficients of variance (CV evaluated intra-group consistency. Undergraduates and medical students differed significantly from residents in all joint measurements (0.001, while ChatGPT differed only in ankle angles (0.001. GPT had the highest CV for hip angles (33.97%, and residents showed the highest variability in knee and ankle measurements (31.49% and 8.2%. Undergraduates were most consistent for knee angles (CV 22.28%, and GPT showed the lowest ankle variability (5.93%. These results suggest that although undergraduates and medical students were more consistent, they were less accurate, likely due to an oversimplified approach lacking clinical nuance. ChatGPT aligned closely with resident measurements in hip and knee angles, highlighting its potential as a supportive clinical tool. However, its high variability in hip measurements reveals a risk for large errors, emphasizing the importance of physician oversight. Overall, the findings highlight how advanced clinical training improves accuracy in image-based assessments and support the future use of AI as a complementary tool in clinical settings, provided it is used with appropriate oversight.

Abdurrahman Ehsan, Batoul Baydoun, Manar Chebli, Zarrar Chauhdri

College Affiliated: Wayne State University, Wayne State University, Wayne State University, Wayne State University

Category: Health Sciences

Mentors: Ameen Suhrawardy

Presentation Number: 1608

Title: ESTABLISHING A STANDARDIZED SQUAT CLASSIFICATION SYSTEM IN THE ORTHOPAEDIC CLINIC: RELIABILITY, ACCURACY, AND USABILITY ANALYSIS

Abstract: Current orthopaedic exams lack a formal system to assess global lower extremity (LE function. This study introduces a novel squat classification system to evaluate LE function based on squat mechanics. The system consists of two components: squat depth (Grades 1-4, reflecting eccentric strength and range of motion (ROM, and ability to rise (Grades A-C, reflecting concentric strength of the extensor mechanism. Twenty-five patients were evaluated at their lowest point of descent during both assisted and unassisted squats. Hip, knee, and ankle flexion angles were measured using DetroitBoneSetter.com. Patients were classified using the system by four cohorts: orthopaedic residents (n=2, medical students (n=2, undergraduate students (n=3, and an AI model (ChatGPT. Classifications by the senior resident served as the gold standard. Fleiss' Kappa was used to assess inter-user agreement, and classification accuracy was defined as percent agreement with the gold standard. Medical students demonstrated near-perfect agreement (= 0.83, followed by residents (= 0.77. Undergraduates (= 0.45 and ChatGPT (= 0.49 showed moderate agreement. Accuracy of depth grading was 83.3% for residents and medical students, compared to 59.7% and 41.7% for undergraduates and ChatGPT, respectively. All groups achieved 100% accuracy for ability-to-rise grading. The classification system was found to be reliable, teachable, and reproducible across clinical experience levels. Its simplicity and strong performance suggest utility as a standardized physical exam tool and rehabilitative benchmark for lower extremity function.

Kalynn Grandberry

College Affiliated: Howard University

Category: Health Sciences

Mentors: Viviane Cristine Leite Gomes

Presentation Number: 1611

Title: MATERNAL ENDOCRINE PROFILE AND PLACENTAL RECEPTOR EXPRESSION IN THE PREECLAMPTIC-LIKE BPH/5 MOUSE

Abstract: Preeclampsia is a leading hypertensive disorder of pregnancy worldwide. Children born from preeclamptic pregnancies are predisposed to long-term neuroendocrine and reproductive disorders. Although prenatal exposure to abnormal maternal endocrine profile is implicated in these outcomes, underlying mechanisms remain poorly understood. High levels of Anti-Mullerian Hormone (AMH have been reported in a subset of preeclamptic women. This may lead to increased maternal Luteinizing Hormone (LH secretion, adverse placental function, and altered offspring neuroendocrine programming. Herein, we used the Blood Pressure High Subline 5 (BPH/5 mouse, a spontaneous model of superimposed preeclampsia and impaired offspring reproductive health to explore maternal AMH and LH profiles and corresponding placental receptor expression during late gestation. We hypothesized that AMH and LH were elevated in late-gestation BPH/5 dams compared to Blood Pressure Normotensive Subline 3 (BPN/3 controls, concurrent with dysregulated placental AMH (Amhr2 and LH (Lhcgr receptor gene expression. Intra-strain time matings were performed and serum and placentas were collected at embryonic day (e 18.5. Serum AMH and LH concentrations were assessed via ELISA (n=5 dams/group. Placental Amhr2 and Lhcgr were assessed via RT-qPCR (n=5/sex/group. Comparisons were made using Student's t-test (GraphPad Prism 10.4. Serum AMH concentration was 3-fold higher in e18.5 BPH/5 vs. controls (P 0.0001. Conversely, serum LH concentration was higher in e18.5 BPN/3 dams (0.05. Placental Amhr2 and Lhcgr was not different between groups (P0.05. In conclusion, while preeclamptic-like BPH/5 females display higher serum AMH during late gestation, this is not accompanied by changes in circulating LH nor placental receptor expression.

Eshika Avidi

College Affiliated: Michigan State University

Category: Health Sciences

Mentors: Amara Ezeamama , Jenifer Fenton

Presentation Number: 1612

Title: THE LONGITUDINAL ASSOCIATION OF POLYUNSATURATED FATTY ACIDS AND EXECUTIVE FUNCTION OF ADOLESCENTS WITH PERINATAL HIV IN KAMPALA, UGANDA

Abstract: Polyunsaturated fatty acid (PUFA levels are vital for adolescent cognitive development. The role of PUFAs in executive function (EF is understudied, especially in populations with perinatal HIV exposure/infection, who experience malnutrition and neuroinflammation. The objectives of this study were to quantify associations between serum PUFA levels and EF in Ugandan adolescents over 12 months and evaluate modification by perinatal HIV status. It was hypothesized that polyunsaturated fatty acid (PUFA levels were associated with decreased executive dysfunction (ED, especially in those with perinatal HIV exposure/infection. Adolescents with perinatal HIV infection (APHIV, n=159, adolescents HIV exposed uninfected (AHEU, n=155, and adolescents HIV unexposed uninfected (AHUU, n=153 were recruited. Questionnaire- and performance-based measures of EF (analyzed as z-scores were assessed at baseline, 6-, and 12-months. Linear mixed-effects models were used to analyze associations between baseline serum PUFA tertiles and longitudinal ED measures. Among all adolescents, moderate v. low total -3 PUFA (mean difference [95% confidence interval]: -0.51 [-0.87,-0.15], Omega-3 Index (-0.53 [-0.91,-0.15], and -3 docosahexaenoic acid (-0.55 [-0.92,-0.19] predicted lower self-reported ED. Among AHUU, high total -3 PUFA and low -6:-3 ratio associated with decreased performance-based ED. Moderate total PUFA levels (-0.49 [-0.98,-0.00] were associated with lower proxy-reported ED compared with low levels in AHUU. Among APHIV, high -3 eicosapentaenoic acid predicted an increase (0.83 [0.05,1.60] in performance-based ED. These findings support the potential of -3 PUFAs to improve EF in populations affected by HIV and highlight the importance of further studying the relationship between PUFAs and EF among APHIV.

Dan'Yale Wright

College Affiliated: Central Michigan University

Category: Health Sciences

Mentors: Courtney Venker

Presentation Number: 1614

Title: THE USE OF LOOKING WHILE LISTENING TO EXAMINE SPOKEN LANGUAGE PRODUCTION IN CHILDREN WITH DOWN SYNDROME

Abstract: Down Syndrome is a genetic condition that occurs due to an additional copy of chromosome 21 (About Down Syndrome, n.d.. Down Syndrome can result in neurotypical facial and physical features, as well as struggles with learning development. Learning developmental challenges associated with Down Syndrome are speech and language delay. In our study, INCLUDE, we assess whether children with Down Syndrome use expressive language based on different visual and auditory cues given during the Looking While Listening (LWL clinical trial. LWL is a holistic examination of the receptive language present in children with speech delays. LWL has not been commonly used to assess the population of children diagnosed with Down Syndrome. During the LWL, children will sit in a booth facing a television screen that will verbally communicate a task within three different domains, including Fast Mapping, Nouns, and Verbs. Although LWL is generally used to assess receptive language, in this study, we are assessing how the LWL elicits spoken language. This study includes 10 children with Down syndrome between the ages of 32 months and 67 months. In the Fast Mapping task, five children spontaneously imitated one or more target words, and five children did not. One child produced eight imitations of target words compared to the five that produced none. This shows variability of spoken language in children with Down syndrome. Further data collection, transcription, and analysis are still ongoing at this time.

Adoniram Johnson

College Affiliated: University of Maryland Baltimore

Category: Health Sciences

Mentors: Ping Wang Saumya Nigam

Presentation Number: 1615

Title: UTILIZATION OF DEEP LEARNING AI-BASED MODEL TO QUANTIFY IRON OXIDE CONTENT IN A MAGNETIC PARTICLE IMAGE

Abstract: Magnetic particle imaging (MPI is a recently developed imaging technology with applications in the biomedical sciences.MPI has high-sensitivity and specificity, does not use ionizing radiation, and lacks background signal, directly detecting superparamagnetic iron oxide nanoparticles (SPIONs. Conventional quantitative analysis of SPION content involves chemical methods which are laborious and image-based methods suffer from user bias which necessitates the use of artificial intelligence (AI. AI-based methods have been applied to image reconstruction, deblurring, and segmentation in MPI; however, no application has been developed for predicting and quantifying iron content. This project aims to employ an AI-based model, Convolutional Neural Network (CNN, to predict iron content from MPI images. To this end, we acquired 3D MPI images of 1% agarose phantoms containing different iron amounts and trained a CNN model while reducing validation loss and mean squared error (MSE. Our model was validated by 10-fold cross validation. In order to assess the performance of the model the MSE, MAE (mean absolute error, RMSE (root mean square error and PCC (pearson correlation coefficient were utilized. Once an acceptable average was obtained for the metrics, testing of the model was performed. The testing data consists of SPIONs labeled cells, and mice models with various amounts of SPIONs administered. In this work, we will also test the performance of the model testing data including SPIONs from different suppliers. This project is crucial for the development of MPI as it improves quantitative aspects of MPI by providing an unbiased method to quantify iron oxide content.

Isabella Garcia

College Affiliated: Michigan State University

Category: Health Sciences

Mentors: Jean Kerver

Presentation Number: 1616

Title: FAMILY NUTRITION AND PHYSICAL ACTIVITY OBESOGENIC RISK SCORES AS PREDICTORS OF CHILDHOOD OBESITY IN A MID-MICHIGAN PREGNANCY COHORT

Abstract: Childhood obesity is a major public health problem linked to long-term health risks, such as type 2 diabetes and cardiovascular disease. Early detection of children at risk is crucial for implementing effective prevention strategies. While family routines influence children's nutrition and physical activity, clinicians have limited reliable and quick tools to evaluate these factors during routine visits. This secondary data analysis aimed to explore the relationship between home environment risk factors and childhood obesity to support the broader implementation of a brief behavioral screening tool. We used the Family Nutrition and Physical Activity (FNPA screening tool to assess the impact of the home environment on children in a prospective pregnancy cohort from Lansing, Michigan. Sixty mothers from the Archive for Research on Child Health (ARCH pregnancy cohort completed the FNPA, which evaluates 10 domains of family routines and behaviors using a four-point ordinal response scale. Higher scores indicate greater obesogenic risk. An overall risk score was calculated for each child aged 4 to 6 years or 10 to 12 years. Research staff measured the children's height and weight using standard tools to calculate their Body Mass Index (BMI. Linear regression analysis was employed to assess the associations between FNPA scores and BMI, adjusting for potential confounding variables such as sex and race. The findings support the utility of the FNPA as a practical clinical screening tool for early identification of obesity risk. Incorporating family-based risk assessments into pediatric care can help shape early obesity prevention policies and interventions.

Brooklyn Durfield

College Affiliated: Xavier

Category: Health Sciences

Mentors: Dawn Misra

Presentation Number: 1617

Title: FAMILY TIES AND STRESS: EXPLORING THE IMPACT OF RELATIONSHIP CLOSENESS ON BLACK PREGNANT WOMEN

Abstract: This study explores the associations between family relationships and perceived stress among Black pregnant women, a population that faces significant disparities in pregnancy complications and perinatal health outcomes. Perceived stress has been identified as a risk factor for preterm birth in this group. Using a unique approach to assessing relationships during pregnancy, this research examines how aspects of the mother's relationship closeness with her immediate family (the baby's father, her mother, and her father relate to perceived stress levels. Data were drawn from the LIFE study, a retrospective cohort of 1,409 Black women recruited during the immediate postpartum period. Race- and gender-matched interviews were conducted within 72 hours of birth, with a response rate of approximately 75 percent. Relationship closeness during pregnancy was measured using a single item with 5-point Likert responses: very warm, warm, neither warm nor cold, cold, very cold. Perceived stress was recalled using the 10-item Cohen's Perceived Stress Scale (PSS, which includes 5-point response categories from "never" to "very often." Stress was treated as a continuous outcome variable. Initial analyses compared mean PSS scores across all closeness categories. Based on those results, the final comparison was between "neither warm nor cold" and all other categories combined. This study addresses key gaps in understanding how family support systems affect stress during pregnancy for Black women. Findings may help inform culturally responsive interventions to reduce persistent racial disparities in maternal and infant health outcomes.

Ahmed Memon, Kristi Kola

College Affiliated: Wayne State University, Wayne State University

Category: Health Sciences

Mentors: Ameen Suhrawardy

Presentation Number: 1618

Title: SIX STEPS TO SQUATS: A TRAINING PROTOCOL TO GUIDE FUNCTIONAL REHABILITATION FOLLOWING ISOLATED LOWER EXTREMITY FRACTURES

Abstract: To evaluate whether a structured, six-phase, squat-based rehabilitation protocol improves functional and physical outcomes in orthopedic trauma patients recovering from isolated lower extremity fractures after being designated as weightbearing-as-tolerated (WBAT. Outcomes are compared to patients who became WBAT 6-12 months prior without structured squat training. This prospective comparative study includes adults with a single lower extremity fracture and no prior lower extremity orthopedic procedures. Experimental patients begin the "Six Steps to Squats" protocol upon achieving WBAT within two months prior to enrollment. The protocol emphasizes progressive mobility and strength: ankle mobility, hamstring mobility, passive hip/knee/ankle ROM, passive single leg hip/knee/ankle ROM, eccentric squat, and concentric squat. Controls achieved WBAT 6-12 months ago without squat-specific rehab. Functional outcomes are assessed using the SF-36; physical outcomes use standardized hip, knee, and ankle flexion angle data during assisted and unassisted squats. Eighteen patients enrolled: 13 controls, 5 experimental. Controls showed ~20.6° greater unassisted knee flexion. No meaningful hip or ankle flexion differences. Bimalleolar ORIF patients showed reduced squat performance. Three experimental patients report adherence; no adverse events. Functional outcome data are in progress. The "Six Steps to Squats" protocol offers a structured, replicable method for post-trauma rehabilitation. Squat assessment may reliably track mobility and strength recovery. Ongoing data will clarify associations with functional and subjective outcomes.

Jessica Rowe

College Affiliated: Michigan State University

Category: Health Sciences

Mentors: Viviane Cristine Leite Gomes

Presentation Number: 1621

Title: UTERINE ARTERY PERIVASCULAR ADIPOSE TISSUE HYPOXIA AND IMMUNE CELL PROFILE IN A MOUSE MODEL OF OBESITY AND SUPERIMPOSED PREECLAMPSIA

Abstract: Preeclampsia is a leading hypertensive disorder of pregnancy having obesity as a major risk factor. In healthy pregnancies, the uterine artery undergoes significant remodeling to support increasing uteroplacental blood supply. In preeclamptic pregnancies, uteroplacental vascular remodeling is impaired due to poorly understood mechanisms. There is growing evidence that perivascular adipose tissue (PVAT plays a significant role in vascular homeostasis. We hypothesize that obesity-driven uterine artery PVAT (utPVAT expansion leads to reduced microvasculature density, tissue hypoxia and inflammation, culminating with utPVAT fibrosis, stiffening, and increased uterine artery resistance. To test this hypothesis, we used the Blood Pressure High Subline 5 (BPH/5 mouse, a spontaneous model of obesity and superimposed preeclampsia.Adult (8-12-week-old BPH/5 and control Blood Pressure Normal Subline 3 (BPN/3 females underwent timed breeding andday of copulation was designated as embryonic day (e 0.5. Females were euthanized at early (e7.5 and late gestation (e18.5, and utPVAT and periovarian white adipose tissue (ovWAT were collected (n=4-5/group. Hypoxia-inducible factor 1 alpha (Hif1a gene expression was assessed via RT-qPCR and immunophenotyping was performed using flow cytometry. Comparisons were made using Two-way ANOVA and post-hoc Tukey's tests (GraphPad Prism.Hif1a was not different between e7.5 and e18.5 BPH/5 and BPN/3 utPVAT and ovWAT (p0.05. Interestingly, BPH/5 utPVAT had a higher percentage of macrophages and lower percentage of dendritic cells and eosinophils during late gestation (0.05. In conclusion, utPVAT of obese, preeclamptic-like BPH/5 mice displays a disrupted immune profile during late gestation. Future steps include exploring Hif1a protein levels and utPVAT microvasculature density.

Jacquelyn Dal Bon

College Affiliated: Drew University

Category: Health Sciences

Mentors: Alexandra Yaw , Hanne Hoffmann

Presentation Number: 1622

Title: VALIDATING A NOVEL METHOD FOR STUDYING CIRCADIAN RHYTHMS IN THE PLACENTA

Abstract: Preeclampsia (PE, a hypertensive disorder of pregnancy, is a leading cause of maternal and fetal mortality. Although the cause of PE is unknown, placental function is implicated in its development. The placenta transports nutrients to the fetus, comprising three layers which contain maternal DNA (decidua, fetal DNA (labyrinth, or both (junctional zone. Patients with PE present atypical expression of circadian clock genes, which regulate 24-hour rhythms. The relationship between circadian rhythms and placental function remains unclear. Methods to investigate placental circadian rhythms require time-specific tissue collections, are labor-intensive, and require large sample sizes. To overcome this challenge, we used validated circadian reporter mice (Period2::Luciferase to develop ex vivo Period2::Luciferase bioluminescent recordings from placenta layer explants. Tissues were taken on mouse gestational days (MGD reflecting what in humans is considered Early Onset PE (GD11, Late Onset PE (MGD14, and near-birth (MGD18. We hypothesized that our sectioning method would produce layer-specific tissue explants, and our drug application technique would modulate explant circadian rhythms. Hematoxylin and eosin staining confirmed that explants comprised their intended layers: decidua (85-87%, junctional zone (75-80%, or labyrinth (90-95%. To validate pharmacological modulation of circadian rhythms, we used PF670462, a drug known to target molecular clock proteins and thus affect circadian rhythms. Baseline explant circadian rhythms were established for each layer, and PF670462 administration lengthened explant periods. These results validate a novel method for studying circadian rhythms in layer-specific placenta explants. This enables unprecedented exploration of placental circadian rhythms, a system with profound consequences for maternal-fetal health.

Sydney Shimizu

College Affiliated: Loyola University Chicago

Category: Health Sciences

Mentors: Dawn Misra

Presentation Number: 1623

Title: NEIGHBORHOOD LEVEL PREDICTORS OF PHYSICAL ACTIVITY IN PREGNANCY AMONG AFRICAN AMERICAN WOMEN

Abstract: Introduction: Exercise during pregnancy may improve maternal health while reducing adverse birth outcomes.Current guidelines recommend at least 150 minutes of moderate-intensity exercise per week for healthy pregnant women, yet few meet these recommendations. Among pregnant women in the U.S., White women have reported higher levels of exercise than Black women. These disparities may be shaped by differences in individual, neighborhood, and broader structural determinants. This study asks whether neighborhood perceptions predict exercise levels in pregnancy among Black women. Methods: We used data from the Life-course Influences on Fetal Environments (LIFE Study (2009-2011. 1,409 postpartum Black women were recruited from a hospital in metropolitan Detroit. Of these women, we included the 1,084 without missing data. Neighborhood perceptions of safety and walkability were measured using validated multi-item scales. Women self-reported the number of minutes exercised per week on average during their pregnancy which we dichotomized as any vs. none. To estimate the associations between exercise and neighborhood environment, we used logistic regression. Results: Neighborhood safety was associated with a higher likelihood of exercise during pregnancy, with women living in safe neighborhoods having higher odds of exercise than women living in unsafe neighborhoods (aOR: 1.40, 95% CI: 1.03, 1.89. There was no significant association between neighborhood walkability and exercise during pregnancy (aOR: 1.28; 95% CI: 0.99, 1.65. Conclusion: Understanding how perceived neighborhood environments relate to exercise during pregnancy is critical to addressing disparities in maternal health behaviors. Efforts to promote exercise among Black pregnant women should consider neighborhood-level determinants.

Ariel Ooms

College Affiliated: Michigan State University

Category: Health Sciences

Mentors: Vivienne Hazzard

Presentation Number: 1624

Title: CROSS-SECTIONAL ASSOCIATIONS BETWEEN FOOD ADDICTION SYMPTOMS AND CARDIOMETABOLIC BIOMARKERS IN YOUNG ADULTS

Abstract: The present study sought to examine associations between food addiction and cardiometabolic biomarkers, and investigate the extent to which such associations are independent of body mass index (BMI.The sample for this analysis is comprised of 372 young adults in the NEXT Plus subsample of the NEXT Generation Health Study with data available on food addiction symptoms assessed with the modified Yale Food Addiction Scale (mYFAS and cardiometabolic biomarkers assessed via blood samples in Wave 7 of the longitudinal cohort study (collected in 2015-2016. Separate linear regression models regressed each biomarker (transformed as necessary to meet normality assumptions on food addiction symptom score, adjusting for age, sex, and race/ethnicity. An additional set of models adjusted for BMI.Participants were, on average, 22.6±0.6 years of age; 62.6% were female, 41.4% were White, 37.1% were Hispanic/Latine, 18.5% were Black/African American, and 3.0% reported another race/ethnicity. Very few participants (3.2% met clinical criteria for food addiction; the average mYFAS symptom score was 0.9±1.0. Without adjustment for BMI, food addiction symptoms were significantly associated with greater levels of high-sensitivity C-reactive protein (hsCRP; =0.12, p=0.02 and total cholesterol to high-density lipoprotein (HDL ratio (=0.11, p=0.04, but no associations were observed for triglycerides, fasting blood glucose, hemoglobin A1c (HbA1c, or alanine aminotransferase (ALT. After adjusting for BMI, food addiction symptoms were no longer associated with hsCRP (=0.01, p=0.84 or total cholesterol to HDL ratio (=0.02, p=0.64.Results indicate food addiction symptoms are linked with some cardiometabolic markers and that these associations are explained by BMI.

Reaghan White

College Affiliated: Michigan State University

Category: Health Sciences

Mentors: Jenifer Fenton , Sidney Fenton, Vanessa Cardino

Presentation Number: 1625

Title: ASSOCIATIONS BETWEEN SERUM OMEGA-6 FATTY ACIDS AND SLEEP OUTCOMES IN OBESE INDIVIDUALS: AN OBSERVATIONAL STUDY

Abstract: Disordered sleep, including insufficient and poor-quality sleep, is widespread, with obese individuals more likely to report sleep problems. 1 in 3 Americans experience disordered sleep, which has been linked to all leading causes of death in the United States. The objective of this study is to investigate the relationship between omega-6 serum fatty acids and sleep outcomes among adult individuals who have overweight and obesity. The sleep data was collected using Fitbit devices, while sleep quality was measured using the Insomnia Severity Index (ISI and Pittsburgh Sleep Quality Index (PSQI questionnaires on Qualtrics. The ISI ranges from 0-28 with the higher scores reflecting a higher severity of insomnia. The PSQI ranges from 0-21 with higher scores reflecting worse sleep quality. Serum samples were collected at baseline, day 7, and day 14, day 28, and day 35. These serum samples were then methylated and analyzed through Gas Chromatography-Mass Spectrometry. The preliminary results indicate serum omega-6 fatty acids are generally linked to a shorter sleep duration. However, DGLA, a specific omega-6 fatty acid, is associated with a longer sleep duration. This contradictory data, along with the high prevalence of disorders sleep in obese individuals, highlights the need to explore relationships between serum omega-6 fatty acids and sleep.

Brandyn Zahs

College Affiliated: Michigan State University

Category: Health Sciences

Mentors: Ping Wang , Saumya Nigam

Presentation Number: 1626

Title: LONGITUDINAL IMAGING OF MACROPHAGE ACTIVITY AND NANOPARTICLE DELIVERY DURING TYPE 1 DIABETES PROGRESSION

Abstract: Type 1 Diabetes (T1D is an autoimmune disease characterized by immune-mediated destruction of insulin-producing pancreatic islet beta cells, resulting in hyperglycemia due to insulin deficiency. Macrophages are critical contributors to T1D pathogenesis, given their involvement in immune initiation. Their functional heterogeneity is often described by two phenotypes: M1, associated with inflammation, and M2, linked to tissue repair. However, macrophage functional states are highly plastic and influenced by local microenvironments. This study investigates macrophage dynamics during T1D progression and monitors the delivery of iron oxide nanoparticles (IONPs to pancreatic macrophages using magnetic particle imaging (MPI, establishing a foundation for therapeutic targeting of macrophage polarization via IONP carriers to prevent or delay T1D onset. Temporal changes in macrophage populations were examined using female NOD mice sacrificed at weeks 4, 8, 12, 15, 18, and 20 for pancreatic tissue immunostaining. QuPath software facilitated cell segmentation and classification of fluorescence images to quantify macrophage infiltration and beta cell integrity within islets. Macrophage populations were expected to significantly increase by week 8, plateau by 10-12 weeks, and subsequently decline with beta cells depletion, consistent with their role in immune activation. An IONP delivery longitudinal study sacrificed NOD mice on days 7 and 14 to assess IONP administration and biodistribution using in vivo MPI. Inductively coupled plasma (ICP optical emission spectrometry confirmed MPI particle accumulation results by normalizing tissue iron concentrations. Immunostaining and fluorescence imaging were employed to analyze IONP uptake by pancreatic macrophages, aiming to identify significant nanoparticle retention for potential therapeutic delivery.

Kathryn Horvath, Madison Pizzuti

College Affiliated: Michigan State University, Michigan State University

Category: Health Sciences

Mentors: Constance Currier , Darline ElReda

Presentation Number: 1627

Title: MENSTRUAL HEALTH RESEARCH IN GHANA

Abstract: The average age at menarche globally is 12 years old (STAT, 2024. That means from 6th grade on, girls must attend school while on their period. Girls in Ghana often attend schools that lack running water, making the management of their menstrual health and hygiene extremely difficult. On average, 2 out 5 schools have toilets and/or running water in Ghana. (DW, 2017 Without access to proper sanitation facilities, it is impossible for girls to change their sanitary products. As a result, girls will go home from school to change their soiled products and often not return for the day. This is detrimental to their education and livelihood as consistent monthly absences can lead to academic difficulties, social challenges, and long-term career impacts (Purbeck School. The purpose of this study was to determine the challenges, experiences, and perceptions of students and teachers in menstrual cup use.

Kinesiology and Nutrition

James Nelon

College Affiliated: Michigan State University

Category: Kinesiology and Nutrition

Mentors: Ahmed Abdelhamid

Presentation Number: 1801

Title: IDENTIFICATION AND CHARACTERIZATION OF NOVEL LACTIC ACID BACTERIA VIA CULTURE-BASED AND SHOTGUN SEQUENCING APPROACHES

Abstract: Commercial starter cultures used in dairy products ensure both consistent and quality characteristics, but their limited diversity constrains product variability. Therefore, there is a strong desire to discover novel starter cultures to create unique products with appealing sensory characteristics. Thus, the main goal of this project is to identify and characterize novel lactic acid bacteria (LAB from artisanal cheeses for potential dairy applications. Five artisanal cheeses, including brie produced with traditional commercial cultures, bleu and three Gouda varieties (plain, mustard seed, and nettle produced using natural microbiota from raw milk were analyzed. In a two-pronged analysis, the cheeses were analyzed both with traditional culture-based approaches to isolate and characterize LAB from each cheese, along with AVITI shotgun metagenomic analysis to determine the composition of the cheese microbiomes through a bioinformatics pipeline. Through traditional laboratory techniques, twelve potential isolates were obtained with five isolates exhibiting desirable milk and cream coagulation properties by achieving casein coagulation a within 6 hours. Coagulated milk and cream demonstrated 2.9-4.2% in protein content while acetoin, benzoic and butanoic acid are the predominant flavor compounds. When analyzed with shotgun metagenomic analysis, gouda cheeses contained a high abundance of Lactococcus cremoris and Lactococcus lactis, whereas brie cheese made with commercial cultures contained a high abundance of Lactococcus lactis and Streptococcus thermophilus, indicating the presence of varied microbiota between raw milk and commercial culture cheeses.

Jaini Gandhi

College Affiliated: Michigan State University

Category: Kinesiology and Nutrition

Mentors: Rajiv Ranganathan

Presentation Number: 1802

Title: INDIVIDUAL DIFFERENCES IN MOTOR SEQUENCE STRATEGIES IN SEWING TASKS.

Abstract: Skilled actions in everyday contexts rely on executing sequences of motor actions and vary considerably among individuals. Our central question is to understand the basis of these individual differences in motor skill. While sequence learning has been extensively studied in lab-based paradigms, it remains poorly understood in real-world continuous tasks. Here, we use sewing as a model task, which demands precision, coordination and organization of multiple motor sub-tasks, to gain insights into individual differences in skill. Sixteen participants performed two different tasks, straight stitch and curve stitch, on an industrial sewing machine while being recorded. The fastest trial was then coded into discrete motor actions using BORIS. Then, we analysed the data using behaviour sequences and time budget analysis. Our results suggest that while efficient performers complete tasks with fewer and faster steps, even participants with similar overall performance levels adopt different strategies. Additionally, tasks with higher structural complexity tend to lead to shorter average step durations, likely due to increased segmentation. These insights have potential applications in training methodologies, workplace skill optimization, and the development of automated systems for motor-based tasks.

Jaycob Iglesias

College Affiliated: CUNY Hunter College

Category: Kinesiology and Nutrition

Mentors: John Popovich Jr.

Presentation Number: 1803

Title: EVALUATING BIOMECHANICAL CHANGES IN ELASTIC-ASSISTED GAIT USING MOTION ANALYSIS: A CASE STUDY

Abstract: Background: Lower extremity weakness and impaired gait are common ailments that affect diverse populations, including stroke survivors, older adults aiming to improve mobility, and athletes. Although elastic bands are a low-cost and commonly used rehabilitation intervention, the biomechanical effects of elastic-assisted gait are not well understood and have not been thoroughly studied with advanced gait analysis methods. We aim to evaluate the biomechanical impact of two elastic-assisted gait devices. Methods: Subject without neurological conditions walked under four conditions: (1 natural, unassisted, (2 with a novel elastic-assisted gait device, and (3 with heavy (4 light weight Thera-Bands configured for elastic-assisted gait. The participant walked at 2.5MPH on an instrumented treadmill (AMTI for 6 minutes during each condition. Standing balance trials were performed to assess postural control.Kinematics and kinetics were recorded using a 10 camera 3D motion capture system (ViconNexus and an instrumented treadmill. For data analysis, joint angles, joint moments, spatiotemporal gait parameters (i.e., gait velocity, stride length, and balance center of pressure were compared across each condition. Results: Data collection is currently in progress, and results will be presented in the final version. Conclusion: This study will document how individuals respond to elastic-assisted gait. Future research studies are needed to evaluate the biomechanical impact of elastic assistance on gait mechanics across diverse populations.

Tyquandria Owusu

College Affiliated: Winston-Salem State University

Category: Kinesiology and Nutrition

Mentors: Chad Wiggins , Wesley Blumenburg

Presentation Number: 1804

Title: CHARACTERIZING THE LINK BETWEEN SLEEP DURATION AND QUALITY ON BLOOD PRESSURE REGULATION IN PREMENOPAUSAL FEMALES

Abstract: BACKGROUND:Short sleep duration and poor sleep quality are associated with increased blood pressure (BP responses to sympathoexcitatory stimuli. Concernedly, research has primarily investigated males or mixed-sex samples, illuminating the need for female specific investigations. This study aimed to characterize the association between sleep duration and quality on BP responses to sympathoexcitatory stimuli in premenopausal females. METHODS: 13 premenopausal females (22±5yrs were recruited. Following 10-min of supine rest, participants performed a 3-min isometric handgrip exercise (IHG at 30% of maximum voluntary contraction, followed by 3-min of post-exercise ischemia (PEI. Participants then performed a cold pressor test (CPT by submerging their hand into ice water ~3-mins. Beat-by-beat BP was measured, with changes (in systolic (SBP and diastolic BP (DBP during the last minute of each test used for analysis. Average total sleep time (TST and efficiency (SE were assessed using activity monitors worn for seven consecutive days. Associations between sleep metrics and BP during sympathoexcitatory tests were assessed using Spearman's correlations. RESULTS: For TST, no association (P0.05 was observed for SBP or DBP during IHG (SBP:r=0.132; DBP:r=0.553, PEI (SBP:r=-0.004; DBP:r=-0.258, or CPT (SBP:r=-0.242; DBP:r=0.121. Conversely, SE was significantly negatively associated with SBP during IHG (r=-0.610; P=0.030 and PEI (r=-0.744; P=0.007, but not CPT (r=-0.214; P=0.482. SE demonstrated no association (P0.05 with DBP during IHG (r=-0.254, PEI (r=-0.322, or CPT (r=0.1139. CONCLUSION: Better sleep quality was associated with lower SBP reactivity to mechano- and metaboreflex activation in premenopausal females. Highlighting sleep quality's potential impact on CV health in females.

Jayden Savin

College Affiliated: Michigan State University

Category: Kinesiology and Nutrition

Mentors: David Ferguson

Presentation Number: 1805

Title: CHARACTERIZING THE EXERCISE RESPONSE IN GROWTH RESTRICTED HUMANS AND ANIMALS

Abstract: BACKGROUND: Growth restriction is classified as intrauterine growth restriction (IUGR or postnatal growth restriction (PNGR, both of which increase the risk for long-term metabolic, cardiovascular, and musculoskeletal complications. IUGR occurs when a fetus does not achieve its genetic growth potential in utero, while PNGR refers to insufficient weight gain postnatally. Exercise interventions have shown potential in improving physiological outcomes in growth-restricted populations; however, findings remain fragmented across studies. PURPOSE: Evaluate the effects of exercise-based interventions, including aerobic and resistance training, on physiological outcomes in growth-restricted animal models and clinical populations. METHODS: A systematic literature review conducted from July 14, 2024, to August 10, 2024. Studies were selected based on relevance to exercise interventions in IUGR or PNGR subjects. A total of 22 studies met inclusion criteria. RESULTS: In PNGR mice, voluntary wheel running led to 11.45% smaller left ventricle volume and 18% smaller left ventricle area in females. Resistance-trained PNGR mice failed to increase quadriceps femoris mass and exhibited a 6% decrease in mTOR phosphorylation. Aerobic exercise in PNGR rats resulted in a 12% improvement in insulin-responsive glucose uptake and a 29% increase in skeletal muscle GLUT4 translocation, IUGR mice and rats showed a 33% increase in skeletal muscle PGC-1 expression after early exercise and a 197% increase in relative -cell mass. CONCLUSION: Exercise-based therapies hold potential in mitigating the adverse physiological outcomes of growth restriction, but responses vary by intervention type and growth restriction. This review highlights the value of exercise while identifying gaps that warrant further investigation.

Microbiology Immunology and Infectious Disease

Anna Weller, Gwen Hannafin

College Affiliated: Michigan State University, Michigan State University

Category: Microbiology Immunology and Infectious Disease

Mentors: Devin Lake Richard Lenski

Presentation Number: 2001

Title: HOW MUCH HAS CHANGED? MEASURING FITNESS AFTER 80,000 GENERATIONS OF EVOLUTION

Abstract: During a Long-Term Evolution Experiment (LTEE that has been ongoing for over three decades now, populations ofE. coli have been continuously growing in a constant environment where selection for fast growth should be the dominating driver of evolution. Previous studies of the LTEE have shown that despite the fact that the environment has been held constant, novel phenotypes have evolved and emerged which altered selection for those populations. This project focused on the pairwise fitness differences between 75,000 and 80,000 generations of nine populations previously shown to not have evolved any of these phenotypes by performing competition assays to measure the fitness at each of the time points. We then compared the results of those competitions to predictions made by models that had been previously shown to accurately predict the fitness dynamics within the LTEE. We do this because if the magnitude or direction of the change in fitness is not predicted by our models, then selection must now be acting in a way that violates one of their assumptions. We show that there was an overall increase in fitness that is large enough for there to be other factors impacting the gains between those time points. Additionally, we explore possible explanations for these deviations at both the group level and the individual population level.

Ibrahima Ndiaye

College Affiliated: Michigan State University

Category: Microbiology Immunology and Infectious Disease

Mentors: Devyn Hill   Jennifer Jacob   Ryann Ray

Presentation Number: 2002

Title: MACROPHAGE ACTIVATION IN RESPONSE TO LILRB4 LIGANDS IN CANCER MICROENVIRONMENTS

Abstract: LILRB4 was identified as a candidate gene for tumor onset and growth using genetically diverse mice with spontaneous tumors. In human cancers, LILRB4 expression correlates with poor prognosis in breast cancer and better outcomes in lung cancer. Single-cell RNA sequencing data show that LILRB4 is expressed exclusively on myeloid-lineage cells, including macrophages. Macrophages are immune cells that can either support or suppress anti-tumor immune responses. They do this by releasing pro- or anti-inflammatory cytokines and chemokines, or by altering antigen presentation through reduced expression of MHC class I and II and co-stimulatory markers like CD80 and CD86-molecules essential for full T cell activation. These immunosuppressive functions often depend on whether macrophages are tissue-resident or derived from circulating monocytes. In this context, LILRB4 may play an important inhibitory role. Known ligands include fibronectin 1 (FN1, APOE, Alcam/CD166, and Galectin-8. This study characterizes three types of murine macrophages-alveolar macrophages (AMs, bone marrow-derived macrophages (BMDMs, and peritoneal macrophages (PMs-cultured for 7-10 days in GM-CSF (to promote dendritic-like traits or M-CSF (to support tissue-repair macrophages. Cells were stimulated with ligands (FN1, APOE, Alcam, and lipopolysaccharide (LPS served as a positive control. Flow cytometry was used to evaluate expression of MHC I, MHC II, CD80, CD86, CD40, CD11b, CD11c, and viability. This work aims to explore how macrophage origin and ligand exposure shape immune activation and phenotype, offering insight into how tissue-specific environments influence immune suppression in cancer.

Ruth Giblin

College Affiliated: Michigan State University

Category: Microbiology Immunology and Infectious Disease

Mentors: Ahmed Abdelhamid

Presentation Number: 2003

Title: EXPLORING SANITIZER EFFICACY IN REDUCING SALMONELLA ENTERICA BIOFILM TRANSFER ON CUCUMBERS

Abstract: Salmonella enterica is the second-most frequent cause of foodborne illness in the United States and a critical pathogen in the food industry, particularly with fresh produce such as cucumbers. This project aimed to evaluate the efficacy of single and multi-step sanitizer treatment in reducing 1 biofilm formation on stainless steel coupons (SSCs by S. entericaserovar Saintpaul and S. enterica serovar Newport and 2 ability of biofilm-associated cells to transfer from SSCs to cucumbers. Biofilms were developed on SSCs for 72 h at room temperature. SSCs were washed with PBS to remove planktonic cells and treated with sanitizers (sodium hypochlorite and peracetic acid in either single-step or multi-step conditions. Transfer of biofilm-associated cells was tested by pressing cucumber slices (2g against SSCs. Residual bacterial populations on SSCs and transferred cells on cucumber slices were enumerated by spread plating. Results indicated that treatment on both serovars with either sanitizer for 1 minute did not show a significant decrease in cells remaining on SSCs or cells transferred from SSCs to cucumbers, but treatment for 5 minutes resulted in a complete reduction down to a detectable limit of less than 10 CFU/mL for sodium hypochlorite and a significant reduction for peracetic acid. Multi-step treatment with application of both sanitizers for 1 minute also resulted in a significant reduction across both serovars. These findings emphasize the importance of effective sanitization protocols, as recent outbreaks of Salmonella entericaon cucumbers have shown that biofilm formation at room temperature can contribute to transfer onto fresh cucumbers.

Taylor Reha

College Affiliated: Aquinas College

Category: Microbiology Immunology and Infectious Disease

Mentors: Chase DiTullio , Natalia Hubbs

Presentation Number: 2004

Title: ISOLATION AND CHARACTERIZATION OF CITROPHAGES LI AND JAY-1

Abstract: Bacteriophages, viruses that infect bacteria, represent the most diverse and abundant biological entities in the biosphere. Due to their specificity and bactericidal activity, they have gained attention as a promising alternative treatment for multidrug-resistant bacterial infections, offering a potential solution to the growing antibiotic resistance crisis. Citrobacter species are opportunistic pathogens implicated in foodborne illness outbreaks and healthcare-associated infections. This study focuses on the environmental isolation and characterization of Citrobacter-infecting bacteriophages (citrophages, specifically phages LI and Jay-1, collected from a freshwater lake and a sewage plant, respectively. The isolated phages were characterized through plaque morphology, phage stock titration, efficiency of plating (EOP, and assessments of temperature and pH stabilities. EOP was used to evaluate the relative efficiency of phage infection across a range of incubation temperatures (25°C, 30°C, 37°C, and 42°C. Our data for LI shows a slight decrease in EOP at 25°C compared to other temperatures and Jay-1 EOP decreases sharply at 42°C. Additionally, temperature and pH stabilities were assessed by monitoring plaque formation following exposures to a broad temperature or pH range. These results will contribute to a better understanding of citrophage biology and highlight their potential application in phage therapy against Citrobacter infections.

Amanda Maldonado

College Affiliated: University of Puerto Rico

Category: Microbiology Immunology and Infectious Disease

Mentors: Jennifer Jacob Susan Barman

Presentation Number: 2005

Title: ASSESSING THE METASTATIC POTENTIAL OF IMMUNE CHECKPOINTS IN LUNG CANCER USING LILRB4 KNOCKOUT MICE.

Abstract: Lung cancer is one of the most prevalent malignancies in the U.S. with an estimated mortality rate of 53% in 2024. While promising treatment has been employed, the complexity of the tumor microenvironment has made therapy difficult. In the lungs, alveolar macrophages (AM are tissue-resident immune cells that can either support or suppress immune response. The ability of AMs to shift depends on checkpoint inhibitors' expression. LILRB4, leukocyte immunoglobulin-like receptor subfamily B4, is a T cell inhibitor present in AMs and known to promote tumor progression in some cancers. Additionally, natural killer (NK cells express NKG2A, natural killer group 2A, a checkpoint known to inhibit NK activity, supporting tumor progression. In this study we aim to investigate the role of LILRB4 in AMs and NKG2A in NK cells in lung tumor metastasis using murine models: LILRB4 Knockout and wild type. We hypothesize that reducing the metastatic potential of cancer can be achieved by blocking immune checkpoints such as LILRB4 and NKG2A in AM and natural killer cells, respectively. To evaluate the impact of LILRB4 on metastatic potential we utilized a lung cancer cell line in our models with and without anti-NKG2 monoclonal antibody treatment. To evaluate the impact of LILRB4 ligation, AMs collected via bronchoalveolar lavage will be cultured in vitro with known LILRB4 ligands: Apolipoprotein E (ApoE, CD166/Alcam, and Fibronectin (FN1. LPS will be positive control. Flow cytometry will be used to identify the activation status of AM's following ligand binding.

Drew Johnson

College Affiliated: Michigan State University

Category: Microbiology Immunology and Infectious Disease

Mentors: Alex Wessel , Christopher Waters

Presentation Number: 2006

Title: TCBS SELECTS FOR QUINOLONE RESISTANT AND LOW CELL DENSITY LOCKED V. CHOLERAE

Abstract: Thiosulfate Citrate Bile-Salts Sucrose (TCBS agar is commonly used as both a selective and differential medium for isolating marineVibrios, including the aquatic human pathogenVibrio cholerae. While it is valuable as a rapid and inexpensive diagnostic tool, we have observed that certainV. cholerae mutant strains grow poorly when cultured on TCBS agar. In particular, certain strains of DNA repair mutantV. cholerae are strongly attenuated for growth on TCBS agar. However, after evolving these mutants on TCBS, we identified suppressor mutations in DNA gyrase which result in not only restored growth on TCBS, but resistance to quinolone antibiotics. Similarly, we've identified mutations in key biofilm-forming genes that confer increased fitness on TCBS. Our results indicate that the selectivity of TCBS regarding these DNA-repair mutants works in a similar fashion to quinolone antibiotics, and Vibrio species can be shielded from these selective effects via biofilm formation.

Sofya Mishina

College Affiliated: Michigan State University

Category: Microbiology Immunology and Infectious Disease

Mentors: Yun Liang

Presentation Number: 2007

Title: EVOLUTION OF VGLL3 IN EUBLEPHARIS MACULARIUS

Abstract: Lupus, or systemic lupus erythematosus (SLE, is a chronic autoimmune disease that occurs when the body's immune system attacks its own healthy tissues and organs. Symptoms can be treated with steroid drugs but not the condition. An estimated 204,000 people have SLE in the United States, according to the most recent data available. (As stated by CDC Dr. Yun Liang 's research identified the role of transcription factor of VGLL3 and its role in sex-biased autoimmune diseases, like lupus, by activating inflammation pathways. Moreover, it suggested that female-biased VGLL3 overexpression is due to metabolic stress, a key factor in placental mammals when carrying and giving birth to offspring. (Liang Y., 2016 Dr. Yun Liang's lab studies the role of VGLL3 in placental mammals (mice and humans. The proposed research focuses on looking at the role of VGLL3 in non-mammalian systems and comparing it with its function in mammals. The chosen model of study is Eublepharis macularius (Leopard gecko, due to there being documented cases of reptilian systems expressing symptoms of SLE (Fredric L., 1978. It is a gray area of research that allows to test the idea of VGLL3 overexpression's linkage to metabolic stress during pregnancy in a non-placental system by performing qPCR comparison with placental samples.

Helen Spence

College Affiliated: Michigan State University

Category: Microbiology Immunology and Infectious Disease

Mentors: Neal Hammer

Presentation Number: 2008

Title: VARIATION IN CARBON SOURCE SUPPLEMENTATION STIMULATES DISTINCT PIGMENTATION OF STAPHYLOCOCCUS AUREUS STRAINS

Abstract: Morbidity and mortality caused by antibiotic recalcitrant Staphylococcus aureus is of significant clinical concern. Accordingly, the World Health Organization (WHO listed S. aureus as a priority pathogen in 2024. A clinically distinguishing feature produced by S. aureus is the golden carotenoid pigment staphyloxanthin. Staphyloxanthin protects S. aureus from oxidative stress and regulates membrane fluidity in response to challenges presented in the host environment. Previous observations revealed that two clinical isolates, methicillin resistant (MRSA, USA300, and methicillin sensitive (MSSA Newman (NWMN exhibit distinct pigmentation. Genetic and spectrophotometric studies suggest the pigments are staphyloxanthin and a precursor. Specifically, pigmentation extracted from NWMN exhibited a spectrum with peaks that matched 4,4-diaponeurosporene, an intermediate in the staphyloxanthin pathway. A major structural difference between mature staphyloxanthin and 4,4-diaponeurosporene is the presence of glucose in the former. Agar plates used to culture S. aureus lack glucose, indicating that the glucose needed for MRSA staphyloxanthin production derives from gluconeogenesis. To assess the contributions different carbon sources make towards staphyloxanthin or 4,4-diaponeurosporene production, agar plates supplemented with different sources of carbon or TCA cycle intermediates showeddistinct pigmentation patterns in both strains. This finding supports the hypothesis that NWMN produces glycosylated 4,4-diaponeurosporene, or 4,4-diaponeurosporic acid. Consistent with these results, surveying the NWMN genome reveals a distinct allele of the staphyloxanthin synthesis gene, CrtO, an acyl transferase. Current experiments are designed to determine whether diverse clinical isolates produce staphyloxanthin or staphyloxanthin intermediates. Future studies will determine the physiological consequences of producing mature staphyloxanthin or intermediates.

Shannon McCubbin

College Affiliated: Michigan State University

Category: Microbiology Immunology and Infectious Disease

Mentors: Han Wen

Presentation Number: 2009

Title: EFFECTS OF LARVAL DENSITY ON DEVELOPMENT AND WOLBACHIA ABUNDANCE IN LP1- THE LAB ESTABLISHED WOLBACHIA WPIP-INFECTED ANOPHELES STEPHENSI

Abstract: Malaria is a mosquito-borne disease caused by the eukaryotic parasite, Plasmodium. Human malaria is only transmitted by Anopheles mosquitoes, so mosquito control is a critical strategy for interrupting malaria transmission. Wolbachia, a Gram-negative symbiotic bacterium found naturally in over 50% of insect species, has emerged as a promising tool for mosquito control. Our lab has established a Wolbachia-infected Anopheles stephensi line LP1, and found this strain exhibits resistance to Plasmodium infection. However, in practical applications, these mosquitoes may be influenced by environmental factors, such as high larval densities. The main goal of this study is to evaluate the impact of different larvae densities on the Wolbachia-Anopheles symbiotic system. Specifically, we will evaluate Wolbachia parameters, including CI rate, maternal transmission rate, and Wolbachia density across different tissues; mosquito fitness costs, such as body size, longevity, fecundity, and fertility; and Plasmodium blocking efficiency. The control will be our wild type, LIS.

Isabella Moreno

College Affiliated: Grand Valley State University

Category: Microbiology Immunology and Infectious Disease

Mentors: Matthew Hart

Presentation Number: 2010

Title: DESIGN AND SYNTHESIS OF POTENTIAL ANTIBIOTICS WITH POLAR FUNCTIONAL GROUPS

Abstract: Tuberculosis (TB, an infectious disease caused by the bacterium Mycobacterium tuberculosis (MTB, remains a global health crisis, especially in low and middle-income countries. Despite advancements in treatment and prevention, TB continues to be the leading cause of death by infectious disease. The incline in multi-drug resistant strains of TB further complicates the efforts to control this disease, with an estimated 2 in 5 people with drug resistant TB accessing treatment in 2023. Due to this, the continued development of new antibiotics and treatments for TB remains a priority for the World Health Organization. This research focuses on the design and synthesis of novel drugs to target TB. In past research, Diphenyl Ureas (DPU have displayed activity towards Mycobacterium Smegmatis, a bacterium similar to TB. New drug candidates were evaluated using a combination of computational docking and Lipinski's Rule analysis. Variations of the DPUs were designed that included additional polar groups to increase bioavailability and increase the binding affinity to TB's protein target, InhA. Progress towards the synthesis of several chosen targets is reported. It is hoped that biological evaluation of these new targets will show promising biological activity towards the treatment of TB.

Neuroscience

Maria Faraj

College Affiliated: Michigan State University

Category: Neuroscience

Mentors: Gina Leinninger

Presentation Number: 2101

Title: THE EFFECTS OF ENDOGENOUS NEUROTENSIN FROM LHA NEURONS TO THEIR PROJECTIONS?

Abstract: Obesity impacts over 40% of the US population, increases the risk of developing diabetes, and shortens lifespan. Most cases arise due to excessive consumption of calorie-dense foods and diminished physical exercise. However, how the brain regulates these behaviors and how they could be modified remains unclear. To address this knowledge gap, our team is studying lateral hypothalamic (LHA neurons that express neurotensin (Nts, referred to as LHANts neurons. Prior work found that activating LHANts neurons suppressed food intake and motivated feeding while increasing locomotor activity, ideal behaviors for weight loss. LHANts neurons project to many areas in the brain, but we hypothesize that they primarily mediate weight loss behaviors via projections to the ventral tegmental area (VTA, a region that densely expresses neurotensin receptor-1 (NtsR1. To study this, we optogenetically stimulated either all LHANts neurons or only those LHANts neurons that project to the VTA. To understand if this effect is due to Nts signaling via NtsR1, we pre-administered an NTR1 antagonist prior to optogenetic stimulation. For all tests we measured the effect on eating, locomotor activity, and body weight, as well as operant responding for sugar pellets, which is well established to measure the motivation to work for rewarding stimuli. Altogether, this work aims to further our understanding of LHANts neurons in modulating motivated feeding and suggest how leveraging this system may suppress food intake that would be helpful for weight loss.

Gwendolyn Urbain

College Affiliated: Michigan State University

Category: Neuroscience

Mentors: Geoffroy Laumet

Presentation Number: 2102

Title: MILD STRESS ALTERS MOUSE ESTROUS CYCLE

Abstract: Stress is known to have a complex role in many diseases. Chronic stress leads to increased risk of heart disease, psychiatric disorders, migraine and many other diseases. Women are more likely to develop stress induced diseases. Hormonal fluctuation is thought to play a key role in explaining why women experience chronic diseases at a rate almost twice as high than men. Previous animal studies inducing severe chronic stress, with several weeks' duration and life-threatening situations (predator odor, have shown to decrease reproductive function and lengthen estrous cycle. However, how mild stress, which is generally acknowledged as a model for daily stress, affects hormonal fluctuation remains unknown. We aim to identify the impact of mild stress using a repeated restraint model on mouse subjects to aid understanding of mild stress-related impacts on hormonal cycle and stress-induced diseases. During this study 19 mice were stressed using a repeated restraint model two hours daily for three consecutive days within a 17-day period. Vaginal smears for each mouse were taken daily within the same two-hour time slot. The smears were then staged using Vaginal Smear Cytology to identify the impact of mild stress. Results demonstrated that the stress mice had significantly longer estrous cycles, significantly less completed cycles and spent significantly longer in the diestrus phase within the 17-day period than control mice. This data demonstrated that mild stress impacts hormonal cycle and gives way to understand sex-related differences in stress-induced diseases better.

Natasha Vaughn

College Affiliated: Grand Valley State University

Category: Neuroscience

Mentors: Natashia Swalve

Presentation Number: 2103

Title: ASSESSING A RELATIONSHIP BETWEEN HORMONAL BIRTH CONTROL AND ALCOHOL CONSUMPTION

Abstract: Hormonal birth control (HBC is a commonly prescribed medication with a quarter of women in America taking HBC. Despite being approved by the FDA for 65 years, many of the effects of HBC have not been studied. The drug has far-reaching effects throughout the body outside of its primary intended use of preventing pregnancy. For example, one of its effects is the disruption of the hypothalamic-pituitary-adrenal (HPA axis and inhibitory neurotransmitter alterations, including GABA, which are linked to symptoms such as mood disruptions. Past research has shown that HBC causes lower levels of a sedative neurosteroid allopregnanolone which results in higher levels of stress. Other substances such as Alcohol stimulates GABA receptors in a similar way to allopregnanolone. So, it can be theorized that when an individual lacks allopregnanolone, they may turn to alcohol to help relieve their anxiety. This research attempts to assess the relationship between alcohol consumption and HBC use through assessing results from questionnaire data from the National Health Collage Assessment (NHCA. This relationship could be beneficial to providers to better inform their patients on of maladaptive relationships between drugs, and birth control so that patients could be better informed about their health.

Justin Jaraczewski

College Affiliated: Michigan State University

Category: Neuroscience

Mentors: Hongbing Wang

Presentation Number: 2104

Title: TRAINING STRENGTH MODULATES THE TEMPORAL WINDOW OF ANISOMYCIN INDUCED DISRUPTION OF CONTEXTUAL FEAR MEMORY CONSOLIDATION AND RECONSOLIDATION

Abstract: Background. De novo protein synthesis is necessary for memory consolidation and reconsolidation, yet much of the evidence rests upon injection of protein-synthesis inhibitors (PSIs such as anisomycin, which have off-target effects.Objective. To disentangle protein synthesis inhibition from its ancillary effects, we mapped the time course over which anisomycin disrupts contextual fear memories formed by weak or strong training, during consolidation or reconsolidation.Methods. A contextual fear conditioning protocol was used in which male 10-14-week-old C57BL/6 mice received weak or strong context-shock pairings. For consolidation, animals were injected with saline 1 h or anisomycin at various time points post-conditioning. For reconsolidation, saline or anisomycin administration followed a 3-min retrieval 24 h after training.Results.Consolidation: Memories were disrupted when anisomycin was given up to 4 h but not 6 h post-conditioning for weak training; strong memories were disrupted when anisomycin was administered immediately but not 1 h after conditioning.Reconsolidation: For weak training, anisomycin impaired memory at 1 h but not 3 h post-retrieval; strong memories were insensitive at all time points.Conclusions. Stronger conditioning shortens consolidation and reconsolidation; reconsolidation is shorter than consolidation. Results align with previous chemogenetic (Gq-DREADDs excitation-induced disruption, providing evidence for an excitation-based mechanism of disruption for PSIs. Future work will co-infuse anisomycin with chemogenetic silencing to determine if increased neuronal activity is required for PSI-induced disruption. Clarifying this foundational question is essential for guiding translational strategies to modify maladaptive memories in disorders such as PTSD.

Ian Render Flores

College Affiliated: Michigan State University

Category: Neuroscience

Mentors: Gina Leinninger

Presentation Number: 2105

Title: IMPACT OF HIGH-FAT DIET ON NEUROTENSIN AND NEUROTENSIN RECEPTOR EXPRESSION IN THE BRAIN

Abstract: High fat diet (HFD-induced obesity disrupts brain cells that modulate feeding and physical activity, which prevents weight loss. The peptide neurotensin (Nts acts via Nts receptor 1 (NtsR1 and Nts receptor 2 (NtsR2 that are expressed in the brain, which can suppress feeding, promote activity, and reduce body weight. In particular, Nts released from the lateral hypothalamic area (LHA engages dopamine neurons in the Ventral Tegmental Area (VTA, and the Substantia Nigra (SN to support weight loss. However, it is unknown if obesity disrupts the Nts system that may contribute to obesity. We hypothesized that progressive exposure to high fat diet alters expression of Nts and its NtsRs in the LHA and in the dopamine-related regions it projects to, the VTA and SN. To study this we fed wild-type mice either high-fat diet or regular chow for 2, 10, or 20 weeks. We collected LHA, VTA, and SN tissue from the mice, isolated mRNA from them, and used RT-qPCR and assess gene expression of Nts, NtsR1, and NtsR2 in each region. These data will reveal if and how the duration of high-fat-diet impacts the Nts system where it engages dopamine signaling. In the future these findings can help us to better understand how obesity affects the normal function of ingestive-related circuits.

Shreshta Sinha

College Affiliated: Michigan State University

Category: Neuroscience

Mentors: Debajit Saha

Presentation Number: 2106

Title: EMPLOYING MACHINE LEARNING FOR NEURAL OLFACTORY DETECTION OF ENDOMETRIOSIS

Abstract: By using locust (Schistocerca americana olfaction, we are able to detect complex odorants. We showcase that once neural recordings from the antennal lobe of the locust's brain have been collected, we are capable of utilizing machine learning AI to predict odorants with a leave-one-trial-out. It is also shown where the AI model is trained on one population of neurons (where data is gathered extracellularly using electrodes and tested on a separate population of neurons. It is shown that both the Bidirectional Long-term Short-term Memory model (BiLSTM and the Random Forest model (RF are both capable of predicting using spike-sorted data and root-mean-square data, respectively. For each one-tailed t-test for the two models, it is shown to be significantly predicting each odorant from the neural recordings, where P 0.0001

Evan Wilson

College Affiliated: Michigan State University

Category: Neuroscience

Mentors: Alexa Veenema , Bridgette Weiss

Presentation Number: 2107

Title: INVESTIGATING OXYTOCIN EXPRESSION IN THE NILE GRASS RAT: A POTENTIAL NEW RODENT MODEL FOR SOCIAL BEHAVIOR

Abstract: Oxytocin (OXT has been shown to play a key role in modulating social behaviors across many mammalian species, including rats. Although rodent models have been useful in understanding the neural basis of social behavior, most are nocturnal, which limits their applicability to humans, a diurnal species. The Nile grass rat (Arvicanthis niloticus is a diurnal rodent used in several circadian rhythm studies, yet very little is known about their social behavior and underlying neurobiology. Investigating OXT in this murid rodent would provide the first steps in determining how their social behavior is regulated, while developing their potential as a new, more translational animal model for social behavior. Therefore, we characterized the OXT system in the Nile grass rat brain, and compared it to the Wistar rat. Brain sections containing key forebrain nuclei were collected, sectioned at 30μm, and processed for diaminobenzidine immunohistochemistry. OXT-immunoreactive fiber density was quantified, and OXT-positive neurons were either counted or analyzed for density in brain regions with considerable labeling. OXT measures were compared across sex, however, species comparisons were qualitative, as the data were collected in separate experiments. Here, we are able to provide an initial understanding of OXT expression in the Nile grass rat brain, and compare this neuropeptide system to the well-known Wistar rat. This work will broaden our understanding of how OXT may differentially regulate social behavior across species, and strengthen the development of the Nile grass rat as a diurnal animal model for social behavior.

Allison Doneth, Mila Vucelic

College Affiliated: Michigan State University, Michigan State University

Category: Neuroscience

Mentors: Alexander Johnson , Alexandra Castillo-Ruiz

Presentation Number: 2108

Title: EXAMINING THE IMPACT OF BIRTH MODE ON INGESTIVE BEHAVIOR AND SENSITIVITY TO DIETARY OBESITY

Abstract: Epidemiological data suggests that around one third of births in the US occur via cesarean delivery (C-section. Further, children born to this method are 30% more likely to be overweight or obese. These findings emphasize the importance of understanding the physiological mechanisms that place individuals born from C-section at greater risk. In this series of studies, we developed an animal model to examine the factors that may underlie risk for metabolic disease based on birth mode. Male and female mice born via natural vaginal birth or cesarean were placed on a high fat or controlled laboratory diet after weaning. Mice were weighed daily and exposed to their respective diets for a 6-week period. They also received brief access tests to water and to sucrose as a method of examining their intake and microstructural patterns of ingestive behavior. Findings suggest that male cesarean born mice were more vulnerable to weight gain driven by the high fat diet.

Chris Lin

College Affiliated: Hunter College

Category: Neuroscience

Mentors: Joseph Lonstein

Presentation Number: 2111

Title: COMPARISON OF NEUROPLASTICITY BETWEEN MATERNAL AND NON-MATERNAL RATS: PERINEURONAL NETS IN THE BASOLATERAL AMYGDALA

Abstract: During motherhood, the brain undergoes changes that fine-tune maternal caregiving to accommodate the behavioral needs of offspring. A key adaptation is the reduced aggregation of perineuronal nets (PNNs that surround cortical parvalbumin+ interneurons (PV+ INs, which promotes neuroplasticity. PNNs are extracellular glycoprotein matrices that regulate synaptic plasticity by serving as physical barriers to cellular connections within the brain. While widely studied in the medial preoptic area(mPOA of laboratory rodents, PNNs remain relatively unexplored in the basolateral amygdala(BLA-a region critical for mediating pup-related sensory inputs to the nucleus accumbens-ventral pallidum (NA-VP circuit and medial preoptic area for goal-directed maternal behavior. During pregnancy and postpartum, PPNs in many brain areas exhibit significant structural alterations in their chondroitin sulfate proteoglycans (CSPG, leading to enhanced opportunities for synaptic neuroplasticity. In our experiment, we hypothesized that, during motherhood, BLA undergoes significant neuroplasticity, including in its PNNs. To test this, the BLA of female rats that recently gave birth and nulliparous female rats were studied to observe the presence and changes in levels of CSPG by using real-time quantitative polymerase chain reaction (RT-qPCR to measure mRNA levels of CSPG components in PNNs -brevican,aggrecan, andphosphacan. Differences between new mothers and the nulliparity control group may indicate changes in the capacity for neuroplasticity in the peripartum BLA to better accommodate pup-related sensory inputs that drive maternal responses to young.

Anamaria Acevedo Diaz

College Affiliated: University of Central Florida

Category: Neuroscience

Mentors: Alexa Veenema

Presentation Number: 2112

Title: SPECIES AND SEX DIFFERENCES IN OXYTOCIN RECEPTOR BINDING DENSITY ACROSS RODENT MODELS

Abstract: Oxytocin plays a critical role in modulating social behaviors across species, including rodents and humans. Moreover, variation in oxytocin receptor (OXTR binding density levels may underlie species- and sex-specific patterns of social interaction. This project primarily investigates sex differences in OXTR binding density within each of the three rodent species: C57BL/6 mice, Wistar rats, and Nile Grass rats, each varying in social organization, ecology, and activity patterns. To assess this, receptor autoradiography (RAR was performed on coronal brain sections mounted onto glass microscope slides that were incubated with the radiolabeled OXTR ligand, which selectively binds to OXTRs, and exposed to autoradiography films. Developed autoradiography films were digitized and analyzed to quantify OXTR binding density across socially relevant brain regions, including the lateral septum (LS, bed nucleus of stria terminalis (BNST, ventromedial hypothalamus (VMH, and medial amygdala (MeA. By doing so, this research seeks to identify neuroanatomical similarities and differences in OXT binding density that may help explain sex- and species-specific social behaviors, as well as providing an evolutionary framework to understand how oxytocinergic signaling through variation in OXTR expression in the brain has adapted to meet the social and ecological demands of each species. These findings may also offer translational insights into sex differences in social behavior and contribute to a deeper understanding of the neurobiological underpinnings of social functioning across species.

Montserrat Pacheco

College Affiliated: University of Central Florida

Category: Neuroscience

Mentors: Alfred Robison , Daniela Anderson

Presentation Number: 2113

Title: AGGRESSION AND THE GUT MICROBIOME

Abstract: Aggression is an evolutionarily conserved and rewarding behavior essential for animal survival. Inappropriate aggression outside of survival-driven contexts is characteristic of several psychiatric disorders, such as drug addiction, Alzheimer's disease, and autism spectrum disorder. Neural mechanisms that regulate aggression include the basolateral amygdala (BLA and the lateral habenula (LHb, brain regions involved in fear, reward, and other emotional behaviors. Aggression can be influenced by the gut-brain axis, a bidirectional communication network between the brain and the gut. Previous work from our lab positively correlated butyrate-producing gut bacteria with aggression in male mice. Butyrate, a short-chain fatty acid byproduct of microbial fermentation, can cross the blood-brain barrier and act as a histone deacetylase (HDAC inhibitor. We hypothesize that butyrate drives aggression by promoting acetylation of histone 3 (H3 in the LHb and BLA, thereby upregulating gene expression. To test this, male mice were screened for baseline aggression using the resident-intruder paradigm, then treated with sodium butyrate and rescreened to assess changes in aggression levels. Tissue samples from the LHb and BLA were collected and analyzed for total H3 protein and acetylated H3 protein levels, which were then correlated with each subject's post-treatment aggression score. If higher levels of H3 acetylation correlate with increased aggression, this would suggest that butyrate can influence aggressive behavior through histone modification, though future experiments would be needed to establish a causal connection. Understanding these mechanisms is essential for advancing our knowledge of the gut-brain axis and its implications for psychiatric conditions characterized by aggression.

Sierra Moore

College Affiliated: Radford University

Category: Neuroscience

Mentors: Alexandra Yaw , Hanne Hoffmann

Presentation Number: 2114

Title: COMPARATIVE PROFILING OF INORGANIC ELEMENT CONCENTRATIONS IN THE NOCTURNAL MOUSE AND DIURNAL NILE GRASS RAT HYPOTHALAMUS

Abstract: Circadian (24h rhythms adapt internal physiological processes, including the sleep-wake cycle and cardiovascular function, to the external world. This alignment is essential for health and disease prevention. Circadian rhythms are coordinated by the brain's master clock in the hypothalamus, the suprachiasmatic nucleus (SCN. Importantly, inorganic elements (IE, like manganese (Mn, which is crucial in neurotransmitter synthesis, act as enzyme cofactors and modulators. IE show circadian patterns in concentration in humans and nocturnal laboratory rodents, indicating a potential role in modulating physiological function in a time-of-day specific manner. Circadian patterns of Mn in urine and serum are opposite in humans versus nocturnal mice. It is unknown if IE enrich specific brain regions or if time-of-day in diurnal versus nocturnal species impacts enrichment. My goal is to determine how time of day modulates IE concentration in the female SCN of diurnal and nocturnal rodents. To determine the concentrations of IE present in the SCN, I collected diurnal Nile grass rat and nocturnal mouse brains at 0, 4, and 12 hours after lights on. SCN element concentrations were measured via laser ablation-inductively coupled mass spectrometry from cryostat-sectioned brains. Our preliminary data show an opposite timing in Mn concentration between the grass rat and mouse at 4 hours after lights on, with Mn enriched in the SCN of both species. This study is a first step towards identifying the role of IE in the central circadian pacemaker and lays the groundwork for future studies to explore how IE are impacted by circadian rhythm disruption.

Vivek Chava

College Affiliated: Michigan State University

Category: Neuroscience

Mentors: Alfred Robison , Brianna Smith, Emmanuel Quansah

Presentation Number: 2115

Title: INVESTIGATING THE ROLE OF FOS/FOSB IN REGULATING MAST CELLS AND INFLAMMATION IN PARKINSON'S DISEASE

Abstract: Parkinson's disease (PD is a neurodegenerative disorder that involves the progressive loss of dopamine neurons. Dopamine neuron loss may be driven by the accumulation of alpha-synuclein pathology and inflammation. The role of inflammation in PD is currently under investigation with evidence from several studies in PD patients suggesting that changes in inflammatory markers and immune cells could initiate or aggravate neuroinflammation and perpetuate the neurodegenerative process. Recent studies have shown that mast cells (MC are activated in the brain following lipopolysaccharide (LPS induced inflammation and alpha-synuclein injection in disease models. However, the consequences of mast cell activation in PD has not yet been evaluated. To assess the role of mast cell activation in PD, we utilized a mouse model lacking FosB expression specifically in mast cells (MCFOSB-. Since FosB regulates mast cell activity, we expect its deletion to result in enhanced activation of mast cells during inflammation. We have induced inflammation in our MCFOSB- mouse model using 5 mg/kg lipopolysaccharide (LPS and will examine both the acute (24-hour and chronic (11-month effect of LPS on our mouse model via quantitative PCR and immunohistochemistry. We expect to find significantly higher cytokine expression and increased dopamine neuron loss in the MCFOSB- mouse model relative to wildtype mice that also receive the same LPS dose. Our results will provide novel insights into the role of mast cells in the initiation and progression of PD.

Isabella Rinaldi

College Affiliated: Michigan State University

Category: Neuroscience

Mentors: Ingo Braasch , Julia Ganz

Presentation Number: 2116

Title: CHARACTERIZATION OF ENTERIC NERVOUS SYSTEM DEVELOPMENT IN SPOTTED GAR (LEPISOSTEUS OCULATUS

Abstract: The enteric nervous system (ENS provides the intrinsic innervation to the gastrointestinal tract. Because of its central role in controlling gut function, identifying the genetic basis of ENS development is important for understanding its role in gastrointestinal diseases. The zebrafish (Danio rerio model system has been crucial in understanding the genetic basis underlying ENS development, as gene regulatory networks governing developmental processes are often shared across the vertebrate lineage. Recent work has identified the spotted gar (Lepisosteus oculatus, a non-teleost fish, as a bridge between the teleost zebrafish and humans if genetic elements cannot be linked between zebrafish and humans. To use gar as a bridge species, we aimed to characterize ENS development in spotted gar. I first performed whole-mount immunohistochemistry between stages 25 and 34 of gar development using the pan-neuronal markers Elavl and acetylated--Tubulin (-Tub to determine when ENS neurons differentiate. Elavl and -Tub were detected in enteric neuronal cell bodies and nerve fibers respectively at stages 32-33 and 33-34 but not at stages 25-30. This suggests that ENS neurons differentiateduring a critical period between stages 29-30 and 32-33. To identify neuronal subtypes, I am currently performing immunohistochemistry with subtype markers Nitric oxide synthase 1, Serotonin, and Choline Acetyltransferase at stages 33-34. Characterizing ENS development in spotted gar will allow us to establish the gar ENS as a model for human ENS diseases and contribute to a better understanding of the evolution of vertebrate ENS development.

Charlotte Schultz

College Affiliated: Michigan State University

Category: Neuroscience

Mentors: Gina Leinninger

Presentation Number: 2118

Title: EFFECTS ON INGESTIVE BEHAVIOR AFTER DELETION OF NEUROTENSIN RECEPTOR 1 IN THE LATERAL PREOPTIC AREA

Abstract: Obesity increases the risk of comorbid health problems like diabetes and chronic pain, yet there are still limited treatments. Neurotensin, a neuropeptide, regulates food and water intake through activation of Neurotensin Receptor 1 (NtsR1. Specifically, within the Lateral Preoptic Area (LPO, we found that chemogenetic activation of LPO NtsR1 neurons decreased food and water intake in normal weight and obese mice. However, it was unknown whether this effect requires Neurotensin signaling via-NtsR1 in the LPO. To test this, we adult injected NtsR1flox/flox mice in the LPO with either AAV-hsyn-GFP (leaves NtsR1 intact, control or AAV-hsyn-Cre-GFP to delete NtsR1 specifically from LPO neurons. Since activation of LPO NtsR1-expressing neurons decreased food and water intake, we hypothesized that deleting NtsR1 would increase food and water intake, resulting in an increase in body weight. The food, water, and body weight of the mice were measured once a week over a period of nine weeks. In contrast to our hypothesis, 9 weeks after deleting NtsR1 the mice decreased food and water intake, but this did not impact body weight. We are continuing to study the mice for up to 16 weeks to determine if prolonged deletion amplifies the feeding and drinking deficit. Taken together, these findings suggest that NtsR1 in the LPO is necessary for proper control of ingestive behavior and identify LPO NtsR1 neurons as novel contributors to ingestion and body weight.

Pharmacology and Toxicology

Xhesika Luarasi

College Affiliated: Ferris State University

Category: Pharmacology and Toxicology

Mentors: Tracey Ward

Presentation Number: 2201

Title: PEROXISOME PROLIFERATED-ACTIVATED RECEPTOR (PPAR DELTA AGONIST AS PROMISING TREATMENT FOR NON-ALCOHOLIC FATTY LIVER DISEASE.

Abstract: Non-Alcoholic Fatty Liver Disease (NAFLDis a growing metabolic disorder characterized by the accumulation of intracellular triglycerides in hepatocytes without excessive alcohol intake. The impairment ofbeta-oxidation mitochondrial pathway leads to chronic hepatic inflammation, contributing tovisceral fat accumulationaround the liver.Given the absence of FDA-approved pharmacological treatments for NAFLD reversal,targeting metabolic regulators such as Peroxisome Proliferator-Activated Receptors (PPARsoffers a promising therapeutic strategy. Of a particular interest arePPAR-delta. To discover novelPPAR-delta agonists,Molecular Operating Environment (MOE-a comprehensive molecular modeling software-was employed for structure-based virtual screening. Top-ranked molecules based onfunctional group interactions, hydrogen bonding, hydrophobic interactions, and conformational fit were synthesized and evaluatedin vitro. Although all the synthesized molecules have a common template, they have significant differences which make them better than the previous generation of molecules. Our focus is ligand design and chemical optimization using Organic chemistry and Biochemistry principles. The phthalimide and benzothiophene ring systems were observed to drive hydrophobic contacts when grafted to a ligand. Later, aryl-aryl secondary amines and aryl sulfonamides were introduced which add defined H-bonding handles and can latch onto polar amino acid residues. In vitro testingdemonstrated that lead compounds not only enhancedmitochondrial beta-oxidationbut also promoted overall lipid catabolism, as evidenced by decreased hepatic lipid accumulation and improved cellular metabolic profiles. These findings highlight the value of rational chemical design in next generationPPAR-delta ligand development.

Jocelin Lamas

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: Andres Contreras

Presentation Number: 2202

Title: HYPERTENSION INDUCED BY ANGIOTENSIN II, PROMOTES COLLAGEN DEPOSITION IN THE PERIVASCULAR ADIPOSE TISSUE

Abstract: critical contributing factors to the development of chronic diseases. HTN impacts the perivascular adipose tissue (PVAT, the outermost fat layer around the arteries. During HTN, PVAT functions are disrupted, particularly its role in releasing anti-inflammatory signals that regulate blood vessel contraction and collagen development. Furthermore, HTN promotes vascular remodeling, involving thickening and narrowing of the arterial walls, which reduces blood flow. A key hormone in the Renin-Angiotensin Aldosterone System (RAAS, Angiotensin II, induces hypertension through vasoconstriction, vascular remodeling, and aldosterone release. Under these conditions, adipocyte progenitor cells (APCs-expressing PDGFRa may shift from maturing into adipocytes and instead develop as fibroblasts contributing to the development of PVAT fibrosis, the excess buildup of collagen.However, the role of APCs in PVAT fibrosis during HTN is not well understood. We hypothesize that Ang II induces perivascular fibrosis through PVAT APCs. To investigate this, we treated AP tracer mice (Pdgfra-tdTomato with 800 ng/kg/min of Ang II using ALZET Model 2002 osmotic pumps. After 14 days, thoracic aorta with PVAT was collected. TdTomato was detected usingAnti-RFP (rabbit, 1:1000; Vector Lab, and Goat-Rabbit 568 1:250, to identify PDGFR-expressing APCsunder fluorescence microscopy. Second harmonic generation microscope was utilized to image both collagen and APCs in the PVAT. Furthermore, the differentiation of PVAT APCs toward fibroblast fates drives PVAT fibrosis, which may play a key role in the pathogenesis of HTN and its contribution to other cardiovascular diseases. Acknowledgements: BRUSH Summer Research Program at Michigan State University and National Heart, Lung, and Blood Institute (NHLBI P01 HL152951.

Lucie Hranacova

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: Adam Lauver

Presentation Number: 2203

Title: THE RELATIONSHIP BETWEEN CLOPIDOGREL TREATMENT AND ENDOTHELIAL TIGHT JUNCTION PROTEIN EXPRESSION IN ANGIOTENSIN II-INDUCED HYPERTENSIVE MICE

Abstract: One in four deaths result from thrombosis. Purinergic 2Y12 (P2Y12 antagonists manage arterial thrombosis by inhibiting platelet aggregation, reducing clotting risk. However, P2Y12 inhibitors increase adverse cerebral bleeding. Clopidogrel, a P2Y12 antagonist, has the lowest risk of cerebral bleeding, though some risk remains. Previously, its bleeding risk was attributed solely to platelet inhibition. However, our lab has shown that this is not entirely true, as increased bleeding was observed in P2Y12 knockout mice treated with clopidogrel. Instead, endothelial dysfunction may explain this phenomenon. Endothelial cells regulate blood-brain barrier (BBB permeability, and increased permeability heightens the risk of cerebral bleeding. Using hypertensive P2Y12 knockout mice, our lab demonstrated that clopidogrel increases BBB permeability independently of P2Y12. Hypertensive mice were studied due to the clinical significance of hypertension and its damaging effects on cerebral vasculature. Tight junction (TJ proteins between endothelial cells are crucial in maintaining BBB integrity. Increased BBB permeability results from degradation or mislocalization of these proteins. We hypothesize that clopidogrel increases BBB permeability through interference of TJ proteins. To test this hypothesis, P2Y12 knockout mice will be implanted with angiotension II infusion pumps to induce hypertension. Mice will be treated with clopidogrel or vehicle for two weeks. Western blotting and histological analyses will be conducted to assess the expression and localization of TJ proteins. We expect that clopidogrel treatment will downregulate TJ protein expression and/or cause structural disruption of the tight junction machinery. These findings will provide mechanistic insight into how clopidogrel disrupts the BBB.

Jillian Luczkowski

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: Tian Qiu

Presentation Number: 2204

Title: EVALUATING COLONIC TOXICITY OUTCOMES OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS WITH VARYING CARBON CHAIN LENGTHS AND MOLECULAR WEIGHTS IN CAENORHABDITIS ELEGANS

Abstract: Per- and polyfluoroalkyl substances (PFAS are an emerging class of environmental contaminants known for their persistence and accumulation in biological systems. PFAS exposure is primarily from ingestion where the intestinal tract absorbs PFAS into the body. Previous research revealed that PFAS can disrupt intestinal barriers, however, colonic toxicity data has only been generated using perfluorooctanesulfonate and perfluorooctanoate. The large structural diversity of PFAS makes it challenging to determine the structure-activity relationships between PFAS structures and colonic toxicity. It is critical to develop alternative, cost- and labor-effective approaches using non-rodent models to screen the colonic toxicity of various PFAS structures. C. elegans is a model organism offering advantages over rodents including easily characterizable phenotypes, ease in culture, rapid development, and possesses a simple intestinal tract suitable for colonic toxicity investigations. Using C. elegans, we screened several PFAS from carboxylate and sulfonate families for their colonic toxicity. We focused on intestinal integrity by evaluating gut permeability through microscopy imaging experiments using a modified Smurf assay. Among tested sulfonate-containing PFAS, perfluorooctanesulfonate was found to significantly induce leaky gut syndrome in populations of worms, whereas the shorter chain sulfonate-containing PFAS did not significantly induce the leaky gut phenotype. From carboxylate-containing PFAS, perfluorohexanoate was found to significantly induce the leaky gut phenotype in populations of worms. Furthermore, perfluorohexanoate was found to cause pharyngeal membrane leakiness. Our research reveals insights in the connection between PFAS structures and induced colonic toxicity and provides an alternative assay for the assessment of colonic toxicity on xenobiotics in general.

Zhanyla Coley

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: James Luyendyk

Presentation Number: 2205

Title: EXPRESSION OF COAGULATION FACTOR XIII-B BY PRIMARY HEPATOCYTES

Abstract: Thrombosis is the process of blood clots forming in veins or arteries and can result in serious complications like death. About 1 in 4 people who have the condition will die from associated complications. There are many aspects that can contribute to the condition transpiring and one of these factors is Coagulation factor XIII (Factor XIII that's an attractive target for therapeutics because of its blood clot stabilizing role in the coagulation cascade. Additionally, Factor XIII is a protransglutaminase circulating in plasma that crosslinks fibrin clots formed at sites of vascular injury. Factor XIII is composed of 2 catalytic A subunits (FXIII-A and 2 regulatory B-subunits (FXIII-B and it circulates bound to fibrinogen in plasma in its heterotetramer (A2B2. While FXIII-A is produced by macrophages and platelets, (XIII-B is produced by liver parenchymal cells (hepatocytes. The molecular advantage of producing these subunits in distinct cell types is unclear. Moreover, despite its critical importance in stabilizing FXIII-A in plasma, the mechanisms controlling FXIII-B expression by hepatocytes are unknown. We hypothesize that primary hepatocytes secrete a majority of FXIII-B but maintain an intracellular surplus of FXIII-B. To test this hypothesis, murine primary mouse hepatocytes were isolated by perfusion and collagenase digestion. Next, we detected the presence of FXIII-B through western blotting and measure protein concentrations using a direct ELISA. We predict the results will indicate that hepatocytes secrete FXIII-B and maintain FXIII-B in the liver. With this knowledge we can infer that FXIII-B potentially has a role in liver regeneration.

Sophia Witulski

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: James Luyendyk

Presentation Number: 2206

Title: LOCATING FACTOR XIII-B IN LIVER CELLS AND THEIR SUPERNATANT

Abstract: Background: The stability and effectiveness of crosslinking in thrombi are strongly dependent on the protransglutaminase Factor XIII (FXIII and its constituents Factor XIII-A (FXIII-A and Factor XIII-B (FXIII-B. Fibrin is crosslinked by FXIII-A which forms -(-y-glutamyl-Lysy covalent bonds within fibrin polymers to strengthen the integrity of the thrombus. The FXIII-B subunit circulates as a heterodimer with FXIII-A and in complex with fibrinogen, increasing the half-life of FXIII. Additional roles of FXIII-B are unidentified; Yet FXIII-B is produced in the liver along with fibrinogen and in greater quantities than FXIII-A which is produced in other parts of the body. There is speculation that FXIII-B is produced excessively to ensure a higher percentage of FXIII-A is bound with FXIII-B and complete the complex. However, it is also predicted that FXIII-B is generated in such amounts due to other potential roles it could play. Objectives: We are testing the hypothesis that FXIII-B can be found in both hepatocytes and the supernatant outside of our hepatocytes. Methods: Mouse livers were perfused and washed to extract hepatocytes, then the cells were plated into monolayer and 96 well plates with their respective hepatocyte seeding media. Approximately 7 days later, the plates underwent media changes and replaced the seeding media with their respective maintenance media. These cultured cells were taken from timepoints of 0 days, 10 days, and 14 days for various experiments including Western Blots, to measure FXIII-B protein expression in hepatocytes, cell titer glow, to detect the levels of ATP in cells and deduce cell viability, and ELISA, to quantify the levels of FXIII-B found in the hepatocyte supernatant. Results: All hepatocyte spheroids showed high levels of ATP when tested for luminescence by means of cell titer glow suggesting that all spheroids were alive. When testing hepatocytes collected at time 0 with western blots, the results of the non-reducing conditions test showed negligent levels of FXIII-B present in the cells. However, when experimenting with reducing conditions, we see a significantly strong signal of FXIII-B found in hepatocytes. From the ELISA results, we see that high levels of FXIII-B are present in the supernatant of hepatocytes. Conclusion: The results indicated that FXIII-B can be found in the supernatant of hepatocytes. These results suggest that there may be alternative roles for FXIII-B in addition to stabilizing FXIII-A, and that more research is warranted. Keywords: Fibrin, Factor XIII-B, Hepatocyte

Connor McGreer

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: Ashten Stambersky

Presentation Number: 2211

Title: USE OF RTA408 IN PREVENTING TOXIC EFFECTS OF CHLOROPICRIN

Abstract: Chloropicrin or Trichloronitromethane is a chemical used as a pesticide, fumigant, and chemical warfare agent in World War 1. This toxin causes inflammation and irritation to the eyes and respiratory system. In this experiment, the eyes of mice 5-7 weeks old were exposed to various mixtures containing DMSO as the control, Chloropicrin, PBS as the vehicle, and RTA408. RTA408, also known as Omaveloxolone, is an antioxidant inflammation modulator which activates the Nrf2 pathway. Nrf2 is a transcription factor which controls expression of antioxidant genes which have anti-inflammatory functions. Our hypothesis was that RTA408 would reduce the toxic effects caused by chloropicrin exposure in mice. Clinical assessments and images were taken after 3 hours, 6 hours, 1 day, 2 days, and 3 days, then scored on a scale of 0 to 4 for presence of ulceration and opacity. Clinical scores indicated that RTA408 successfully decreased toxic effects caused by chloropicrin in mice.

Caden Heminger

College Affiliated: Taylor University

Category: Pharmacology and Toxicology

Mentors: James Luyendyk

Presentation Number: 2212

Title: INVESTIGATING A NOVEL ROLE FOR FXIII-B IN PRIMARY HEPATOCYTES

Abstract: One of the most important aspects of the clotting mechanism is coagulation factor XIII (FXIII. Following vascular injury, the coagulation cascade is activated leading to fibrin formation. Once fibrin is formed, it polymerizes and is cross-linked by a subunit of FXIII. FXIII is made up of two subunit dimers, FXIII-A and FXIII-B. FXIII-A is well characterized as the catalytic subunit that cross-links fibrin, but there is little known about FXIII-B past its ability to stabilize FXIII-A in plasma. Ongoing studies indicate that a lack of FXIII-A does not change gene expression of FXIII-B in the liver cells which synthesize it. This characteristic suggests that FXIII-B may have another role in hepatocytes. For this reason, we hypothesize that hepatocytes in wild type mice retain an intracellular volume of clotting factor XIII-B. By isolating hepatocytes from mice and allowing them to grow in spheroid cultures, we can observe the presence and relative amount of XIII-B in both the hepatocytes and in their media. Protein can be obtained from cells via cell lysis and from media and run through western blot and ELISA respectively. A significant volume of FXIII-B found intracellularly would indicate that FXIII-B most likely performs a different role within the hepatocytes and is retained for this purpose. If this is the case, further studies would be done to discover this new role of FXIII-B. Findings in this area would open doors for better understanding of FXIII-B regulation as well as its specific roles in hepatocytes.

Gabriella Ortiz

College Affiliated: University of Wisconsin-Madison

Category: Pharmacology and Toxicology

Mentors: Adam Lauver

Presentation Number: 2213

Title: ROFECOXIB PHARMACOKINETICS IN MALE AND FEMALE SPRAGUE-DAWLEY RATS

Abstract: Released in 2022, the FDA draft guidance, "Assessment of Pressor Effects of Drugs," proposes a dedicated clinical study for chronic use drugs to rule out a potential blood pressure (BP increase of 3mmHg. The guidance, however, lacks recommendations for preclinical studies to detect pressor effects before clinical trials. Given the resources needed to get to clinical studies, establishing a pharmacologically and statistically sensitive preclinical model to reliably detect pressor effect could fill an important gap in future safety testing. We plan to validate rofecoxib pharmacokinetics (PK for use in preclinical safety assessments. A single dose of rofecoxib (10 mg/kg will be administered to four male and four female Sprague-Dawley rats (n=8. Blood will be drawn over 24 hours for PK analysis.PK curves will be created to evaluate the concentration profile of rofecoxib in male and female rats in WinNonlin. We expect to find a relevant time point for both sexes based on the PK profile to confirm drug exposure in a prospective BP study. We anticipate our study's PK parameters to be similar to previous studies: Cmax = 400 ng/mg, Tmax = 2.3 h, AUC = 2963 ng* h/ml, t1/2 = 5.0 h. We expect to find a reliable timepoint during the excretion phase for confirming drug exposure in future studies. Rofecoxib demonstrated a consistent PK profile, supporting its use as a reliable positive control, with WinNonlin curves showing comparable results across sexes and aligning with prior findings.

Andrea Arce Rodriguez, Aguadilla Campus

College Affiliated: Inter American University of Puerto Rico

Category: Pharmacology and Toxicology

Mentors: Adam Lauver

Presentation Number: 2214

Title: THE INFLUENCE OF ISOFLURANE ON THE GUT MICROBIOME IN A RAT MODEL OF HYPERTENSION

Abstract: Dysbiosis can elicit systemic inflammation and disrupt intestinal mechanotransduction, a process involved in blood pressure (BP regulation. Isoflurane, a commonly used anesthetic agent for maintaining general anesthesia, has known effects on BP regulation. Isoflurane may also alter the gut microbiome (GM, leading to systemic inflammation and metabolic changes that contribute to hypertension. We evaluate the effects of diet and repeated isoflurane exposure on the GM and associated BP changes. Thirty-six Dahl salt-sensitive (SS rats were assigned to two cohorts (n=18: control diet (CD; 10% kcal from fat or high-fat diet (HFD; 60% kcal from fat. Half of the rats (n=18 were exposed to isoflurane every two weeks for ultrasound imaging procedures, totaling 12 exposures per rat. Arterial BP was measured using radiotelemetry or tail cuff plethysmography. Fecal pellets were collected and analyzed by shallow shotgun whole genome sequencing at baseline and 10, 17, and 24 weeks. Our findings will determine the role diet plays in driving changes in the GM, which is associated with hypertension. Rats fed a HFD will exhibit altered microbial composition and diversity compared to those on a CD, with corresponding increases in BP. Repeated exposure to isoflurane may modulate the diet-associated changes and the hypertensive response. Understanding the impact of diet on the microbiome is crucial for hypertension research. Diet-induced microbial changes can impact BP regulation, and repeated isoflurane exposure may disrupt the GM, influencing hypertension development. These findings could influence hypertension management by encouraging personalized dietary interventions and reconsideration anesthetic use in individuals at risk.

Emma Andrechek

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: Alanis Torres Berrios , Karilyn Sant

Presentation Number: 2215

Title: MORPHOLOGICAL EFFECTS OF DDA EXPOSURE DURING EMBRYONIC DEVELOPMENT STAGES IN ZEBRAFISH

Abstract: Before its ban, people readily used the pesticide dichlorodiphenyltrichloroethane (DDT to exterminate pests and control malaria and typhus outbreaks. The bookSilent Spring, written by Rachel Carson, raised awareness on environmental concerns relating to DDT, sparking a movement for environmental safety. Previous studies show that presence of 2,2-bis[4-chlorophenyl]acetic acid (DDA, the only water-soluble byproduct of the 46 DDT+ metabolites, in urine and blood samples indicates prior exposure to DDT. Additional research has found DDT+ metabolites in water and sediment samples from contaminated areas. We expect exposure to DDA to have similar effects as DDT exposure, although it remains understudied. By exposing zebrafish embryos to a range of concentrations of DDA, we hypothesize that DDA will cause morphological malformations in zebrafish embryos similar to those caused by DDT, such as pericardial edema, yolk sac edema, spinal curvature, stunted growth, and jaw deformities. We observed embryonic zebrafish of the wild-type AB strain for morphological malformations after daily exposure to DDA at concentrations of 0 (DMSO 0.01%, 0.5, 5, or 50 uM respectively. We also recorded hatching and mortality rates. By comparing the DDA-exposed embryos to the DMSO-exposed embryos, we expect to see an increase in morphological malformations among the DDA-exposed groups. Ultimately, this study aims to examine the occurrence and significance of morphological malformations when we expose embryonic zebrafish to DDA during developmental stages. We are investigating the broader impacts of DDA and its potential synergistic effects with DDT.

Ashley Gilbert

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: Rance Nault

Presentation Number: 2216

Title: IN THE ZONE: A TRANSCRIPTOMICS APPROACH TO UNDERSTANDING ZONE-SELECTIVE FATTY LIVER DISEASE

Abstract: Metabolic dysfunction-associated steatotic liver disease (MASLD, also known as non-alcoholic fatty liver disease, is a growing public health concern across the United States. In clinical cases and rodent models, MASLD has been shown to develop in a zone-selective manner relating to the centrilobular and periportal regions. However, the underlying mechanisms behind this zone-selectiveness are unknown. This study tests our hypothesis that centrilobular steatosis develops with the repression of PPAR target genes within the peroxisomal ß-oxidation pathway, while periportal steatosis develops with the decreased expression of rate limiting enzymes in the one-carbon metabolism (OCM pathway. Two centrilobular steatosis models, a high fat (GAN diet or perfluorooctanesulfonic acid (PFOS, and two periportal models, a methionine-choline deficient (MCD diet or 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD were investigated using bulk RNA sequencing (RNA-seq of livers. Clinical chemistry data demonstrates that serum glucose decreased in the periportal models MCD and TCDD. Furthermore, both portal models significantly increase serum alanine aminotransferase (ALT suggesting more severe liver injury compared to the central models. Gene expression analysis found 654 unique differentially expressed genes (DEGs to the periportal models and 30 unique DEGs to centrilobular models. Gene set enrichment analysis (GSEA found induction of ß-oxidation pathway genes in the centrilobular models, while the portal models showed overall repression. Contrary to our initial hypothesis, OCM was not changed in the portal models.In conclusion, our findings suggest differences in disruption of the ß-oxidation pathway between models of periportal and centrilobular steatosis.

Ian Kelly

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: Ally Lewis , Anne Dorrance

Presentation Number: 2221

Title: KEY GLIAL CELL ACTIVATION IN AN AGED TRANSGENIC RAT MODEL OF MIXED DEMENTIA

Abstract: Alzheimer's disease (AD accounts for 60% of dementia cases; however, it often occurs as mixed pathology, with 50% AD patients showing signs of cerebrovascular disease. Individuals with hypertension are at risk of developing dementia and have faster dementia progression. Hypertension leads to reduced blood flow, increased neuroinflammation, and breakdown of the blood-brain barrier (BBB, all of which contribute to cognitive decline. Astrocytes have endfeet that wrap around arteries to support the BBB. Microglia are specialized macrophages that remove metabolic waste from the nervous system. Both reactive astrogliosis and microgliosis contribute to cognitive decline in AD. To develop a model of mixed-dementia (MxD, we crossed stroke-prone spontaneously hypertensive rats (SHRSP with a transgenic AD model (TG-344. We hypothesized that aged SHRSP+TG-344 rats would have more activated astrocytes and microglia in the CA1 hippocampal region and cortex compared to age-matched rats with hypertension or dementia alone. Brain sections were stained with GFAP (astrocytes and Iba1 (microglia. They were imaged using confocal fluorescence microscopy. Astrocyte quantity in the cortex and hippocampus was higher in MxD 12-month males than in the SHRSP groups . The cortical astrocytes from the MxD 12-Month males were more ramified than those from the AD or hypertensive groups, however this difference was not seen in the hippocampus. These results demonstrate that hypertension has an additive effect on the progression of Alzheimer's Disease and increases reactive astrogliosis in a model of SHRSP and AD than AD or hypertension alone.

Libby Kelly

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: Ebenezar Okoyeocha , Neera Tewari-Singh

Presentation Number: 2222

Title: ASSESSING A SAFE DOSAGE AND NRF2 ACTIVATION BY RTA408 IN OCULAR TISSUE FOR EFFICACY STUDIES

Abstract: Nuclear factor erythroid 2-related factor 2 (NRF2 is a transcription factor which regulates cellular response to oxidative stress and toxic threats via gene expression resulting in detoxification and oxidative stress reduction. NRF2 is usually under tight regulatory control via the KEAP1-CUL3 complex and is activated by conformational changes to Kelch-like ECH-associated protein 1 (KEAP1 in the presence of reactive oxygen species (ROS. RTA408 (Omaveloxolone is a NRF2 activator approved for treatment of Friedreich ataxia (FRDA. RTA408 binds to KEAP1, inhibiting its interaction with NRF2 allowing it to translocate from the cytosol to the nucleus for gene transcription. The purpose of this study is to determine the efficacy of RTA408 in activation of NRF2 and any subsequent toxicity in ocular tissue of mice. We are interested in determining the concentration of RTA408 at which no toxic effects are observed and NRF2 gene expression is optimized. This will allow for further testing to determine if RTA408 is a viable treatment for chloropicrin induced ocular toxicity. We hypothesize that topical administration of RTA408 will activate the NRF2 pathway in ocular tissue without toxic effects. Groups of male mice, 5 - 7 weeks of age, were exposed to three different concentrations of RTA408 (0.0001%, 0.01%, and 0.1% via topical application to ocular tissue and images were taken at various time points after initial exposure. Images were evaluated for presence and severity of ulceration, neovascularization, and opacity. Mice were euthanized three days post exposure and ocular tissue was harvested for evaluation of gene expression of NRF2 target genes (IL-6, HO-1, and NQO1 via qPCR. Our results show that clinical scores for ulceration and opacity were not statistically significant indicating that there is no toxicity present. Evaluation of neovascularization showed significantly lower scores for 0.1% RTA408 compared to the control group at the two-day time point and significantly higher scores for 0.01% RTA408 compared to the control group at the three-day time point. Analysis of qPCR showed no significant increase in relative fold gene expression for IL-6 and HO-1 at any RTA408 concentration. Significant increase in relative fold gene expression was observed in NQ01 at 0.01% and 0.1% RTA408 concentrations.

Dyllan Nelson

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: Alanis Torres Berrios , Karilyn Sant

Presentation Number: 2223

Title: THE EFFECTS OF DDA ON ZEBRAFISH LARVAE NEUROBEHAVIOR

Abstract: DDT was a widely used pesticide for decades until its ban in 1972. As a result, its extensive use and subsequent disposal caused it to seep into waterways through runoff and leach into soil. This exposure has led to serious health effects, including breast cancer, birth defects, diabetes, and neurological impairments in children. Despite having been banned for 50 years, its effects persist due to DDT's incredibly slow degradation rate and bioaccumulation. DDT degrades into multiple metabolites, including DDA, which lacks significant toxicological information. This research explores the effects of DDA on embryonic development of zebrafish, particularly its impact on neurobehavior. We hypothesize that DDA will lead to adverse neurobehavioral effects, such as decreased responsiveness to stimuli.To test this hypothesis, we will expose 96 zebrafish embryos to varying concentrations of DDA including 0 μM, 0.5 μM, 5 μM, and 50 μM, until they reach five days post-fertilization. After the exposure period, we will observe the larvae in a Noldus Daniovision behavioral chamber designed to run a light/dark cycle, along with repeated mechanical taps on the well plate to assess behavioral responses. Our expectation is that the higher the DDA concentration, the less physically responsive the zebrafish will be to stimuli. The results of this research will help contribute to our limited understanding of the consequences of DDA exposure and its potential effects on embryonic development.

Benjamin Nketsiah

College Affiliated: Michigan State University

Category: Pharmacology and Toxicology

Mentors: Jamie Bernard , Jonathan Diedrich

Presentation Number: 2224

Title: ADIPOSE TISSUE PROMOTES SKIN CELL MALIGNANCY THROUGH ANGPTL4 UPREGULATION

Abstract: Non-melanoma skin cancer (NMSC is the fifth most common malignancy diagnosed across the world. Bariatric surgery has been shown to reduce skin cancer risk, suggesting a possible role of adipose tissue in tumor promotion. Previous studies from the Bernard lab suggest that factors secreted from adipose tissue promote malignant transformation, a process associated with the induction of Angptl4. ANGPTL4 is an endogenous inhibitor of lipoprotein lipase that modulates free fatty acid delivery to adipose tissue and oxidative tissues such as muscle and liver. The C-terminal protein demonstrates tumor-associated activities such as angiogenesis, metastasis, protection against anoikis, and enhancement of cell survival. Therefore, we hypothesized that the induction of this gene promotes malignant transformation of skin cells by adipose tissue. My objective was to validate the transcriptomic analyses in JB6 P+ cells exposed to mouse adipose tissue or mouse fat tissue filtrate (mFTF and determine the functional significance of ANGPTL4 in malignant transformation. Quantitative real-time PCR (qRT-PCR was used to measure Angptl4 and additional targets involved in inflammation (Cxcl1 and Cxcl5. Significant upregulation of all genes was observed in JB6 P+ cells treated with mFTF even up to 24 hours of treatment. siRNAs targeting Angtpl4 transcripts were then used to knockdown Angtpl4 to functionally test its role in soft agar growth, a surrogate marker of malignant transformation. We successfully confirmed knockdown of ANGPTL4 using both qRT-PCR and Western Blot analysis. Future studies will confirm its functional role in skin tumorigenesis which may lead to a novel therapeutic target.

Holley Johnson

College Affiliated: Fayetteville State University

Category: Pharmacology and Toxicology

Mentors: Karilyn Sant , Katelyn Polemi

Presentation Number: 2225

Title: INVESTIGATING THE EFFECTS OF NON-NUTRITIVE SWEETENERS ON HEPATIC SWEET TASTE RECEPTORS AND CALCIUM SIGNALING IN HEPG2 CELLS

Abstract: According to the American Diabetes Association, approximately 1.2 million people are diagnosed with diabetes each year. Non-nutritive sweeteners (NNS are widely used as alternatives to table sugar. Non-nutritive sweeteners (NNS are calorie-free alternatives that are significantly sweeter than sugar but do not cause a rise in blood sugar levels. Recent studies have shown that chronic consumption of NNS can disrupt calcium and insulin signaling pathways in HepG2 (liver cells, potentially impairing glucose storage and metabolism. Sweet taste receptors are known for their expression on the tongue, but they're also present in the liver. We hypothesize that exposure of HepG2 cells to NNS activates hepatic sweet taste receptors, leading to increased intracellular calcium levels and glycogenesis. NNS and lactisole (a TSR2 inhibitor were co-administered and tested separately to evaluate whether activating or inhibiting sweet taste receptors influences insulin signaling and calcium levels in HepG2 cells. We will perform calcium assays using Calbryte 520 AM to measure intracellular calcium levels. We expect that when hepatic taste receptors are inhibited by Lactisole, there will be reduced insulin signaling because the receptors will be inhibited. Conversely, activation of these receptors by NNS is anticipated to increase intracellular calcium levels. When co-administered together (Lactisole NNS, we expect that there will be a suppressed expression of glucose uptake. Overall, this study investigates the potential effects of non-nutritive sweeteners (NNS and lactisole on cellular and hepatic receptor function, depending on whether they are activated or inhibited.

Physical and Mathematical Sciences

Jonah Caldwell

College Affiliated: Lawrence Technological University

Category: Physical and Mathematical Sciences

Mentors: Yadu Pokhrel

Presentation Number: 2301

Title: UNCOVERING AQUIFER STRESS: A DIGITAL INVESTIGATION INTO GROUNDWATER LOSS IN THE HIGH PLAINS

Abstract: The High Plains Aquifer, one of the most intensively pumped aquifers in the United States, has experienced decades of groundwater depletion due to unsustainable irrigation practices. This project examines long-term trends in water level changes across multiple sites within the aquifer using historical Daily Values (DV datasets from the United States Geological Survey (USGS, covering the period from predevelopment (1930 to 1980 to the present. Using Python and QGIS, automated tools were developed for data parsing, filtering, plotting, and spatial visualization to analyze groundwater level changes across thousands of data points per site. Spatial data integration and heatmap generation in QGIS portrayed regional disparities in water table levels, with sites in the central and southern High Plains consistently exhibiting groundwater declines, supporting research identifying these regions as depletion hotspots. These findings show the value of combining programming tools and geospatial analysis to better understand and communicate groundwater trends in large-scale aquifer systems. Future steps include incorporating GRACE satellite data to assess regional groundwater storage changes and validating model outputs with in situ measurements.

Katherine Matthews

College Affiliated: Barnard College

Category: Physical and Mathematical Sciences

Mentors: Annick Anctil , Jaewon Han

Presentation Number: 2302

Title: LIFE CYCLE ASSESSMENT OF CDTE/PEROVSKITE TANDEM PHOTOVOLTAIC

Abstract: CdTe currently holds over a 30% share of the United States' utility-scale solar photovoltaic market, which will likely increase due to its US-based manufacturing process and current tariffs. In the US, CdTe PV modules are predominantly produced in Ohio, but new manufacturing facilities are opening in Trinity, Alabama and Iberia Parish, Louisiana. Additionally, CdTe PV module manufacturers are looking towards tandem perovskite technology to increase efficiency. LCA is used to evaluate the environmental impact of manufacturing CdTe/perovskite tandem PV panels in different locations (Ohio, Alabama, and Louisiana. To our knowledge, this is the first LCA of the new manufacturing locations and of CdTe/perovskite tandem technology. We define our system boundary from raw material extraction to PV module production and standard-condition lifetime electricity generation. The life cycle inventory data is collected from published literature, patent information, and Ecoinvent v3.10. We evaluate the cumulative energy demand via the CED v1.12 method and the global warming potential via the TRACI v2.1 method because of our focus on US production. The environmental impact results allow us to compare the manufacturing of CdTe/perovskite tandem PV at the new US locations and evaluate the potential of the new tandem technology.

Mark Pais

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Seth Jacobson

Presentation Number: 2303

Title: EXPLORING DEBRIS EVOLUTION IN PLANETARY INSTABILITY SIMULATIONS: EFFECTS OF PARTICLE NUMBER, RESONANCE CONFIGURATION, AND INSTABILITY TIMING.

Abstract: The number of giant impacts that occurred during the late stages of terrestrial planet formation in the solar system remains highly debated. A fraction of the mass in today's asteroid belt may originate from these impacts, providing an opportunity to constrain the frequency of such collisions. This is done through the comparison between the total mass of simulated debris in the asteroid belt to the total mass of possible debris currently in the asteroid belt However, previous work has found either a large overproduction of debris or that nothing was delivered to the asteroid belt, making comparisons difficult.This may be an effect of having debris particles that are too massive. In this project, I incrementally increase the resolution of simulations to correct for the overabundance. The N-body integrator SyMBA is used to model one terrestrial planet formation scenario in which an orbital instability is triggered among the giant planets to incite giant impacts. The systems evolve for 100 Myr. To increase the resolution, I reduce individual debris particle masses (initially 10?? to 3x10?3 M by increasing the number of particles generated post-collision by 3, 5, 7 and 10 times the original number of particles generated, which was initially set to 38. I developed custom Python pipelines to extract and analyze the final debris population, comparing simulated asteroid belt delivery across varying particle sizes and instability timings. This work aims to improve the mass distribution throughout the inner solar system, ultimately providing tighter constraints on the number of giant impacts during Earth's formation history.

Griffin Siersma

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Megan Donahue

Presentation Number: 2304

Title: VELOCITY DISPERSION MEASUREMENT OF NEARBY GALAXY CLUSTERS WITH WEAK-LENSING MASSES

Abstract: This project aims to provide a uniform method of measuring the velocity dispersions of Local Volume Complete Cluster Survey (LoVoCCS galaxy clusters with over 100 spectroscopic redshifts. Archival data from the NASA/IPAC Extragalactic Database (NED, Dark Energy Spectroscopic Instrument (DESI, and the Sloan Digital Sky Survey (SDSS was used to analyze the spectroscopic redshifts. Initial cleaning of the data was conducted to ensure the target had high quality spectroscopic redshift measurements and duplicates were removed across each archival dataset. Interlopers are removed following the method used in Sereno et al. 2024. We successfully measured the velocity dispersion for 26 LoVoCCS clusters. Comparisons with archival measurements show good agreement. In the future, this project will focus on applying our pipeline to measure the velocity dispersion of the full LoVoCCS cluster sample.

Chloe Ricker

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Christopher Wrede

Presentation Number: 2305

Title: COSMIC DUST, GAMMA RAYS, AND NOVAE: MEASURING NUCLEAR LIFETIMES

Abstract: Classical novae are thermonuclear explosions on accreting white dwarf stars in binary systems. Through their nucleosynthesis, classical novae are predicted to diversify the interstellar medium with intermediate-mass nuclei. These events are simpler to model and are more common than bigger contributors such as supernovae, providing ample amounts of data that can serve as a foundation for modeling more complex systems. Two key reactions within novae are proton captures on radioactive 22Na and 30P. The decay of 22Na releases a characteristic 1275 keV gamma ray, which space-based gamma ray telescopes have yet to detect, leaving its production uncertain. Equally important are the unconstrained silicon isotopic ratios influenced by the 30P proton-capture reaction. This reaction serves as a critical checkpoint, regulating the flow of material to heavier masses and significantly impacting the isotopic composition of presolar grains, microscopic dust grains formed in stellar environments providing insights into nucleosynthesis. These experiments employ the same nuclear physics setup, Doppler Shift Lifetimes 2 (DSL2, located at the user-facility TRIUMF-ISAC2 in Canada, to measure the lifetimes of key excited states in both 23Mg and 31S, thereby reducing uncertainties in the reaction rates involving 22Na and 30P. Improved reaction rates will enable more accurate simulations of nova nucleosynthesis, strengthening the predictive power of astrophysical models. This will also provide a benchmark for space-based gamma ray telescopes seeking to detect 22Na decay, and identify the isotopic composition of presolar grains in primitive meteorites.

Austin Sjaarda

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Franziska Maria Maier

Presentation Number: 2306

Title: DESIGN OF A HIGHLY SELECTIVE AND HIGH-FLUX MASS SEPARATOR TO PROVIDE PURIFIED RADIOACTIVE ION BEAMS

Abstract: The Facility for Rare Isotope Beams (FRIB produces rare isotopes to support cutting-edge research in nuclear science. Many experiments require specific ion species, necessitating precise and selective mass separation techniques. Multi-reflection time-of-flight (MR-ToF devices have emerged as powerful tools for high-precision mass spectrometry and highly selective mass separation. They can deliver high-intensity purified ion beams, beneficial for experiments in nuclear structure and nuclear astrophysics. In these devices, ions are confined in a closed loop between two electrostatic mirrors and separate in time-of-flight according to their mass-to-charge ratio. This enables the separation of ions with very small mass differences. The ion throughput of MR-ToF devices has been found in simulation to be proportional to the beam energy. Current MR-ToF mass separators in use at radioactive ion beam facilities operate at around 2 keV beam energy. To significantly improve ion throughput beneficial for downstream experiments, a 30 keV MR-ToF setup is currently being designed for the Facility for Rare Isotope Beams (FRIB. In this poster, I will present the design of this next-generation MR-ToF device and its simulated performance.

Hung Nguyen

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Seth Jacobson

Presentation Number: 2307

Title: LA LUNA: THE SIZE AND COMPOSITION OF THE MOON-FORMING IMPACTOR

Abstract: The Moon-forming impact was the most significant event during the accretion of the Earth substantially establishing the physical and chemical states of the Earth-Moon system. In the canonical giant impact lunar formation hypothesis, a Mars-sized body (Theia collides with the proto-Earth and the Moon forms out of the resulting circumplanetary disk. However, in this scenario the primary contribution to the composition of the Moon is from Theia, which is problematic given the close isotopic similarity between the Earth and Moon across a range of isotopic systems (e.g. W, O, Si, Ti. Multiple alternative hypotheses have since been proposed including a smaller but faster moving Theia and a nearly equal size Theia and proto-Earth. We consider these different lunar formation hypotheses in the context of a complete model of terrestrial planet formation. Here, we show that the oxidation state of the proto-Earth and Theia have specific relationships to each other and the mass ratio between them in order to reproduces the mantle chemistry of the bulk silicate Earth. On the other hand, different proposed terrestrial planet formation scenarios have different relationships between the composition of the proto-Earth prior to the Moon-forming impact, the amount of mass accreted after the Moon-forming impact (i.e., late accretion, and the timing of the Moon-forming impact.

Gabriella Palombo, Kripa Paudel, Lindsey Geiger, Lucian Forestieri, Makenna Rendeiro

College Affiliated: Grand Valley State University, Michigan State University, Michigan State University, Grand Valley State University, Michigan State University, Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Deborah Herrington , Ryan Sweeder

Presentation Number: 2308

Title: ORDER, DISORDER, AND THE ALGORITHM: FINDING QUALITY ENTROPY CONTENT ON YOUTUBE

Abstract: This project focuses on improving digital chemistry education. It presents a systematic analysis of videos centered around entropy. Using key search terms such as "entropy", "entropy chemistry explained", and "entropy and the second law of thermodynamics," our team identified 28 English-language videos under 15 minutes that were conceptually focused on entropy. While videos with over 100,000 views were prioritized in our research, six videos with lower view counts were accounted for due to the limited availability of content. After initial screening of the videos, 7 were excluded due lack of chemistry focus or being overly calculation-heavy. The remaining 21 videos were coded in depth by 2 faculty and 6 undergraduate students. All members had input on final video consensus, guiding to the final selection of 20 videos. Our analysis revealed some results of the data over the 20 videos that were analyzed. 13 videos (65% covered the Second Law of Thermodynamics, 9 (45% presented entropy as randomness exclusively, 9 (40% included phase changes, and 6 (30% mentioned microstates. Notably, videos posted before 2017 were more likely to frame entropy as randomness, while those from 2021 onward increasingly included microstates and phase transitions. The majority of videos integrated Johnstone's triangle (75% and 3D-learning elements (~50%, with energy as the most prominent crosscutting concept and model representation. Approaches varied across the sample: some videos utilized Boltzmann-based explanations rooted in physical chemistry, while others relied on real-world analogies-such as dye dispersal or melting ice-to illustrate entropy-driven processes. This analysis offers insight into evolving trends in digital science education and highlights opportunities to improve conceptual clarity and scientific accuracy in multimedia chemistry instruction.

Daphne Varmah

College Affiliated: Texas Christian University

Category: Physical and Mathematical Sciences

Mentors: Julie Elliott

Presentation Number: 2309

Title: AN INITIAL ASSESSMENT OF DATA QUALITY AND SIGNAL SOURCES AT GNSS STATIONS IN ALASKA'S ACORN SYSTEM

Abstract: The Alaska Continuously Operating Reference Network (ACORN is an initiative to expand a statewide Global Navigation Satellite System (GNSS network led by the Alaska Department of Natural Resources and the Alaska Department of Transportation and Public Facilities. ACORN is a real-time network of GNSS base stations that stream location information continuously. This network plays an important role in improving positioning accuracy and monitoring ground motion across the state of Alaska.This study focuses on examining the newly developed ACORN network to better understand its performance and the behavior of the Earth's surface at these station sites. Key research questions include: What are the current positions (coordinates of the ACORN stations? How fast are these positions changing over time? What are the expected and reasonable velocity rates at these locations?The main goals are to estimate station velocities, identify whether the movement at each site is stable or shows non-linear trends, and compare the behavior of ACORN stations with nearby GNSS stations. Stations that show unusual or unexpected motion will be listed and further analyzed to understand potential causes. Because Alaska sits on an active tectonic boundary, we expect to see variations in velocity between different regions. Understanding these patterns will help improve our knowledge of Alaska's tectonic activity and support better use of real-time positioning data in the state.

Zachariah Puckett

College Affiliated: Brown University

Category: Physical and Mathematical Sciences

Mentors: Julie Elliott

Presentation Number: 2310

Title: GPS AND THE AMAZON

Abstract: The Amazon rainforest is the largest rainforest in the world, spanning 2.8 million square miles - about 35% of the South American continent. The Amazon River stretches 4,000 miles from the Andes Mountains and flows East toward the Atlantic Ocean. The Amazon River transports the largest volume of water out of any river in the world. The huge volume of water moving through this hydrologic system leaves a measurable impact on the solid Earth. In this project, I characterized the crustal deformation caused by this seasonal hydrological cycle and its contributing factors by analyzing GPS data. I selected 18 GPS sites from across the region based on data quality and location in order to get a broad regional picture of possible variations. Using MATLAB, I analyzed GPS data time series to isolate the seasonal hydrologic signal and remove the effects of earthquakes, equipment changes, and long-term motion caused by tectonic plate motion. I then compared the GPS time series with predictions from hydrological models to determine which possible contributing sources of hydrologic change (including total regional water change, atmospheric water loading, and local hydrologic changes are responsible for the observed deformation. This analysis will provide a better understanding of how hydrologic systems are changing across the Amazon.

Andrew Harms

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Jay Strader , Ryan Urquhart

Presentation Number: 2311

Title: CONSTRAINING THE PREVALENCE OF RADIO-BRIGHT NEBULAE AROUND ULTRALUMINOUS X-RAY SOURCES

Abstract: Ultraluminous X-ray Sources, or ULXs, are among the most luminous X-ray sources in the universe. They are theorized to be stellar-mass black holes and neutron stars accreting at rates higher than thought typically possible for stable systems. The intense radiation emitted by these sources can cause surrounding gas and dust to heat up and emit radio waves. These radio-bright nebulae expand outward from the compact ULX and are often referred to as radio "bubbles". Very few radio bubbles are known, and there is a lot left to learn about them. This project attempts to create a better understanding of their prevalence through a systematic survey of a catalogue of targets. In this research project, I examined radio images from the Australian SKA Pathfinder telescope to find radio bubbles around known ULXs. For targets with no detected bubble, I recorded a background reading to constrain an upper limit of brightness for undetectable bubbles (i.e. what's the brightest a ULX bubble can be and still not get detected. I present this upper limit, and also the first radio detection of a bubble around NGC 925 ULX-1. By placing limits on the occurrence rate of ULX bubbles, my work builds towards a more comprehensive understanding of the population as a whole.

Wilhelm Hawes

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Laura Chomiuk

Presentation Number: 2312

Title: RADIO OBSERVATIONS OF NOVAE WITH EVOLVED COMPANIONS

Abstract: Classical novae occur in binary systems when a white dwarf accumulates the material from their companion star and causes a thermonuclear eruption in the accreted material. The eruptions emit detectable radiation from a range of wavelengths. Radio observations are useful when studying classical novae eruptions, as they are not impacted by dust and gas. We can use radio observations to study the physical characteristics of the white dwarf and the eruption. Here we study seven novae, V723 Cas, V5589 Sgr, V407 Cyg, V1535 Sco, V392 Per, V1534 Sco, and RS Oph in radio wavelengths. We plot and analyze their radio light curves, estimate their brightness temperature and characterize these novae. We are able to determine the main source of the radio emission and how quickly the radio light curve declines.

Joseph Busch

College Affiliated: Haverford College

Category: Physical and Mathematical Sciences

Mentors: Pengpeng Zhang , Yasemin Ozbek

Presentation Number: 2313

Title: STRAIN EFFECTS IN SEMICONDUCTOR HETEROSTRUCTURES

Abstract: Strain effects in semiconductor lattice structures influence the electronic properties that these structures exhibit. These strain effects may be engineered to produce the properties needed for novel electronic devices. Here, we study the effects of strain on two-dimensional materials such as, Indium Selenide (In2Se3, Niobium Selenide (NbSe2 and associated heterostructures grown with Molecular Beam Epitaxy (MBE. Our main goal is to understand the relationship between strain and Indium Selenide lattice structures, and their associated ferroelectric properties. Samples were characterized using Scanning Tunneling Microscopy, and the resulting images were analyzed using a two-dimensional Fast Fourier Transform (2D FFT to extract reciprocal lattice information. Geometric phase analysis techniques and the Lawler-Fujita algorithm were then applied to analyze the strain patterns present in our reciprocal lattice and STM images. Our findings contribute to a deeper understanding of how intrinsic strain in MBE grown 2D materials influences their electronic behavior, guiding the development of straintronics.

Kennedy Gurski

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Jay Strader

Presentation Number: 2314

Title: SETTING CONSTRAINTS ON THE PRESENCE OF IMBHS INSIDE THE LMC USING MEERKAT

Abstract: Intermediate-Mass Black Holes (IMBHs are the missing link in black hole formation models, and their presence in local galaxies like the Large Magellanic Cloud (LMC remains uncertain. We aim to identify accreting IMBHs in LMC star clusters by matching optical and radio data. If no radio counterparts are detected, then limits will be set on the presence of accreting IMBHs in these clusters.

Geraldine Gallegos Romero

College Affiliated: St. Augustine College at Lewis University

Category: Physical and Mathematical Sciences

Mentors: Christoph Adami

Presentation Number: 2315

Title: TESTING A NOVEL MACHINE LEARNING METHOD ON STANDARDIZED DATA SETS AND NUCLIDE DATA

Abstract: The goal of this research is to apply a novel machine learning (ML method that is based on information theory in the search for promising radioactive nuclei that can be used at MSU's FRIB accelerator. This method, implemented in the program "IDSeq" ("Information Decomposition for Sequences", has previously been shown to be superior to more standard ML models based on neural networks, which are machine learning models designed to simulate human thinking processes. To create the infrastructure necessary to perform this research, we will first use IDSeq to classify images rather than nuclides. For this we will use the software application Jupyter Notebook, the programming language Python, and the IDSeq software, along with data from the MNIST database, to develop a pipeline that can ultimately be used for estimating the binding to classify the hand-written digits from the MNIST database, we will separate the images into a "training set" (60,000 images and a "test" set (10,000 images, and create position weight matrices with the training images. The accuracy of the classification with IDSeq will be evaluated by calculating the fraction of correctly predicted test images. Once this step has been successful, we can adapt the classification pipeline to the over 3,000 nuclides in the NUBASE database.Since this study is still in progress, the information presented here reflects early insights and understandings that may evolve as more results become available.

Makaila Parks

College Affiliated: Spelman College

Category: Physical and Mathematical Sciences

Mentors: Paul Gueye

Presentation Number: 2316

Title: VISUALIZING THE NEUTRON SKIN: MODELING ISOTOPE DENSITIES FOR MONA-LISA EXPERIMENTS

Abstract: Understanding the internal structure of atomic nuclei is essential to advancing rare isotopic research and interpreting data from experimental facilities such as the Facility for Rare Isotope Beams (FRIB. This project focuses on modeling and visualizing the charge and matter density distributions of key isotopes, Magnesium-33, Carbon-12, Iron-56, and Lead-208 using computational simulations. These isotopes span a broad range of mass numbers and neutron-to-proton ratios, making them valuable case studies for exploring nuclear structure trends. Using Python, I implemented the Fermi distribution (also known as the Woods-Saxon model, expressed as (r = / [1 + exp((r R/a], where represents central nuclear density, R is the nuclear radius, and a is the skin depth or surface diffuseness. This equation models how nucleons are spatially distributed within the nucleus and how density falls off near the surface. By adjusting these parameters for each isotope, I examined how differences in nuclear geometry influence properties like central compactness and neutron skin thickness. My analysis reveals clear variations in density profiles that correlate with mass number and the neutron-to-proton ratio, with neutron-rich isotopes exhibiting thicker nuclear skins and more diffuse matter distributions. These trends have direct implications for experimental setups involving neutron detectors like MoNA-LISA, as understanding the spatial configuration of nuclear matter informs both detector design and data interpretation. Ultimately, this computational approach offers a visual and quantitative framework for bridging theoretical nuclear models with experimental observations, contributing to the broader goals of nuclear structure research at FRIB.

Pranav Agarwal

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Hendrik Schatz

Presentation Number: 2317

Title: POSITION CALIBRATION OF SECAR'S MCP DETECTOR AT FRIB

Abstract: Many elements in the universe are formed deep within stars through nuclear reactions. One important class of these reactions involves the capture of charged particles, such as protons or alpha particles, by atomic nuclei. To study these rare events, facilities like SECAR (Separator for Capture Reactions reproduce such reactions under controlled laboratory conditions and count the resulting products, or recoils, to determine reaction rates. A key component of this measurement process is the Microchannel Plate (MCP detector, which distinguishes true recoils from unreacted beam particles and background noise by analyzing the spatial distribution of particles as they pass through the detector. To ensure the accuracy and resolution of the MCP's spatial information, precise calibration and testing are essential. This project focused on improving the spatial calibration of the MCP, thereby enhancing SECAR's ability to reliably measure charged-particle capture reactions and furthering our understanding of how the elements in the universe are formed.

Einstein Dhayal

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Franziska Maria Maier

Presentation Number: 2318

Title: TOWARDS CLEANER ION BEAMS: CONTAMINANT REMOVAL STUDY FOR FRIB'S FUTURE MR-TOF MASS SEPARATOR

Abstract: The Facility for Rare Isotope Beams (FRIB is a state-of-the-art rare-isotope beam facility capable of producing short-lived, ultra-rare nuclides whose study advances our understanding of nuclear structure, astrophysical processes, and fundamental nuclear interactions. However, production of these nuclides is accompanied by contaminating ion species which prevent many scientific investigations. To address this issue, a Multi-Reflection Time-of-Flight (MR-TOF device is in development at FRIB. It will be the first MR-ToF device worldwide capable of ion storage at 30 keV beam energy, significantly increasing the ion intensity of the purified ion beam [1].As the ions bounce back and forth between two electrostatic mirrors, they separate in time-of-flight according to their mass-to-charge ratio. Once contaminants are separated from the ions of interest, they need to be removed. Various methods exist for current state-of-the-art 2 keV MR-ToF devices, see e.g. Ref [2,3], but their performance at higher beam energies was unexplored.We performed comprehensive ion-optical simulations and physical laboratory tests to quantify their performance at our increased beam energy of 30 keV. The presentation provides an evaluation of each method, detailing both successes and limitations. Based on these findings, we identify and recommend the optimal contaminant removal solution for FRIB's future highly selective and high-ion-throughput MR-ToF device.[1] Maier, F.M.M. et al., NIMA 1056, 168545 (2023; [2] Wolf, R. N et al, IJMS, 349-350, 123-133 (2013; [3] Wienholtz, F. et al, IJMS, 421, 285-293 (2017.

Lindsey Hickman, Skylar Milne

College Affiliated: Michigan State University, Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Jaideep Singh

Presentation Number: 2321

Title: PROGRESS IN THE SEARCH FOR TIME-REVERSAL VIOLATION WITH PEAR-SHAPED NUCLEI

Abstract: The existence of the visible part of the universe is thought to be due to subatomic forces unlike each other when you reverse the arrow of time. The Radium Electric Dipole Moment experiment, hosted at Argonne National Lab, is designed to search for these exotic subatomic forces using atomic clocks. A time-reversal violation is indicated by a difference in two atomic clocks oriented clockwise and counterclockwise with respect to an electric field. Radium nuclei are used as these clocks because of their pear-shaped deformations, allowing for a clock rate difference possibly one thousand times that of non-deformed nuclei. The clock rate difference is proportional to the magnitude of the electric field. To reduce false signals and enable a control experiment insensitive to exotic forces, our apparatus must be able to reverse the electric field orientation. We measure differences in four combinations: each clock faces a different direction and the electric field is switched from up to down. During this switch, the high voltage must be off. Once the electric field direction has flipped, it must be turned back on again. This is done with a Solid State Relay (SSR, which is where the high voltage is applied. Through a connected computer signal, it controls and turns off the electric field. The SSR, along with other necessary elements, is housed in an interface box we are designing, fabricating, and testing. This work is supported the U.S. DOE, Office of Science, Office of Nuclear Physics, under contracts DE-AC02-06CH11357 and DE-SC0019455 and DE-SC0025679

Sushit Tanay

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Jay Strader , Kwangmin Oh

Presentation Number: 2322

Title: GLOBULAR CLUSTER X-RAY SOURCE IDENTIFICATION

Abstract: Globular clusters are densely packed systems of stars, and it is found that they have a variety of exotic objects like low-mass X-ray binaries, cataclysmic variables, and millisecond pulsars. Many of these objects are X-ray emitters, and Chandra X-ray Observatory is a perfect observatory for investigating such systems. The project consists of detection and X-ray point-source analysis in a selected globular cluster from archival Chandra data with application of the CIAO software package.The raw event data are first reprocessed to create cleaned images in multiple energy bands. The wavdetect tool is then utilized to determine possible X-ray sources for variable point spreads as well as for background levels. The position, net count, and flux of the sources are computed and used in creating an initial catalogue. The initial classification of sources is performed by position matching using available optical and infrared catalogues.Multi-wavelength analysis, where X-ray sources are contrasted with well-understood cluster stellar populations, will be performed at later stages of the project in order to ascertain possible types of sources. Identification is part of what is already understood regarding dynamical interaction and binary evolutionary scenarios in globular clusters. Ultimately, the project illustrates that high-resolution X-ray imaging is an effective technique for identifying compact object populations in closely packed stellar environments.

Steven Nkurunziza

College Affiliated: Grand Rapids Community College

Category: Physical and Mathematical Sciences

Mentors: Shannon Biros

Presentation Number: 2323

Title: SYNTHESIS OF ARYL PHOSPHINE OXIDES AS LIGANDS FOR LANTHANIDE COORDINATION CHEMISTRY

Abstract: This poster describes the synthesis of (2-methoxyphenyldiphenylphosphine via Grignard chemistry. This phosphine was oxidized to the phosphine oxide and complexed with a variety of Ln(OTf3 salts. The complexes were characterized by NMR, MS and IR spectroscopy.

Adalyn Gibson

College Affiliated: University of Colorado Boulder

Category: Physical and Mathematical Sciences

Mentors: Adina Feinstein

Presentation Number: 2324

Title: ATMOSPHERIC CHARACTERIZATION THE 45 MYR PLANET, DS TUC AB

Abstract: We do not understand how planets form and how they evolve. Observations of young exoplanet atmospheres may act as stepping stones to address these fundamental questions. Here, we use high-resolution spectroscopic observations obtained with Gemini-S/Immersion Grating Infrared Spectrometer (IGRINS to investigate the atmospheric properties of the 45 Myr planet DS Tuc Ab. We employ a range of traditional and novel techniques to analyze these spectra, aiming to isolate a signal from the planet's atmosphere. First, we fit for the temperature of the host star and find an average temperature of $T_\textrm{eff} = 5722.0 \ \pm 88.33 \ K$. With this $T_\textrm{eff}$ as a prior, we employ a modified version of a machine learning tool called \texttt{blas'e}, which allows us to simultaneously fit for the stellar spectrum, atmospheric telluric absorption features, and instrumental systematics. Second, we use a principal component analysis to remove the stellar and telluric signals. We cross-correlate our decontaminated spectra with a model for the planets atmosphere to search for evidence of water, carbon monoxide, and methane. From our initial results, we generate synthetic James Webb Space Telescope (JWST spectra. The atmospheric composition of DS Tuc Ab we find here can inform future atmospheric characterization efforts with facilities such as JWST, enhancing our understanding of the evolution of planetary atmospheres.

Gabriel Dennis

College Affiliated: Wilbur Wright College

Category: Physical and Mathematical Sciences

Mentors: Ryan LaRose

Presentation Number: 2325

Title: ANALYSIS OF ERROR CORRECTING SCHEMES EFFECT ON SIMULATED QUANTUM NETWORKS

Abstract: Noise leads to the corruption of quantum information in quantum networks, translating to the loss of information and corruption of transmitted states during applications of protocols. Therefore, improvements in fidelity are necessary for the development of quantum applications and the quantum internet. This study investigates simulated quantum networks under noisy conditions and analyzes the effectiveness of bit-flip-specific error correcting codes for error mitigation. By examining the evolution of simulated quantum systems, their interactions with various gates within engineered environments, we evaluate relevant performance metrics such as but not limited to fidelity and throughput across different scenarios. We explore how different network topologies and configurations affect factors such as but not limited scalability, and latency influence how we determine the effectiveness of error correcting schemes. Our results show the effect tailored error correcting codes have on fidelity especially when combined with network topologies that influence transmission errors and routing efficiency. Developing efficient methods for noise reduction in quantum networks will directly advance scalable quantum computing architectures, enhance the security of quantum key distribution, improve the reliability of quantum repeaters, and support robust quantum communication systems overall.

Keshun Nelson

College Affiliated: Norfolk State University

Category: Physical and Mathematical Sciences

Mentors: Melanie Chiu

Presentation Number: 2326

Title: A COMPUTATIONAL AND SYNTHETIC INVESTIGATION OF LEWIS BASICITY CHANGES IN PHOTOSWITCHABLE N-HETEROCYCLIC OLEFINS

Abstract: N-heterocyclic olefins (NHOs are electron-rich, polar, superbases that have been developed as prominent organocatalysts. Photoswitchable NHOs are molecules that exhibit light-responsive electronic properties with the potential to control the Lewis basicity with light during chemical reactions, enhancing their performance as a selective catalyst. This study investigates the extent to which Lewis basicity changes upon photoswitching NHOs. While previous work has examined basicity trends in saturated and unsaturated NHOs relative to their N-heterocyclic carbene (NHC counterparts, little is known about how light-induced structural changes affect their basicity. To address this, we computationally modeled photoswitchable NHOs and non-switchable control compounds using Neural Network Potentials (NNP and density functional theory (DFT in Rowan. These computations predict how much the basicity of NHOs will change upon photoswitching. For each isomer, geometry optimization was performed to obtain thermochemical data. Fukui index calculations identified the most nucleophilic site, which was then protonated to compute proton affinity differences. The open isomer showed greater nucleophilicity and Lewis basicity than its closed counterpart. These differences were significantly more pronounced than those seen in control compounds, validating our computational approach. These results provide strong support that photoisomerization enables selective, tunable reactivity, as the open isomer is more reactive and the closed isomer is more selective, which is essential for selective polymerization. This guides the next phase of our project, which is synthesizing photoswitchable NHOs to catalyze selective polymerization. By modulating Lewis basicity with light, we aim to achieve precise control over polymer growth and selectivity, enabling sustainable, smart catalytic systems.

Trenton O'Bannon

College Affiliated: UC Berkeley

Category: Physical and Mathematical Sciences

Mentors: Elizabeth Munch Nkechi Nnadi

Presentation Number: 2327

Title: QUANTIFYING APPROXIMATE SYMMETRY USING THE EULER CHARACTERISTIC TRANSFORM

Abstract: Symmetry is common in biological forms, yet few methods exist to detect and quantify approximate symmetry in a robust and automated manner, especially in noisy or irregular shapes. This project examines how tools from topological data analysis can be utilized to bridge that gap. We focus on the Euler Characteristic Transform (ECT, which encodes a shape by tracking changes in its topology (e.g., number of pieces or holes as we scan the shape from multiple directions. Unlike many other shape descriptors, the ECT has provable theoretical guarantees, meaning it can uniquely identify a shape up to a specific set of transformations. Our approach builds on this property by comparing the ECT of a shape with rotated versions of itself. These comparisons are recorded as differences between matrices representing directional scans of the shape. By analyzing how this difference changes with rotation angle, we can identify directions where the shape aligns most closely with itself, corresponding to axes of approximate symmetry. While past work has examined symmetry in biological development using pixel-level image features, our method is grounded in topology. It offers a more interpretable and generalizable framework. Early results indicate that this technique can robustly identify symmetry in 2D shapes, even in the presence of imperfections. In the future, this framework could be extended to reflection symmetry or 3D structures, with applications in developmental biology, medical imaging, and object recognition.

Alejandra Davalos

College Affiliated: Indiana University Bloomington

Category: Physical and Mathematical Sciences

Mentors: Julie Elliott

Presentation Number: 2328

Title: USING GEODESY TO UNDERSTAND THE HYDROLOGIC VARIATIONS IN COSTA RICA

Abstract: Costa Rica is situated close to the equator in a geologically active area, as it is located along the boundary between two tectonic plates (the Caribbean and Cocos Plate. Costa Rica experiences considerable variations in rainfall, humidity, and weather throughout the year due to its location between the Pacific Ocean and Caribbean Sea, its mountain ranges, seasonal patterns, extreme rainfall events, and El Niño-Southern Oscillation (ENSO, among other factors. These regional hydrologic patterns are associated with measurable surface deformation. Geodesy is a science used to analyze changes in the Earth's shape, and using geodetic data, such as GPS, allows us to measure this deformation. This study investigates the seasonal hydrologic behavior and its impact on the solid Earth in Costa Rica by analyzing continuous GPS data from 14 sites in Costa Rica and Panama. Time series of horizontal and vertical GPS data were created to observe the trends in crustal deformation. The time series were corrected for noise and offsets associated with tectonic activity, equipment-related changes, and postseismic motion. The resulting time series will illustrate patterns of seasonal surface deformation, allowing an analysis of hydrologic changes over time by comparing it with hydrologic models from the GRACE mission (Gravity Recovery and Climate Experiment and several other sources.

Lily McCadden

College Affiliated: Villanova University

Category: Physical and Mathematical Sciences

Mentors: Julie Elliott

Presentation Number: 2329

Title: A GEODETIC LOOK AT THE TECTONIC KINEMATICS AND BLOCK MOTION IN EASTERN RUSSIA AND WESTERN ALASKA

Abstract: Eastern Russia, western Alaska, and the Bering Sea form a complex tectonic region, influenced by the interaction and deformation associated with both major and minor plates, including the North American, Eurasian, and Pacific plates. Despite this area's tectonic significance and potential for damaging earthquakes, the kinematics of this area are not fully understood, particularly the motion of smaller blocks and their relationship to large-scale plate rotation. Accurately characterizing the motion and interactions within this zone is essential for understanding relative plate movement and assessing seismic hazard in this region. To improve our understanding of the Bering region, we analyze available GNSS data from continuous and campaign GPS stations in eastern Russia and western Alaska. We utilize programming tools to analyze GPS time series data in the North, East, and Vertical components, enabling us to understand the movement of each site, and correct for seasonal oscillations, equipment changes, and offsets caused by large earthquakes, including the 2021 M8.2 Chignik, 2018 M7.9 Kodiak, and 2020 M7.8 Simeonof events to isolate long-term tectonic signals. We use this information to create a velocity field relative to North America and segment the plates into tectonic blocks before estimating Euler poles to determine the plate rotations and capture the complexity of this region more effectively. Our findings will provide valuable insights into the tectonic behavior of eastern Russia and western Alaska and establish a geodetic framework for understanding plate interactions within this segment of the North Pacific margin.

Atsuhiro Yaginuma

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Darryl Seligman

Presentation Number: 2330

Title: THE DISCOVERY AND INITIAL CHARACTERIZATION OF THE THIRD INTERSTELLAR OBJECT 3I/ATLAS AND THE FEASIBILITY OF A SPACECRAFT FLYBY/RENDEZVOUS

Abstract: In this presentation I will review the discovery and initial characterization of the third macroscopic interstellar object discovered traversing the Solar System: 3I/ATLAS. The object was discovered on 2025 July 1 UT and has an orbital eccentricity of $e\sim6.1$, perihelion of $q\sim1.36$au, and inclination of $\sim175^\circ$. Along with a team of astronomers across the world, we obtained discovery and preliminary characterization observations that I will review here. These observations demonstrated that the object displayed (i cometary active, (ii a reddened reflectance spectrum, and (iii low magnitude or no brightness variations. Additionally, I will present a feasibility analysis of sending a spacecraft to 3I/ATLAS launched from the Earth or Mars to obtain measurements from our third interstellar visitor.

Vaibhav Chhajed

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Jackson Barnes Seth Jacobson

Presentation Number: 2332

Title: PLANETESIMAL FORMATION FROM PEBBLE CLOUD COLLAPSE: EFFECTS OF ROTATION AND SIZE DISTRIBUTION

Abstract: Planetesimals-the building blocks of planets-form from the gravitational collapse of pebble clouds in protoplanetary disks. This project investigates how the initial size distribution and rotation rate of these pebble clouds influence the physical properties of the resulting planetesimals, such as their shapes, densities, and tendency to form binary systems. Using the N-body simulation code PKDGRAV with self-gravity and soft-sphere collision modeling (SSDEM, we simulate both monodisperse and polydisperse pebble clouds under varying rotational conditions. Our results show that monodisperse clouds tend to form more compact, spherical, and denser bodies, while polydisperse clouds lead to more irregular and less dense planetesimals due to internal packing variation. Additionally, faster rotation favors binary formation and body flattening, while slower spin rates promote more spheroidal shapes. These findings provide new insights into early planet formation and may help explain observed properties of asteroids and Kuiper Belt objects. This research was conducted under the guidance of Dr. Seth Jacobson and Jackson Barnes.

Troy Dasher

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Ante Ravlic

Presentation Number: 2333

Title: WEAK PROCESSES IN SUPERNOVAE

Abstract: The role of weak interactions in core-collapse supernovae (CCSN is critical to understanding both the dynamics of collapse and the neutrino-driven feedback that shapes the explosion. A key question in this area is the relative contribution of different weak processes to the neutrino emission in stellar cores. Previous research has focused on electron capture as the dominant weak process. However, preliminary analysis from our group revealed that for certain nuclei under specific temperature and density conditions, beta decay competes with the electron capture rate. To address this, we developed a high-performance computational pipeline using the NuLib neutrino interaction library to compute average energies and emissivities, which are then integrated into the GR1D supernova simulation code so that we can see how different weak interaction rates affect CCSN evolution. The next phase finds beta decay rates over a large range of nuclei calculated using density functional theory (DFT and quasiparticle random-phase approximation (QRPA. Preliminary results suggest that beta decay may play a more substantial role in core-collapse dynamics than previously assumed. These findings have important implications for our understanding of neutrino transport, energy deposition, and the broader modeling of stellar explosions and nucleosynthesis.

Ryan Groneck

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Adina Feinstein

Presentation Number: 2334

Title: DETECTING HOT-JUPITER EXOPLANETS AROUND YOUNG STARS IN TESS DATA

Abstract: Despite the hundreds of discovered giant planets on short orbital periods, known as Hot Jupiters (HJs, we still do not understand how they form. HJs are believed to form farther from their host star and migrate in, however the timescales of these processes has yet to be constrained.In my research, I am developing a Python-based pipeline that integrates several existing tools to systematically search for HJs as a function of age, with the objective of constraining formation and migration timescales.To do this, I am using observations from NASA's Transiting Exoplanet Survey Satellite (TESS, which provides high-cadence photometry for millions of stars. Toquantify the detection efficiency of my pipeline, I performinjection-recovery tests, where synthetic exoplanettransitsare added to real light curves and then recovered by the pipeline.My preliminaryresults suggest we should detect ~65% of all HJs with radii 15% of their host star's radius and periods 6 days.Over the next year, I will apply this pipeline to a catalog of young stars. Whetheror notwe detect HJs around young stars, the results will provide important insights into the timing and mechanisms of gas giant formation and migration.

John Isabel

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Sierra Casten

Presentation Number: 2335

Title: SIMULATING HYDROGEN TRIGGERED X-RAY BURSTS ON SLOWLY ACCRETING NEUTRON STARS WITH MESA

Abstract: Neutron stars often come in binaries with a low-mass companion that accretes hydrogen-rich material onto its surface, causing a thermonuclear explosion called an X-ray Burst. These X-ray bursts last 10-100s and cause a large spike in the star's luminosity that can be detected. It was originally thought, until recently, that all observed thermonuclear X-ray bursts are triggered by the thermally unstable 3-process. Recently, observations of weak X-ray bursts from SAX J1808.4- 3658 were seen to be plausibly triggered by thermally unstable CNO burning. This raises the question of unstable ignition of hydrogen on slowly accreting neutron stars. Using MESA, the stellar evolution code, we simulate hydrogen-triggered bursts; we explore how changing the accretion rate, metallicity of the accreted material, and surface gravity affect the burst profile and ignition depth. For high metallicities, we can produce a peak luminosity similar to that from SAX J1808.4- 3658.

An Le

College Affiliated: Michigan State University

Category: Physical and Mathematical Sciences

Mentors: Christopher Baldwin

Presentation Number: 2336

Title: ADIABATIC REVERSE ANNEALING IN THE PRESENCE OF NOISE

Abstract: Many ambitious goals in science and engineering require solving hard optimization problems involving a large number of variables. Examples include drug design, traffic flow optimization, and machine learning. Quantum Annealing (QA is a branch of quantum computing that exploits quantum fluctuations to solve these problems. It is well known that in certain circumstances, QA suffers from first-order quantum phase transitions (1QPTs that lead to exponential run time, eliminating any advantage over classical algorithms. To address this limitation, adiabatic reverse annealing (ARA has been proposed as an effective alternative that suppresses these 1QPTs in closed systems. However, some recent studies have suggested, on the basis of numerical simulations, that this protocol may fail in the presence of noise, as all near-term quantum computers will be subject to. In this project, we will analytically diagnose the effects of noise on ARA using path-integral techniques applied to solvable mean-field models, quantifying both the steady states and dynamical properties of the systems. We will determine their non-equilibrium phase diagrams to identify whether and how the suppression of 1QPTs indeed disappears in the presence of noise. These findings will offer a perspective on whether ARA remains a viable quantum algorithm in noisy environments, crucial for understanding its practical potential for quantum optimization applications.

Annah Frost   Fatme Ismail

College Affiliated: University of Michigan – Dearborn, university of michigan- dearborn

Category: Physical and Mathematical Sciences

Mentors: Bushra Hussain

Presentation Number: 2337

Title: SPIN WAVE MODE ANALYSIS OF VERTICALLY DEVELOPED SQUARE FERROMAGNETIC NANOSTRUCTURES

Abstract: In our research we are investigating the spin wave in a nanostructure consisting of a ferromagnetic square of a nanoring placed on a top of a ferromagnetic square disk. This work is a part of a larger study focused on how vertical design affects magnetization dynamics in nanoscale materials. This structure uses a nickel-iron alloy, which is commonly used in many magnetic devices. An external magnetic field is applied to switch between different magnetic states in the structure. An objective is to find the discrete spin wave modes. The magnetic interactions included in this study are the quantum mechanical exchange, and the long-rangeelectromagnetic dipole-dipole interactions.

Smyth Fleming

College Affiliated: Eckerd College

Category: Physical and Mathematical Sciences

Mentors: Jeffrey Freymueller , Julie Elliott

Presentation Number: 2338

Title: COMPARING HYDROLOGICAL DEFORMATION MODELS TO GPS DATA IN AND AROUND KYRGYZSTAN

Abstract: Kyrgyzstan is a country in central Asia, surrounded and largely dominated by the Tian Shan mountain range. This rugged environment, with potential large seasonal changes in the hydrologic system due to snow accumulation and melting, make it an ideal laboratory to study the impacts of hydrologic change on the solid Earth and potential future variations as climate changes. The country (and surrounding regions have a number of continuous GPS sites which can be used to measure surface deformation at daily resolutions, which means that long-term cycles like seasonal changes can be modeled with high accuracy. Time series of GPS data show that Kyrgyzstan has a large seasonal fluctuation in height, indicating hydrologic variation. This project compares hydrological models derived from GRACE to GPS data to find the best model for seasonal hydrologic changes in and around Kyrgyzstan. As climate change continues to melt glaciers, this region may begin to change drastically, and having a more thorough understanding of hydrologic change (and how to model this change will inform hazard assessment and water use issues.

Plant Science

Dominik Zelek

College Affiliated: Michigan State University

Category: Plant Science

Mentors: James Moran

Presentation Number: 2401

Title: SWITCHING IT UP: SPATIAL CHITIN AVAILABILITY IN SOIL CHANGES GROWTH DYNAMICS OF SWITCHGRASS

Abstract: We investigated the impact of spatially distributed chitin as an organic nitrogen (N source by comparing switchgrass (Panicum virgatum, var. Cave-in-Rock grown in a field soil mixture with chitin homogenously distributed versus presented in four pressed heterogeneously distributed pellets. All plants had access to the same total mass of chitin despite treatment type. The plants were grown for ~17 weeks under greenhouse conditions with plant height recorded twice weekly. At the conclusion of the experiment, we measured plant above-and below-ground biomass and used light microscopy to quantify plant root colonization by arbuscular mycorrhizal fungi, finding that heterogenous plants had higher colonization(p=0.074; n=5.Switchgrass grownwith chitin pellets grew taller (0.001and produced increased biomass (0.001 compared to plants grown in soil with homogeneously distributed chitin. In addition, plants grown with chitin pellets had a lower root-to-shoot ratio than those grown with evenly distributed chitin, suggesting that the presence of the pellets impacted root morphology. Finally, we used stable isotope analysis (15N to determine that plants grown with chitin pellets acquired more of their biomass N from chitin rather than available soil N as compared to homogenously distributed chitin grown plants (0.05. We demonstrated that organic chitin-derived N can improve switchgrass growth, and that heterogeneously distributed chitin hotspots further support N acquisition versus an even chitin distribution.

Savannah Himebaugh

College Affiliated: Michigan State University

Category: Plant Science

Mentors: Rachel Kerwin

Presentation Number: 2402

Title: ROOT ACYLSUGARS CHANGE IN TOMATOES ACROSS DEVELOPMENT

Abstract: Plants in the Solanaceae family including cultivated tomato (Solanum lycopersicum and wild tomato (S. pennellii produce acylsugars, a type of specialized metabolite, that are critical to herbivory defense. Acylsugars are composed of a sugar core decorated with acyl chains. Acylsugars are known to accumulate in trichomes (leaf and stem hairs as well as young root hairs in both tomato species. Trichome acylsugars act as sticky fly paper, but the function of root acylsugars is unknown. Trichome and root acylsugars are produced in dedicated cells through independent biosynthetic pathways with distinct enzymes. The trichome pathway synthesizes acylsucroses in both tomato species and acylglucoses in wild tomato, while the root pathway produces inositol-based acylsugars in young roots of both species. Preliminary evidence shows that roots of mature cultivated tomato produce structurally different acylsugars from trichomes and young roots suggesting the presence of a third biosynthetic pathway. This project aims to characterize root acylsugar profiles in cultivated and wild tomato across development and compare the profiles across age and tissues within and between the two species. The second part of this project is to identify when the developmental transition occurs in order to identify candidate genes for the hypothesized mature root acylsugar pathway. I grew cultivated and wild tomatoes hydroponically, collected tissue samples at 12 time points ranging 10-120 days, and analyzed the acylsugar profiles using liquid chromatography-mass spectrometry (LC-MS.

Eleiezer Majambere

College Affiliated: Davidson College

Category: Plant Science

Mentors: Derek Denney , Emily Josephs

Presentation Number: 2403

Title: GENETIC DIVERGENCE IN FLOWERING GENES LIMITS GENE FLOW IN CHAMAECRISTA FASCICULATA

Abstract: Flowering time in plants determines when individuals can exchange pollen, and mismatches in timing between populations can lead to reproductive isolation. This challenge puts some plant species at risk of extinction, particularly those unable to adjust their flowering schedules in response to changing environments. Chamaecrista fasciculata has adapted to diverse environments with variants in photoperiod sensitivity in different latitudes, indicating a genetic basis for local adaptation. Understanding local flowering cues and the genetic bases of flowering genes will be critical in designing effective conservation measures and interventions, such as assisted gene flow, to enhance their adaptability across different latitudes. In this experiment, we expect to find genetic divergence in flowering time genes that contributes to phenological mismatches that limit gene flow and affect the success of assisted colonization. To uncover flowering genes involved, we used known flowering genes from Arabidopsis thaliana and Glycine max to identify putative orthologs in Chamaecrista fasciculata. Protein sequences for these genes were retrieved and used as queries in BLASTP searches against the predicted proteome of Chamaecrista fasciculata. Putative orthologs were identified based on best reciprocal hits (RBH, revealing candidate genes potentially linked to photoperiodic flowering. We then examined gene duplications to uncover possible paralogs within the flowering pathway and scanned the genome using SweeD to check for any signs of selection on those flowering genes. These scans will be used to determine if flowering-time loci are under divergent selection between northern and southern populations of Chamaecrista fasciculata.

Lili Winkelman

College Affiliated: Williams College

Category: Plant Science

Mentors: Alexandra Kravchenko , Gokul Gaudel , Maxwell Oerther

Presentation Number: 2404

Title: MAPPING AND QUANTIFICATION OF HYDROLYTIC AND OXIDATIVE ENZYME ACTIVITY IN SORGHUM RHIZOSPHERES

Abstract: Sorghum (Sorghum bicolor is a promising feedstock for biofuel production. However, the belowground dynamics of sorghum cropping systems are not well understood. Activity of hydrolytic enzymes in the rhizosphere, such as beta-glucosidases, chitinases, and phosphatases, is a good indicator of overall nutrient cycling and typically indicates robust plant growth. Oxidative enzymes (such as phenol oxidases and peroxidases break down much larger organic compounds in the soil, such as lignin, and have not really been studied before in the context of live roots. Breakdown of these larger compounds could be an important piece of the puzzle of how sorghum can contribute to soil carbon gains.This study aims to quantify and map activity of three hydrolytic enzymes and two oxidative enzymes in older and younger portions of sorghum rhizospheres across two different soil types: one with a finer texture and less available carbon and phosphorus, and the other with a coarser texture and more available carbon and phosphorus.Plants were grown in rhizoboxes under controlled greenhouse conditions. We found preliminary evidence that soil texture and nutrient availability may influence hydrolytic activity, and that there may also be a soil-dependent elevation of enzyme activity in younger roots. We also found that oxidative enzyme activity is not affected by soil type and root age in the same way as hydrolytic enzymes. These results offer insights into the carbon sequestration potential of sorghum cropping systems, while supporting soil health and maximizing biomass yield in sustainable bioenergy production.

Reyna Atkinson

College Affiliated: Michigan State University

Category: Plant Science

Mentors: Ann Feke , Eva Farre Prokosch

Presentation Number: 2405

Title: THE LINK BETWEEN CIRCADIAN PERIOD AND PHOTOPERIODIC TUBERIZATION RESPONSES IN WILD POTATO

Abstract: This research investigates the role of a potato's circadian period in regulating tuberization within different photoperiods. A previous experiment conducted by our team included two plants each from nine species of potato, one with a long circadian period and one with a short circadian period. We then measured tuberization time in both the inductive short-day condition and one the inhibitory long-day condition.Resulting data revealed a strong correlation between a longer circadian period and the ability to tuberize under inhibitoryconditions. Building upon these findings, our current experiment is designed to examine the strength of said inhibition within a single species. Our current design for this study involves growing 20 different accessions of Solanum microdontum under long-day conditions to observe and analyze their tuberization responses. This species was chosen due to its strong correlation between circadian period and tuberization and its wide range of circadian periods. Because this species has such a large range, we are able to examine how plants with long circadian periods and short circadian periods react to long day cycles.

Sophia Gudinas

College Affiliated: Michigan State University

Category: Plant Science

Mentors: Erich Grotewold

Presentation Number: 2406

Title: MOLECULAR AND GENETIC CHARACTERIZATION OF CRISPR-CAS9 INDUCED MUTATIONS IN MAIZE TRANSCRIPTION FACTORS MYB31 AND MYB5

Abstract: Maize is an important crop because of its nutritional value, industrial significance, and environmental impact. Phenolic compounds, produced by the phenylpropanoid pathway, such as anthocyanins, lignin, and flavonoids are specialized metabolites that perform a variety of functions in plant growth and development as well as the abiotic and biotic stress response (Fornale et al., 2010, Gomez-Cano et al., 2020. While many genes involved in maize phenylpropanoid biosynthesis are known, how the pathway is regulated is less well understood. Several transcription factors (TFs have been identified as potentially important regulators of the pathway, but the consequences of loss-of-function of these TFs on metabolism and development remain unknown in maize. This research will consist of investigating the consequences of mutating the genes corresponding to ZmMYB31 and ZmMYB5 and their relationship to the production of phenolic compounds. By functionally characterizing these transcription factors in CRISPR-edited maize plants, we expect to observe their role in regulation of phenolic compounds. This anticipated function is based on their association with phenylpropanoid gene regulation, and their targeted manipulation can significantly improve the growth and development of maize plants.

Benedict Shi

College Affiliated: Middlebury College

Category: Plant Science

Mentors: Jiming Jiang

Presentation Number: 2407

Title: SUBGENOME A TAKES THE LEAD: CHROMATIN AND FUNCTIONAL PATHWAY ANALYSES IN CULTIVATED STRAWBERRY

Abstract: The strawberry industry in the United States is valued at over $3 billion annually. Improving cultivated strawberry (Fragaria x ananassa varieties through targeted breeding strategies can enhance traits such as fruit quality and disease resistance. F. x ananassa is an allopolyploid species formed in the mid-18th century through hybridization between Fragaria virginianaand Fragaria chiloensis, incorporating genomic contributions from four diploid progenitors. In 2019, breeders at UC Davis developed Royal Royce, a modern cultivar optimized for yield, shelf life, and desirable phenotypic traits. Despite the well-documented phenomenon of subgenome dominance in allopolyploids, the underlying molecular mechanisms remain poorly understood. The octoploid genome of F. x ananassa provides a unique system to explore these dynamics, particularly given the dominance of subgenome A, derived from Fragaria vesca, which exhibits higher homeolog expression relative to other subgenomes. Our study investigates the role of chromatin dynamics in shaping this dominance and its implications for the plant's evolutionary success. We employed Gene Ontology (GO and KEGG pathway analyses to identify differentially expressed genes and functional divergence between subgenome A and its diploid progenitor, F. vesca. After preforming an GO Term Enrichment, we found that GO terms associated with defense response, terpenoid activity, and cell-surface signalling to be significant, which we biological significance will be explored through KEGG pathway analysis. These findings offer new insights into the evolution of subgenome dominance and its contribution to the functional architecture of the cultivated strawberry genome.

Bethany Nolta

College Affiliated: Michigan State University

Category: Plant Science

Mentors: Leah Knoor

Presentation Number: 2408

Title: PLANT GROWTH PROMOTION FROM THREE RELATED PSEUDOMONAS ISOLATES DURING ALKALINE STRESS

Abstract: As the global climate changes, the pH of agricultural soils will change as well. This can be stressful for plants because nutrients including iron become unavailable at high pHs. Plants have a microbiome that is crucial to their health and plays a role in increasing their resilience to these soil changes. When the model plant Arabidopsis thaliana (Arabidopsis is exposed to alkaline conditions, a family of compounds called coumarins are produced in the roots. These coumarins are essential for assisting in iron uptake and have been recently shown to modulate the root microbiome, yet the extent of this impact is still unknown. Here we tested closely related isolates Pseudomonas simiae WCS417, Pseudomonas sp. MF48, and Pseudomonas sp. MF50 for the ability to improve plant health during alkaline stress. In vitro, all isolates demonstrated production of iron-mobilizing siderophores. Because coumarins are selectively antimicrobial, we tested the isolates' ability to grow in the presence of these compounds and found varying degrees of resistance among them. Because of their ability to produce siderophores and survive in the presence of coumarins, we hypothesized these isolates would improve plant health outcomes in alkaline stress. To test this hypothesis, we inoculated Arabidopsis with these isolates in mono-association in both optimal and alkaline conditions. We used wild type Arabidopsis along with coumarin biosynthetic mutants (f6'h1 to further investigate coumarins' role in these interactions. We assessed biomass, root architecture, colonization, and visible coumarin production in roots. Wild type plants experienced greater improvements in health outcomes in alkaline stress compared to coumarin biosynthetic mutants. These findings will better our understanding of constructing beneficial communities to better the health of crops experiencing alkaline stress.

Emma Alstott

College Affiliated: Iowa State University

Category: Plant Science

Mentors: George Sundin , Luisa Castiblanco

Presentation Number: 2411

Title: THE IMPACT OF CYCLIC-DI-GMP CONCENTRATION ON SMALL RNA EXPRESSION IN ERWINIA AMYLOVORA

Abstract: Fire blight, a disease caused by the bacterium Erwinia amylovora, is a significant limiting factor for apple and pear production in the Midwest. The fire blight pathogen can infect all parts of the tree, leading to tree death. It is known that extensive colonization of Erwinia amylovora occurs due to the regulation of critical virulence factors through cyclic di-GMP signaling and small RNAs (sRNAs that regulate protein production. However, the link between cyclic di-GMP concentration and transcription of sRNAs has yet to be explored. To address this, the transcription of five sRNAs (arcZ, hrs12, hrs6, rprA, and hrs1 will be evaluated under low and high cyclic di-GMP concentrations through the use of plasmids containing transcriptional fusions of their promoters to the green fluorescence protein gene. Each of these five sRNAs are known to induce or repress the production of different virulence factors during E. amylovora pathogenesis. Previous research suggests that arcZ and rprA transcription will be expressed under increased cyclic di-GMP concentrations, however this has not been confirmed experimentally. In addition, the impact of cyclic di-GMP levels on the transcription of hrs12, hrs6, and hrs1 is unknown. Overall, our findings will offer further insights as to how cyclic di-GMP functions as a critical regulator of virulence. This will provide an increased understanding of the pathogenicity of E. amylovora, and specifically how changes in virulence expression occur so quickly.

SaVaughna John-Baptiste

College Affiliated: University of the Virgin Islands

Category: Plant Science

Mentors: Alejandro Rojas

Presentation Number: 2412

Title: DIVERSITY OF FUNGAL PATHOGENS RESPONSIBLE FOR CERCOSPORA LEAF BLIGHT AND DIAPORTHE SEED DECAY IN SOYBEAN

Abstract: Soybean (Glycine max is a major agricultural crop that is susceptible to two common fungal diseases: Cercospora leaf blight and Diaporthe seed decay, caused byCercosporaspp. andDiaporthespp., respectively. These pathogens affect seed quality, causing distinct symptoms such as a purple stain caused byCercospora, or seed decay and shriveling caused byDiaporthe. Initially, both diseases were attributed to a single species, but more recently, multiple species of both genera have been associated with symptomatic seeds. Both pathogens share similarities in their disease cycles-infecting plants early in the season, remaining latent for a period, and expressing symptoms closer to harvest. When these diseases damage the seed late in the season, farmers often get paid less for their harvest at the elevator. This study aims to identify the specific fungal species responsible for these diseases in collected soybean samples. Using polymerase chain reaction (PCR amplification targeting species-specific genetic markers, we determined whether each disease is caused by one or multiple fungal pathogens. Understanding which specific fungi are involved in these diseases, along with their infection timing and disease progression, can support the development of better management strategies and ultimately improve soybean production.

Zarien Vilsaint

College Affiliated: Fort Valley State University

Category: Plant Science

Mentors: Thelma Madzima

Presentation Number: 2413

Title: EPIGENETIC MEDIATED RESPONSE TO ABIOTIC STRESS IN MAIZE

Abstract: Plants face various abiotic stresses, such as drought, salinity, extreme temperatures, and oxidative conditions, which can negatively affect growth, development and productivity. One way plants respond to the environment is through epigenetic changes like DNA (cytosine methylation. DNA methylation is an epigenetic modification that affects gene expression without changing the DNA sequence. This study explores how the plant-specific RNA-directed DNA methylation (RdDM pathway regulates the expression of specific genes in maize (corn. RdDM is a process where small RNA molecules guide the addition of methyl groups to specific DNA sequences. In maize, themediator of paramutation 1 (mop1 gene is required for progression of the RdDM epigenetic pathway.We focus on analyzing DNA methylation at the promoters of stress-responsive genes, where transposable elements (TE if not silenced by RdDM can mutate or inactive a protein-coding gene. Furthermore, we will do this using wild-type (Mop1 and mutant (mop1-1 maize plants. After an abscisic acid (ABA treatment, we extracted DNA from both genotypes. ABA is a stress hormone that helps manage plant responses to drought and salt stress. We analyzed whether ABA-induced expression changes are linked to methylation differences. By comparing methylation patterns, we aim to clarify RdDM's role in stress responses. Our findings may identify key genes regulated by methylation, helping improve stress tolerance in crops.

Margaret Norman

College Affiliated: Michigan State University

Category: Plant Science

Mentors: Josh Vanderweide

Presentation Number: 2414

Title: UNDERSTANDING THE ROLE OF ETHYLENE AND RESPIRATION IN ORGANIC ACID CATABOLISM IN RIPENING AND POST-HARVEST BLUEBERRY

Abstract: Blueberry has traditionallybeen labeled as a non-climacteric fruit, meaning that the plant phytohormone ethylene has a limited role in ripening. However, recent studies have elucidated the role of ethylene in fruit ripening, suggesting that it has climacteric characteristics. After blueberry fruits ripen (turn completely blue, berries "hang" on the plant until farmers can harvest them, and this time frame generally ranges from one to seven days. During this process, the berry's total organic acid concentration decreases significantly, which increases the sweetness perception of the fruit. This decrease in individual organic acids represents the major change among flavor-related metabolites between maturity and harvest. Our preliminary research suggests a large degree of variability in organic acid catabolism among genotypes, with older varieties potentially experiencing a greater rate of catabolism during ripening. It is not well understood whether organic acid catabolism is related to ethylene or respiration rates in blueberry, either pre- or post-harvest. Our objective is to understand whether the rate in organic acid catabolism is correlated with ethylene or respiration rate of the fruit. This study will be carried out with 14highbush blueberry (Vaccinium corymbosum L. cultivars of diverse genetic background and release dates spanning over one century (1912-2015. We hypothesize that ethylene and respiration rates in berries - both pre- and post-harvest - will be greater in berries with an older release date, and that ethylene and respiration rates will relate to rate of organic acid catabolism among cultivars.

Arianna Ruiz Malagon

College Affiliated: North Park University

Category: Plant Science

Mentors: Briana Hashim

Presentation Number: 2415

Title: HIGH-THROUGHPUT SCREENING OF PENNYCRESS TO IDENTIFY RESISTANT ACCESSIONS TO FUSARIUM VIRGULIFORME.

Abstract: Pennycress(Thlaspi arvenseis an emerging cover crop sown after the harvest of major cash crops. As a cover crop, it improves soil health by reducing soil erosion, runoff, and increases nutrient retention. Beyond its environmental benefits, pennycress is also an oilseed crop with high oil content, suitable for biofuel production. This dual purpose supports sustainable agriculture while providing farmers additional revenue during the off-season. Though pennycress has significant potential as a corn-soybean rotation cover crop in the Midwest, it remains understudied, with limited research on its susceptibility to fungal pathogens. This knowledge gap raises concerns about how pathogen infection of pennycress might impact the major rotation crop(s. To address this, we are screening 405 natural pennycress accessions using a high-throughput method to identify fungal susceptibility. The soilborne fungal pathogenFusarium virguliforme, cause of soybean sudden death syndrome, was used for susceptibility screening due to its significance as a major soybean threat. We employed MYcroplanters, 3D-printed planters compatible with 48-well plates, to grow seedlings. This allows roots to contact the fungal inoculum while shoots grow upward. After 14 days, images are captured and analyzed via a Python script that assigns disease ratings based on size and color. We hypothesize that phenotypic differences in disease susceptibility among pennycress accessions will be observable, which will allow us to use these disease rating data for a genome-wide association study in the future. Identifying resistant and susceptible accessions will improve pennycress resilience and help mitigate disease risk in rotational systems, advancing sustainable agriculture.

Rosemarie Carter

College Affiliated: Truman State University

Category: Plant Science

Mentors: Josh Vermaas Neetu Yadav

Presentation Number: 2416

Title: MOLECULES, MATHEMATICAL MODELS AND MESOPHYLL CONDUCTANCE

Abstract: In order for photosynthesis to occur, CO2 must be fixed by rubisco. To reach rubisco, each CO2 molecule must make hero's journey, first crossing through the stomata and then moving through spongy mesophyll tissue in the leaf that is responsible for photosynthesis. On its voyage through the mesophyll tissue, CO2 is met with even more challenges: the cell wall, cell membrane, cytoplasm, chloroplast membranes, the intermembrane space, the stroma, and finally the thylakoid membrane. 'Mesophyll conductance' is a measure for how easy this is at the molecular level. In simple terms, the higher the conductance, the easier it is for CO2 to go from the airspace just behind the stomata all the way to rubisco. Though overall mesophyll conductance can be determined experimentally, the conductance through each of the individual barriers is unknown. Past work has used molecular simulations and mathematical models to predict the conductance of individual components, but more needs to be done to hone model accuracy. By integrating experimental data from a wider variety of plant species with a specific model, we seek to better understand how reliable these models are and how they can be improved. When mesophyll conductance increases, photosynthetic efficiency increases and water loss decreases, which leads to increased crop yields and the potential for more sustainable farming. For scientists who work to improve mesophyll conductance, knowledge of relative contributions of the components will enable them to target components that will have the largest effect on overall conductance.

Danna Valenzuela

College Affiliated: Eastern Michigan University

Category: Plant Science

Mentors: Hiruni Weerasooriya

Presentation Number: 2417

Title: INVESTIGATING THE CHANGES IN ORGANELLE INTERACTIONS AND IMPORTANCE OF AMINOTRANSFERASES IN PHOTORESPIRATION

Abstract: Photorespiration is a crucial process in photosynthetic organisms that helps prevent the buildup of toxic intermediates. Aminotransferases play an essential role in this pathway through recycling toxic carbon intermediates. Successful photorespiration requires dynamic interactions between chloroplasts, mitochondria, and peroxisomes to enable the exchange of intermediate metabolites. Aminotransferases GGAT and SGAT convert glyoxylate to glycine. In a subsequent step, SGAT generates hydroxypyruvate, which HPR1 then converts to glycerate in the peroxisomes. We have successfully confirmed the peroxisomal localization of SGAT using transient expression in tobacco. Relocalization of SGAT to the cytosol has been achieved when peroxisomal targeting sequence was blocked. Moreover, we are testing the impact of cytosolic re-localization of SGAT onsgat mutant phenotype under photorespiratory conditions. Further, to evaluate the importance of several candidate aminotransferases, phenotypes ofasp4,bcat7,agt3, andbcat4 will be tested under high light conditions. Additionally, we are testing how organelle interactions change under photorespiratory conditions inChlamydomonas reinhardtiiandArabidopsis thaliana. Preliminary data demonstrate an increase in mitochondrion-peroxisome-chloroplast interactions in tobacco cells under high-light (700µmol m-2s-1 conditions compared to normal light. Evaluating how organelle interactions change in some photorespiratory mutants such as plgg1 andhpr1in these model organisms is currently underway. This project will unveil the role of aminotransferases in the glyoxylate cytosolic shunt during photorespiration and elucidate the factors driving organelle interactions under photorespiratory conditions.

Cindy Garcia Fernandez

College Affiliated: William Paterson University of New Jersey

Category: Plant Science

Mentors: Robert VanBuren

Presentation Number: 2421

Title: UNRAVELING PHOTOPROTECTIVE STRATEGIES AND GENE NETWORKS UNDERLYING DESICCATION TOLERANCE IN RESURRECTION PLANTS

Abstract: Resurrection plants are a unique group of angiosperms capable of surviving near-complete water loss and resuming normal physiological function within hours of rehydration. This project explores the mechanisms underlying desiccation tolerance in three closely related species from the Linderniaceae family:Craterostigma plantagineum,Lindernia brevidens, andLinderniella pulchella. These species differ slightly in their resilience and their recovery dynamics, providing an ideal comparative framework to identify both conserved elements and species-specific strategies for photoprotection and stress management. We employed an integrated, multi-scale approach that combines plant physiology, microscopy, and transcriptomics. Physiological assays, such as gas exchange measurements and high-resolution chlorophyll fluorescence imaging, will evaluate how photosynthesis is regulated during dehydration and rehydration. Microscopy techniques will allow visualization of chloroplast and thylakoid structural changes across different timed stages. At the molecular level, previously generated RNA-seq datasets forC. plantagineum andL. brevidenswill be analyzed alongside newly generated genome and transcriptome data for L. pulchella. Together, these datasets will reveal gene regulatory networks and expression patterns related to ROS detoxification, photoprotection, chloroplast remodeling, and metabolic repair. By linking physiological responses with gene expression profiles, this research aims to uncover how resurrection plants coordinate protective mechanisms to survive desiccation. The findings will contribute to a broader understanding of how photosynthetic organisms manage extreme environmental stress and may offer insights into future crop improvement strategies.

Lexi Peterson

College Affiliated: Sam Houston State University

Category: Plant Science

Mentors: Graham Burkart

Presentation Number: 2422

Title: OEP7 AS A RECEPTOR FOR STRESS INDUCED CHLOROPHAGY

Abstract: Chloroplasts are essential organelles in plant cells responsible for photosynthesis. However, during times of stress such as nutrient starvation and increased salinity, damaged chloroplasts must be properly degraded, a process known as chlorophagy. However, there is limited research on the protein receptors that moderate the degradation of damaged, unused chloroplasts or specific proteins within the chloroplast. Some forms of chlorophagy rely on ATG (autophagy-related proteins for autophagosome formation, and we will be utilizing these proteins as indicators for potential receptor proteins that facilitate chlorophagy. We will be imaging endoplasmic reticulum (ER-chloroplast contact sites in Nicotiana tabacumusing VAP27, an ER transmembrane protein known to establish ER-membrane contact sites with various organelles and facilitate autophagy, and OEP7, a protein that localizes to the chloroplast outer envelope. OEP7 possesses a potential ATG8-interacting motif (AIM domain that is found in many autophagy receptor proteins. CRISPR/Cas9 gene editing was used to modify the OEP7 sequence to better understand the function of OEP7. We have found that VAP27 proteins interact with OEP7 at ER-chloroplast contact sites and the overexpression of OEP7-mCherry appears to induce stromule formation. We have also confirmed that OEP7 interacts with ATG8e via the AIM domain. OEP7 CRISPR lines also display and increased sensitivity to salt stress. We hypothesize that OEP7 is necessary for establishing ER-chloroplast contact sites with VAP27 also functions as a chlorophagy receptor during salt stress to recycle chloroplast components and preserve cellular homeostasis.

Macy White

College Affiliated: Messiah University

Category: Plant Science

Mentors: Alexander Demetros , Sarah Lebeis

Presentation Number: 2423

Title: EXPLORING THE IMPACT OF THE ROS-AUXIN FEEDBACK LOOP ON PLANT IMMUNITY

Abstract: Plants have coevolved with microbes, some of which offer benefits or drawbacks to their survival. In response to the recognition of microbe-associated molecular patterns (MAMPs, plants initiate a MAMP-triggered immune response that induces cell wall fortification, expression of defense genes, and initiation of a reactive oxygen species (ROS burst that can inhibit bacterial colonization and alter root architecture. As a result of the ROS burst, some bacteria produce auxin, a hormone that aids in colonization by counteracting the toxicity of the reactive oxygen species. These processes form a feedback loop between the plant and the microbe, with ROS production a necessary component of bacterial auxin secretion. The influence of the ROS-auxin feedback loopon the colonization by an opportunistic pathogenis not well understood. This study examines the influence of the ROS-auxin feedback loop on plant immunity in the presence of an opportunistic pathogen in Arabidopsis thaliana using three bacterial isolates: Enterobacter sp. 71, an auxin producer Variovorax sp. CL14, an auxin degrader, and Paenibacillus MF181, an opportunistic pathogen. Our results indicate that sp. 71 provides protection to the plant when inoculated in co-association with MF181, perhaps indicating that auxin-producing bacteria and the associated ROS-auxin feedback loop helps to reduce the harm caused by an opportunistic pathogen. A greater understanding of these interactions may provide insight into the influence of auxin-producing microbes on plant health.

Ryen Padilla

College Affiliated: Eastern Michigan University

Category: Plant Science

Mentors: Brandon Reagan , Federica Brandizzi

Presentation Number: 2424

Title: INVESTIGATING THE ROLE OF LUNAPARK PROTEINS IN RESPONSE TO ER STRESS IN ARABIDOPSIS THALIANA

Abstract: The endoplasmic reticulum (ER consists of a complex and dynamic network of tubules and cisternae that is responsible for many important processes, including protein and lipid synthesis. Maintaining cellular homeostasis of this important organelle is essential and is facilitated via a series of pathways known as the unfolded protein response (UPR. When misfolded proteins accumulate within the ER, the UPR is activated to upregulate the expression of genes involved in restoring ER homeostasis. In addition to maintaining protein homeostasis within the ER, the cell also maintains the structure of this complex organelle through the activity of specialized ER-shaping proteins. Disruption of the structure of the ER leads to severe growth defects and compromised stress responses. To better understand the role of specific ER shaping proteins in plants' response to ER stress, we investigated the role of LUNAPARK proteins usingArabidopsis thaliana as a model organism. We have demonstrated that thelnp1/2 double mutant exhibits basal activation of the UPR under physiological conditions and decreased sensitivity to mild ER stress. In contrast, under severe ER stress conditions, thelnp1/2 double mutant shows increased sensitivity. These data suggest that LUNAPARK proteins are critical to managing ER stress. In this project, we continue to examine the specific role and function of LUNAPARK proteins in ER stress responses and how their functions are regulated by posttranslational modification. By understanding how the ER structure is maintained in response to stress, this work will allow us to identify novel mechanisms to improve plant and human health.

Lauren Tabor

College Affiliated: Grand Valley State University

Category: Plant Science

Mentors: Michelle Hulin

Presentation Number: 2425

Title: IDENTIFYING THE GENETIC BASIS OF PLASMID COMPETENCE IN THE PLANT PATHOGEN PSEUDOMONAS SYRINGAE

Abstract: Plasmids drive bacterial evolution between diverse bacteria within the same ecological niche. This proximity facilitates gain of genes, such as pathogenicity and tolerance to antimicrobials, that allow them to better survive in their environments. Conjugation, a mechanism used to acquire new plasmids, allows bacteria to exchange DNA through direct cell-to-cell contact.Pseudomonas syringae (Ps is a globally important plant pathogen that infects over 180 different plant species, and its pathogenicity has been linked to plasmid gain and loss. Ps relies on its T3 Secretion System (T3SS to inject effector proteins into plant cells to suppress immunity and promote disease. The carriage of plasmid Type III Effector (T3E genes varies widely across Ps strains, ranging from none to multiple plasmids. The knowledge of Ps interaction with plasmids is still limited. Here, we examine the diversity of Ps competence to take up plasmidsvia conjugation and determine what genetic factors are involved in the process. To identify the genetic basis of Ps plasmid compatibility, we evaluated conjugation, temperature, and pathogenicity in a genome-wide association study (GWAS.

Catherine Chappell

College Affiliated: GRAND VALLEY STATE UNIVERSITY

Category: Plant Science

Mentors: Sang-Jin Kim

Presentation Number: 2426

Title: SYNTHETIC BIOLOGY AND CRISPR MEDIATED STRATEGIES FOR INCREASING THE PRODUCTIVITY OF BIOENERGY SORGHUM AS A BIOFUEL CROP

Abstract: In a world reliant on non-renewable fossil fuels, demand for sustainable fuel alternatives has increased over the past few decades. A cultivar of the food crop Sorghum, bioenergy sorghum was bred for more sustainable traits, including drought tolerance, lower input requirements and adaptability, and especially forlarger biomass, which is primarily derived from theplant cell wall. To address this demand, we aimto increase biofuel yields by manipulating polysaccharides found in the cell wall of bioenergy sorghum. We are specifically interested in mixed-linkage glucan (MLG which is a structural carbohydrate in developing cell walls. Advantageous traits of MLG as a source of biofuel include its simplepolysaccharide structure, single manufacturer protein (CSLF6, andhighdigestibility/extractability. To increase MLG, we first engineered the CSLF6gene to overexpress MLG. However, MLG was degraded as the plant matured, which reduced yields. To overcome this, we created a geneticcircuit that would allowplantsto synthesizeMLGonly instemcells AND after periods of developmentalMLGdegradation. As expected, higher MLG levelswere only observedin theolder sorghum stem.Another strategy to increase MLG in sorghum is by reducing the MLG degradation enzyme (lichenaseusing CrispR-Cas9 mediated gene editing.We have confirmed the mutations by gene-editing and are now proceeding to verify zygosity and monitor MLG production. We aim toenhance the overall productivity of bioenergy sorghum byintegrating multiple synthetic biology and gene programming strategies,thereby improving the feasibility of bioenergy sorghum as a competitive source of renewable fuel.

Emma Durr

College Affiliated: North Carolina State University

Category: Plant Science

Mentors: Thomas Sharkey , Yuan Xu

Presentation Number: 2427

Title: CHARACTERIZING ISOPRENE RELEASE IN SWEET POTATOES UNDER WOUNDING AND THERMAL STRESS

Abstract: Isoprene is a volatile 5-carbon compound that helps protect plants against stress and damage by stabilizing membranes and neutralizing reactive oxygen species (ROS. It is an odorless hemiterpene produced by select plants, causing it to be under-researched. Generally, crop plants do not produce isoprene, as it is metabolically costly and offers limited benefits under managed agricultural conditions. Research has found that isoprene-emitting plants are often in the rosid clade; however, evidence suggests a member of the superasterids clade naturally produces this gas. Sweet potato (Ipomoea batatas has leaves that emit isoprene. Wounding or burning a leaf produces a "burst" of isoprene, which could help protect the plant. With this information, we aim to find the significance of sweet potatoes producing isoprene. Additionally, we want to compare isoprene emitted by a superasterid and by a rosid to determine how similar the chemical profiles are. For this experiment, we will wound sweet potato leaves with hot forceps and measure isoprene emitted over time. In addition to this, we will assess photosynthetic performance by conducting A/Ci curves after wounding and examining the effects of darkness on isoprene release. We will also explore how isoprene emission in stressed plants varies depending on whether plants are grown under standard greenhouse or highly elevated temperatures. This research will improve our understanding of isoprene in superasterid species and how certain plants may use it to cope with environmental stress.

Emmy Saarnio

College Affiliated: Oberlin College

Category: Plant Science

Mentors: Eric Patterson , Sara Alvarez Rodriguez

Presentation Number: 2431

Title: MICHIGAN-BASED HERBICIDE RESISTANCE IN AMBROSIA ARTEMISIIFOLIA

Abstract: Common ragweed (Ambrosia artemisiifolia L. is a problematic weed native to North America that has invaded many temperate regions around the world. Ragweed is a leading cause of seasonal allergies worldwide due to its production of highly allergenic pollen; furthermore, populations compete with crops, causing tremendous yield loss if uncontrolled. The most common and effective method of control are herbicides; however, several ragweed populations have evolved resistance to a range of herbicide mode-of-actions. To understand the genetics of herbicide resistance in this species, we assembled a chromosome-level genome of a susceptible population of ragweed using a combination of PacBio and Hi-C sequencing data. The final genome assembly spans 1.1Gb, phased into its two haplotypes. In Michigan, we have several ragweed populations that show resistance to Group 14 herbicides, which inhibit protoporphyrinogen oxidase (PPO, an enzyme crucial to synthesizing chlorophyll and heme. Using our genome, we sought the molecular mechanism of resistance in two such populations. First, we phenotyped resistance through a dose response assay using the PPO inhibitor sulfentrazone. Next, we sequenced the PPO2 gene of survivors and compared them to susceptible individuals. We found a novel substitution located at amino acid position Arginine-99, which we further confirmed using protein folding and molecular docking simulations that calculate binding affinity of the two herbicides. These results will lead to the development of diagnostic tools for detecting resistant populations of ragweed in the field, a better understanding of Group 14 mode-of-action, and a deeper understanding of evolution in weedy species.

Sheila Waffle

College Affiliated: Maranatha Baptist University

Category: Plant Science

Mentors: Aleksandra Skirycz , Hillary Fischer

Presentation Number: 2432

Title: TURNING LEMONS INTO LEMONADE: IS THE PLANT USING APHID SALIVA TO MAKE SUCROSE?

Abstract: Aphids are a globally distributed pest that reduce crop yields directly through their feeding. During the feeding process, aphids insert their piercing-sucking mouthparts into plants to both extract phloem and secrete saliva composed of proteins and metabolites, although little is known about the metabolites present in aphid saliva. Plants appear capable of recycling aphid salivary metabolites into plant metabolism, but it is unknown whether this function is beneficial to either plants or aphids. Previous research indicates that the glyoxylate pathway, along with other connected pathways, may be where aphid salivary metabolites are being incorporated into the plant as sucrose. In this study, we performed enzymatic assays to determine the relative concentrations of citrate, sucrose, glucose, and fructose in aphid saliva to better understand the salivary composition that aphids are spitting into plants. Additionally, we utilized Arabidopsis thaliana mutants in aphid bioassays to assess the impact of the glyoxylate pathway on aphid and plant fitness. Results from this work indicate that plants unable to synthesize sucrose through the crosstalk between the glyoxylate pathway and gluconeogenesis are more resistant to aphid feeding. Understanding the metabolic pathways allowing plant recycling of aphid saliva could aid the engineering of plants to be more tolerant to aphid feeding.

Kariun Steven

College Affiliated: Cal Poly Humboldt

Category: Plant Science

Mentors: Daniela Strenkert , Stefan Schmollinger

Presentation Number: 2433

Title: ELUCIDATING THE FUNCTION OF SELECTED GREENCUT PROTEINS IN THE GREEN ALGA CHLAMYDOMONAS REINHARDTII

Abstract: GreenCut genes are a conserved set of roughly 600 genes only found in photosynthetic organisms, including the model green alga Chlamydomonas reinhardtii. While some GreenCut genes are known to play key roles in photosynthesis, many remain uncharacterized. This project focuses on one such gene, PLAP2, which shows increased expression in C. reinhardtii during light stress. To explore its potential role, we used CRISPR-Cas12a to generate plap2 knockout mutants and exposed both mutant and wild-type strains to a range of light conditions. We then assessed physiological responses using growth metrics, as well as photosynthetic measurements to clarify the function of PLAP2 in light stress response and contribute to a deeper understanding of uncharacterized GreenCut genes. Insights from this work may help guide future efforts to improve stress tolerance in photosynthetic crops.

Jaidyn Choi

College Affiliated: Michigan State University

Category: Plant Science

Mentors: Eva Farre Prokosch

Presentation Number: 2434

Title: EXPLORING THE MECHANISM OF PHOTOPERIODIC CHANGES OF GENE EXPRESSION IN CULTIVATED POTATO.

Abstract: Delayed phases in gene expression are observed in ribosome biogenesis genes under long days compared to short days in cultivated potatoes. Ribosome biogenesis genes encode ribosomal proteins that are crucial for translating mRNA into proteins during gene expression. I hypothesize that Telomere Repeat Binding (TRB transcription factors regulate expression of the ribosome biogenesis genes, as we observed similar changes in the timing of gene expression in TRB4/5A transcription factors under the two different day lengths. Furthermore, other studies have linked TRB4/5a transcription factors to ribosome biogenesis in the model plant Arabidopsis thaliana. As photoperiod changes are associated with seasonal shifts, these changes indicate that ribosome biogenesis gene transcription could have a role in optimizing growth under different day lengths. To test whether TRB4/5A regulate ribosomal biogenesis genes in cultivated potato, I cloned two ribosome biogenesis gene promoters in front of a firefly luciferase transcriptional reporter. These constructs will be used to quantify transcription in transient expression experiments in either tobacco or potato. I will express these ribosome biogenesis transcriptional reporters in the presence or absence of TRB4/5A coding regions. I hypothesize that if TRB transcription factors bind to the ribosome biogenesis promoters and positively regulate transcription, we will observe higher levels of bioluminescent signals of the transcriptional reporters. Thereby indicating that these proteins play a role in regulating ribosome biosynthesis. Subsequently, we can further explore the mechanism regulating the timing of gene expression by generating stable mutants and overexpressors of the TRB4/5A genes in potato.

Olivia Conhagen

College Affiliated: Hamilton College

Category: Plant Science

Mentors: Emily Pawlowski

Presentation Number: 2435

Title: CHARACTERIZATION OF TWO CAMELINA TRANSCRIPTION FACTORS IN THE REGULATION OF SEED OIL ACCUMULATION AND COMPOSITION

Abstract: Camelina is an oilseed crop with potential in biofuel applications, most notably during aviation fuel testing. Therefore the ability to regulate and maximize the production of seed oil, in terms of quantity and quality, is a significant step in order to increase the commercial viability of Camelina as a biofuel crop. Previous research identified two transcription factors of interest, TF1 and TF2, as potential regulators of seed oil accumulation in Camelina, based on their association with fatty acid and lipid synthesis in Camelina. Previous research found there was a significant decrease in total seed oil accumulation in TF1 and TF2 knock-out lines, further corroborating the transcription factors as associated with seed oil production. Due to limitations of available seed specific promoters, additional promoters needed to be identified to optimize over-expression of these TFs within the critical early stages of seed development. The aim of this research is to characterize the expression patterns of these promoters, in order to create oversexpression lines that express TF1 and TF2 at certain stages and levels throughout seed development. By growing Promoter-GFP lines then tagging the plants at incremental days after flowering, based on data on the expression of the promoter targeted genes, we can gain a better understanding of the timeline for TF expression during seed development. Embryonic tissues will be examined under confocal microscopy for GFP fluorescence indicating promoter expression, and will allow for a greater comprehensive understanding of transcription factor expression during seed development.

skyler cobb

College Affiliated: Bennett College

Category: Plant Science

Mentors: Kevin Santiago-Morales , Sarah Lebeis

Presentation Number: 2436

Title: AUXIN-PHOSPHORUS INTERACTIONS IN REGULATING ROOT DEVELOPMENT IN ALFALFA (MEDICAGO SATIVA

Abstract: Phosphorus is a nutrient and plays an important role so that the plant grows healthy and has great development. It is needed for energy transfer (ATP, DNA, and normal plant development. Plants use their roots to acquire and sense phosphorus in the soil or media, but when the roots can't sense the right amount of phosphorus, they will change their root architecture to overcome the lack of phosphorus. In this project, I will be experimenting how auxin will influence the alfalfa plant architecture and root growth, and see how phosphorus affects the root growth of alfalfa when grown in different concentrations. Auxin is very significant to this experiment because it is a plant hormone that regulates growth and development by controlling root elongation branching and root hair formation. Also, it has previously been shown to drive a lot of changes in root architecture and development.0uM, 500uM, 1,000uM, and phosphorus will test out how the nutrients availability changes the root architecture. This experiment tests how different levels of Auxin and Phosphorus affect root development in alfalfa. Sterilized seedlings will be grown on media with varying IAA and phosphate concentrations, and root traits like length-and-branching-will be measured and compared across treatments.

Psychology

Grant Saba, Ryan Papero, Samia Neeley

College Affiliated: Eastern Michigan University, Eastern Michigan University, Eastern Michigan University

Category: Psychology

Mentors: Sydney Batchelder

Presentation Number: 2501

Title: THE CO-USE OF ALCOHOL AND E-CIGARETTES: IMPLICATIONS FOR DEMAND, TREATMENT, AND POLICY

Abstract: Young adults use both alcohol and e-cigarettes at alarming rates; in 2021, 19% reported using e-cigarettes in the past month and 80% of vapers have also used alcohol. Past research has evaluated interactions between alcohol and combustible cigarette use. However, e-cigarette pharmacology and metabolism are unique from combustible cigarettes, therefore, further investigation is required. The present study asked young adults from a university sample (N = 283 about their: 1 cigarette, e-cigarette, and alcohol use; 2 their hypothetical alcohol and e-cigarette consumption in hypothetical purchase tasks; and 3 their anxiety and depressive symptoms. We hypothesized that e-cigarette users will report greater consumption of alcohol than non-users, and individuals with problematic alcohol use would report greater consumption of e-cigarette puffs than individuals without problematic alcohol use. Overall, these results expanded research showing cigarette smokers reported greater alcohol consumption compared to non-smokers and e-cigarette users have greater odds of having an alcohol use disorder than non-users. Overall, this research will inform decisions for policy and treatment, such as e-cigarette screening in healthcare, increasing e-cigarette response cost (e.g., increasing age restrictions, and increasing access to polysubstance treatment.

Brooke Soulliere, Ella Sturtz, Stephanie Barroso

College Affiliated: Michigan State University, Michigan State University, Michigan State University

Category: Psychology

Mentors: Brooke Ingersoll , Isabella Babore

Presentation Number: 2502

Title: THE INFLUENCE OF NEIGHBORHOOD CONDITIONS ON CHILDHOOD AUTISM DIAGNOSES

Abstract: Background: Little literature in the past has focused on how neighborhood conditions affect how and when children receive autism spectrum disorder (ASD diagnoses. The Childhood Opportunity Index (COI measures the quality of conditions and resources in the area where a child lives. COI values reflect the access to resources that a family has (e.g., specialized testing centers. Objectives: Our objective is to examine the relationship between COI and community autism diagnosis. Methods: Data was used from an ongoing RCT. Self-reported addresses were linked to census tract numbers, which were used to generate COI scores. At the final time point, caregivers report if their child received a community ASD diagnosis, N=110. Results: A Pearson's correlation analysis was conducted in SPSS to examine the relationship between COI z-score and whether or not a child had received a community autism diagnosis, while controlling for age. We did not find a significant relationship between COI scores and community autism (or ASD diagnosis ($r = 0.49$, $p = 0.610$. Discussion: Early age diagnosis is linked to better treatment outcomes (Malik-Soni et al., 2022. It is important to understand possible barriers families might face in receiving an early ASD diagnosis. Although we did not find a relationship between COI scores and early ASD diagnosis, future studies should explore how family recourses and community support impact access to diagnostic services and individualized care (e.g., therapeutic, education and family support services.

Landon Bartlett

College Affiliated: Grand Valley State University

Category: Psychology

Mentors: Naomi Aldrich

Presentation Number: 2503

Title: THE ROLE OF DESERVINGNESS AND SOCIAL STATUS IN SHAPING ENVY AND ATTITUDES TOWARD AI

Abstract: Envy is a negative emotion tied to desiring what others have. As a product of evolution, it helps individuals navigate social comparisons, particularly with those of higher status. Envy can emerge in both objective (OSS: material wealth and subjective (SSS: social respect status comparisons, but research suggests SSS elicits more frequent and intense envy-especially when the high-status individual is seen as undeserving. In today's AI-driven world, what's "undeserving" to one may seem "resourceful" to another. This study explored how envy operates across social status types (OSS vs. SSS and AI use (used vs. not used. Participants were randomly assigned to read a vignette and then completed the Benign and Malicious Envy Scale (BeMaS, the Artificial Intelligence Attitudes Scale (AIAS-4, and the Artificial Intelligence Literacy Scale (AILS. We hypothesized that high SSS participants would report more intense and malicious envy-especially toward AI-assisted individuals. Conversely, OSS participants were expected to experience less intense envy and more benign envy, especially toward those who earned their status through hard work. Lastly, we expected that participants with negative attitudes or low understanding of AI (per AIAS-4 and AILS scores would report greater malicious envy. This study aims to clarify how perceptions of status legitimacy and AI use influence emotional responses like envy, offering insights for guiding ethical and socially informed AI integration.

Logan Gibson

College Affiliated: Michigan State University

Category: Psychology

Mentors: William Chopik

Presentation Number: 2504

Title: PERSONALITY PREDICTORS OF LONGITUDINAL ADAPTATION FOLLOWING THE COVID-19 PANDEMIC

Abstract: The COVID-19 pandemic had pervasive impacts on both individuals and countries worldwide. People's educational experiences and physical and mental health were compromised in the wake of lockdowns and other mitigation measures. People's responses to the pandemic varied based on their psychological characteristics, like their personalities. However, studies looking adaptation in these domains as people transition out of the pandemic have been limited, and the few studies that have been done have only looked at changes in these domains over a few months. Did people fully adapt in these domains now that five years have passed since the onset of the pandemic? And do these same psychological characteristics predict adjustment in the domains five years later? The current study examined changes in educational, professional, social, and well-being-and the personality predictors of these changes-in a sample of 265 college students followed from 2020-2021 until 2025. We found that conscientiousness was associated with less negative perceptions of online learning but less likely to prefer remote job. Extraversion was associated with a greater preference for in-person (and less remote work. Extraverts were also less lonely and had higher life satisfaction five years later. Highly neurotic people were lonelier five years after the onset of COVID-19. However, psychological predictors of adaptation were few and far between otherwise. This project provides important context for how people navigated life post-COVID-19 and identifying potential protective and risk factors for variety of life outcomes.

Keeley Stankus

College Affiliated: Michigan State University

Category: Psychology

Mentors: Alexandra Castillo-Ruiz

Presentation Number: 2505

Title: EFFECTS OF CESAREAN BIRTH ON SOCIAL BEHAVIOR

Abstract: Birth occurs at a time of intense remodeling of the brain and deviations from the natural birthing experience can affect brain development. In fact, we previously reported that adult Cesarean-born mice show reduced numbers of vasopressin neurons in the paraventricular nucleus of the hypothalamus (PVN in comparison to their vaginally-born counterparts. Because the vasopressin system of the PVN regulates sociality, our previous findings suggest that Cesarean birth may alter social behavior. To test this hypothesis, we exposed male and female vaginally and Cesarean born adult mice to the sociability phase of the three-chamber test. Specifically, during the test an experimental mouse was placed in the middle chamber of the three-chamber apparatus and was allowed to explore the other two compartments: one containing a same-sex social stimulus (i.e., an unfamiliar mouse inside a wire cage and the other containing an empty wire cage. Then the amount of time the mouse spent in each chamber was recorded. We found that regardless of birth mode experimental mice spent more time in the social chamber. We also found that males spent more time with the social stimulus than females. Our findings suggest that Cesarean birth does not influence the preference that mice show for social vs non-social stimuli. To further investigate the effects of a Cesarean birth on sociality, we are currently assessing the social novelty phase of the three-chamber test in which the preference for a familiar vs. an unfamiliar social stimulus is evaluated.

Mya Hanna

College Affiliated: Grand Valley State University

Category: Psychology

Mentors: Amanda Dillard

Presentation Number: 2506

Title: PROSPECTIVE ASSOCIATIONS BETWEEN TRAIT MINDFULNESS, SLEEP BEHAVIOR, AND SLEEP INTENTION IN COLLEGE STUDENTS

Abstract: Adequate sleep is associated with higher academic performance and better physical and mental health in college students (Eliasson et al, 2009, Orzech et al., 2011, Valerio et al., 2016. However, college students are more likely to experience sleep disturbances than the general population (Buboltz et al., 2001. Recently, research has focused on understanding what promotes good sleep behaviors. Reducing stress and anxiety can result in better sleep quality; therefore, studies have examined the impacts of mindfulness practices and trait mindfulness on sleep. Trait mindfulness is described as a general level of daily mindfulness that a person engages in across situations and time. Trait mindfulness is associated with health behaviors like getting adequate sleep(Sala et al., 2020. The current research utilizes a longitudinal design to assess the prospective association between trait mindfulness and restful sleep in a sample of college students. Participants completed 4 surveys over 3 months in which they reported their trait mindfulness and sleep practices. Analyses tested whether Time 1 trait mindfulness was associated with subsequent reports of restful sleep. Further, we examined whether trait mindfulness was associated with higher intentions to get sleep. Results indicate that higher trait mindfulness at Time 1 is associated with sleep behavior at subsequent time points, but not with sleep intention. Our study examined associations over time and can provide more insight into the consistency of these associations and causal direction. This research can help identify the importance of promoting and teaching daily mindfulness skills in students.

Lucas Ring

College Affiliated: Michigan State University

Category: Psychology

Mentors: Jason Moser

Presentation Number: 2507

Title: WHEN THE BRAIN STOPS CARING: ERN MODULATION BY ANHEDONIA AND LOSS OF INTEREST

Abstract: Event-related potentials collected via electroencephalogram (EEG, like the Error-Related Negativity (ERN; negative deflection occurring approximately 100ms after errors that is often enhanced in individuals experiencing anxiety have been used to index internalizing psychopathology, a spectrum of mental disorders categorized by inward-directed distress and negative emotions like anxiety, depression, and fear. Given the high comorbidity between anxiety and depression, studying these symptoms simultaneously is critical to isolating their unique contributions to cognitive control, a mechanism implicated in both conditions. Anhedonia, the diminished ability to experience pleasure, is a symptom of depression that may affect behavioral outcomes related to performance monitoring. This study examined whether anhedonia was associated with ERN amplitude, accuracy, and reaction time on a Go/No-Go task, while controlling for anxiety. Participants (N=135; 61.50% female; Mage=34.62, SD=6.15 completed measures of anxiety (Penn State Worry Questionnaire, Beck Anxiety Inventory and anhedonia (General Behavior Inventory. EEG was recorded during a Go/No-Go task to extract ERN amplitude (M=-1.90?V, SD=5.12, accuracy (M=78.67%, SD=2.00, and reaction time on correct responses (M=342.69ms, SD=48.01. Partial correlations revealed that greater anhedonia was associated with lower accuracy (r=-0.19, p=.03 when controlling for anxiety. However, there were no associations between anhedonia with ERN amplitude (r=-.08, p=.35 or reaction time (r=.01, p=.92.These findings suggest that anhedonia, a potential indicator of engagement, is linked to impaired performance but not compensatory neural or behavioral mechanisms, highlighting the value of isolating the effects of depressive symptoms from anxiety symptoms when studying cognitive control.

Jessica Belknap

College Affiliated: Michigan State University

Category: Psychology

Mentors: Kimberly Fenn

Presentation Number: 2508

Title: DON'T LET YOUR GUARD DOWN: THE RELATIONSHIP BETWEEN COGNITION AND SONAR MONITORING PERFORMANCE

Abstract: Attention-demanding tasks become more difficult to perform over time. This results in progressive increases in reaction time and decreases in accuracy, an effect known as the vigilance decrement. Here, we investigated the extent to which individual differences in cognitive ability predicted the vigilance decrement in Sonar monitoring, a task in which individuals use auditory and visual signals to identify and classify nearby ships. 172 participants completed two experimental sessions. During Session 1, participants completed a cognitive battery of various tasks measuring attention, placekeeping, working memory, and decision making. They also completed the Armed Forces Qualification Test, an assessment of mathematics, reading comprehension, and vocabulary. In Session 2, participants completed a four-hour Sonar monitoring simulation. Presented with dynamic acoustic cues, participants classified signals into one of four categories based on their unique set of frequencies. We predict that across the Sonar monitoring simulation, reaction time to identify the signals will increase and accuracy in classifying the signals will decrease. Preliminary analyses support our hypothesis, with an 8% increase in reaction time across the 4-hour period. Additionally, we predict that performance on the cognitive assessments will predict the vigilance decrement such that participants who perform better in Session 1 will show a smaller vigilance decrement in Session 2. Ultimately, we look to identify individual differences in cognition that relate to increased resilience to the vigilance decrement, providing new insight into sustained performance on attention-intensive tasks. This work has implications for optimizing recruitment in occupations prone to time-on-task fatigue.

Miranda Bell

College Affiliated: Dillard University

Category: Psychology

Mentors: William Chopik

Presentation Number: 2511

Title: ATTACHMENT STYLES VARY BASED ON RELATIONSHIP CONTEXTS

Abstract: Attachment orientations are a way of explaining how people think, act, and behave with respect to their close relationships. Attachment orientations predict the number, quality, and maintenance of close relationships. However, attachment orientations are not static-they change both over time and across the lifespan. To date, there has been some research on why attachment orientations change, but few studies have examined variation over shorter periods of time, from the totality of people's relationships (i.e., not just romantic partners. The relative neglect of non-romantic relationships in the study of attachment orientations leaves some confusion about how these relationships can potentially shape attachment orientations over time. The current study (N=900 college students-recruited through an undergraduate psychology subject pool in exchange for course credit examined how attachment orientations waxed and waned over a three month period as a function of changes in friendship, parent-child, and romantic relationship characteristics. We surveyed college students three times over a three-month period to see how attachment and relationships changed over time. Using multi-level modeling, we linked variation in different relationships and variation in attachment orientations. The current study is important for characterizing how people's relationships change during this important period (emerging adulthood during the first year of college and provides actionable steps for how to enhance security (e.g., through targeting the support or strain from particular types of relationships such as parents, romantic partners, and friends.

Brandalyn Morris

College Affiliated: Grand Valley State University

Category: Psychology

Mentors: Teresa Castelao-Lawless

Presentation Number: 2512

Title: OPENING THE BLACK-BOX OF MENTAL DISORDERS: AN ACTOR-NETWORK THEORY ANALYSIS OF SCHIZOPHRENIA

Abstract: AbstractSchizophrenia is said to be the most devastating of all mental illnesses. However, it remains poorly understood, culturally specific, and continues to defy robust classification as a disease process. Using a few methodological notions from Bruno Latour's Actor Network Theory (ANT, this literature review seeks to disambiguate schizophrenia. The scope and focus of our examination will be restricted to three actors/actants within the network of the schizophrenia assemblage. By appropriating tools and terminology from ANT to reveal unseen human and non-human elements within the DSM classification system, the medical model of mental dysfunction, and antipsychotic medication this paper aims to describe how the concept of mental disorders, in particular schizophrenia, emerges from the dynamic interplay of this interconnected assemblages of actors and actants which together stabilized it into existence.Remaining consistent with Latour's later work, we will take a critical view of these characteristics in hopes that a more complete picture of the black-boxed concept of schizophrenia will emerge and present with opportunities for greater understanding, more effective treatments, and advancements in the field of behavioral neuroscience.

Tatumn Kirkwood

College Affiliated: Southern University and AM College

Category: Psychology

Mentors: Leapetswe Malete

Presentation Number: 2513

Title: PEER SUPPORT, MENTAL HEALTH, AND STUDENT-ATHLETE PERFORMANCE OUTCOMES

Abstract: Student-athletes face a unique and complex interplay of academic, athletic, and social pressures that can significantly affect their mental health and overall well-being. Although mental health support for this population has gained increasing attention, the specific role of peer support programs in promoting mental health and performance remains underexplored. This scoping review aims to examine and synthesize existing literature on peer support interventions for student-athletes. It maps current research trends, identifies conceptual frameworks, and evaluates methodologies used to study the impact of peer support on mental health indicators, such as stress, anxiety, and depression, as well as academic and athletic performance. By analyzing findings from diverse studies, the review identifies prevalent themes, highlights inconsistencies, and uncovers gaps in the evidence base. Special focus is given to the types of peer support structures implemented, their perceived effectiveness, and the barriers and facilitators to their success. The review also considers how institutional policies, cultural factors, and program design influence outcomes. Inclusion criteria consisted of peer-reviewed articles that addressed student-athletes' mental health, stress, help-seeking behaviors, and perceptions of support. Studies were excluded if they did not specifically examine mental health or help-seeking within the athletic context. Ultimately, this review addresses the guiding question: What is the prevalence of mental health challenges among student-athletes, and how effective are peer support strategies in addressing them? The findings aim to provide actionable insights for researchers, educators, and athletic administrators seeking to develop, implement, and evaluate peer support programs that enhance both mental well-being and athletic performance.

Caroline Crago

College Affiliated: Michigan State University

Category: Psychology

Mentors: Bridget Walsh

Presentation Number: 2514

Title: UNDERSTANDING THE ROLE OF COMMUNICATION CONTEXT IN EARLY CHILDHOOD STUTTERING: A PILOT STUDY

Abstract: Stuttering is a neurodevelopmental condition affecting nearly 1% of the world's population that is characterized by disfluencies interrupting the forward flow of speech, such as sound prolongations, blocks, and repetitions. Variability is a hallmark of stuttering, and adults who stutter report that they may stutter more or less in certain communication situations. For example, when speaking in front of a group of people versus when talking to a pet. Thus, the context of a communication situation may affect a child's speech production, yet there is little research examining this relationship. The aim of this study is to assess how the context of a situation affects speech production in preschool-aged children who do and do not stutter. Children who do and do not stutter are placed in two virtual reality speaking scenarios: one hypothesized to present a higher stress load (e.g., talking to a classroom of children, and one presenting a lower stress load (speaking to a pet kitten. Children's speech during both scenarios will be analyzed to assess linguistic complexity and disfluencies. Findings from this study will provide insight into how communication contexts affect speech production in young children and inform the development of intervention approaches for stuttering.

Devan James

College Affiliated: Siena Heights University

Category: Psychology

Mentors: Leapetswe Malete

Presentation Number: 2516

Title: DISORDERED EATING HABITS: MENTAL HEALTH AND PERFORMANCE CONSEQUENCES FOR ATHLETES

Abstract: This research topic examines how disordered eating behaviors affect athletes' mental health and athletic performance. This research project has a focus on what the most prevalent disordered eating habits that athletes face are. The consequences of disordered eating habits that college athletes face during their careers will be examined. The literature has shown that there has been a focus on female athletes facing disordered eating habits over time, but there has been a gap in the literature that focuses on male athletes who face disordered eating habits. The purpose of this research is for the audience to gain knowledge about the disordered eating habits that affect athletes the most and how these habits can affect them while they are playing or training. Binge eating and bulimia nervosa were both examined during this research project. The definition and the consequences for athletes who are faced with bulimia nervosa and binge eating will be included in this research project. This research project also focuses on the mental health problems that can occur due to disordered eating habits for athletes. For the methodology in this research project, there was a scoping review that included many different articles. The findings from this research were that disordered eating habits can have negative effects on an athlete's mental health and athletic performance.

Emma Gower

College Affiliated: Eastern Michigan University

Category: Psychology

Mentors: Jin Bo

Presentation Number: 2517

Title: EEG CONNECTIVITY AND IQ IN YOUNG ADULTS

Abstract: Previous studies have shown that young adults with poorer cognitive performance have less connectivity in the frontal brain regions at lower EEG frequencies, such as delta, theta, alpha. Other studies show no relation or indicated less activity in higher frequency (beta. This study examined the correlation between intelligence (IQ and EEG weight phase length index (wPLI (i.e., connectivity at all frequency bands. Resting-state EEG data was acquired from 11 undergraduate adults at Eastern Michigan University. The Wechsler Adult Intelligence Scale was used to determine IQ. We predicted that IQ would relate to higher connectivity at lower frequencies but not higher frequencies. We found that there was a significant correlation between lower wave frequencies and IQ. However, there was no relationship found between IQ and connectivity in higher frequencies.

Sam Fisher

College Affiliated: Grand Valley State University

Category: Psychology

Mentors: Bradford Dykes , Jamie Owen-DeSchryver

Presentation Number: 2521

Title: PERSPECTIVES OF AUTISTIC COLLEGE STUDENTS ON SUPPORTS AND SERVICES THAT ADDRESS THEIR MENTAL HEALTH NEEDS

Abstract: As colleges and universities begin to develop more inclusive frameworks for students with disabilities, autistic students have begun to pursue post-secondary education at higher rates. Universities are beginning to integrate a variety of supports and services to promote the overall well-being of autistic students. However, recent research has shown that while a variety of academic and social supports are available, there may be a need for additional supports to address ongoing mental health concerns. This is an issue worthy of significant concern, being that autistic students are at high risk of experiencing mental health concerns, including anxiety, depression, and suicidal thoughts and behaviors. The current study addresses the gap in knowledge concerning mental health-specific supports and services for autistic college students. Through a cross-sectional survey, we asked autistic college students to share their first-hand experiences with mental health concerns, mental health support service usage, and barriers to accessing supports. Our survey was distributed to more than 300 universities in the Midwestern United States and measured the experiences of over 60 students. We hope that this research will inform how colleges and universities implement neurodiversity-affirming mental health supports and services for autistic student populations.

Zachary Spencer

College Affiliated: Grand Valley State University

Category: Psychology

Mentors: Benjamin Walsh

Presentation Number: 2522

Title: TOXIC WORK CLIMATES: HOW HELPFUL ARE THEY FOR UNDERSTANDING EXPERIENCES OF WORKPLACE SEXUAL HARASSMENT

Abstract: Our study investigates how broader dimensions of a toxic work climate predict women's experiences of sexual harassment at work. Drawing from Fitzgerald's tripartite model of sexual harassment, we recognize three distinct categories of sexual harassment: gender harassment (e.g., degrading and misogynistic comments, unwanted sexual attention (e.g., sexual advances imposed without consent, and sexual coercion (e.g., sexual bribes or threats related to workplace pressures. Targets of harassment often experience adverse effects extending from the workplace to their personal lives, from a decrease in job satisfaction, organizational commitment, and workgroup productivity, which may lead to high levels of post-traumatic stress disorder and other physiological and psychological burdens. Organizational tolerance for sexual harassment (OTSH, a dimension of toxic work climate, has been recognized as the single most important climate construct to understand incidences of sexual harassment at work. However, we explore abusive supervision climate and workgroup incivility climate in addition to OTSH as supervisors play a critical role in sexual harassment given the power dynamic, and workgroup incivility climate as coworkers generate norms for respect in the workplace. We anticipate that all three climate dimensions will significantly account for women's workplace harassment experiences; further, we will explore which dimension accounts for the most powerful effect on each form of harassment. Our sample will consist of about 900 working women completing a self-report survey on Prolific. We will use ordinary least squares regression to evaluate our hypotheses, and conclude with practical implications, directions for future research, and study limitations.

Jason Gilbert

College Affiliated: Michigan State University

Category: Psychology

Mentors: Katharine Thakkar

Presentation Number: 2524

Title: SUBJECTIVE AND OBJECTIVE MEASURES OF ALTERED VISUAL PERCEPTION IN PEOPLE WITH PSYCHOTIC-LIKE EXPERIENCES

Abstract: Schizophrenia (SZ can be characterized by a myriad of both positive and negative symptoms. By discovering novel biomarkers, a more precise diagnostic criteria can be created. Empirical evidence suggests visual contrast sensitivity (CS may be one such biological marker. A recent shift in focus has been placed on those in the prodromal stages of illness, before symptoms are present. We can imagine, a priori, symptom severity increasing to a point beyond diagnostic threshold-the high-risk state representing the moment just before that threshold is crossed. The current study measured CS and subjective visual disturbances (BSABS in a population with elevated psychotic-like experiences (PLEs and relative controls, respectively. There were no demonstrable group differences in CS [t(98 = -0.127, p = .899]. There were, however, pronounced group differences in BSABS (U = 1733.5, p 0.001, the biological mechanism of which may provide a more structurally sound foundation for further study.

Trevor Moran

College Affiliated: Michigan State University

Category: Psychology

Mentors: Bridget Walsh , Katelyn Gerwin, Sileana Truong

Presentation Number: 2525

Title: INVESTIGATING THE ROLE OF AUDITORY AND VISUAL FEEDBACK IN CHILDREN'S SPEECH TIMING: IMPLICATIONS FOR STUTTERING

Abstract: Developmental stuttering is a neurodevelopmental disorder that involves disruptions in the rhythmic flow of speech, such as sound repetitions, prolongations, and blocks. It has been proposed that individuals who stutter may have a deficit in sensorimotor integration, the neural process of using sensory information to inform and refine motor actions. Evidence for this reveals that when speech is synchronized with an external pacing stimulus, such as a metronome, speech disruptions can be considerably reduced. Previous research on this effect has suggested that the integration of auditory feedback plays a role in stuttered speech, yet much of this research has focused on adults who stutter. Research with children who stutter allows for a better understanding of the role that sensorimotor integration plays in the earlier stages of speech development. Children who do and do not stutter complete a task requiring them to produce a word to the beat of a metronome during a synchronization phase and then maintain the beat during a continuation phase in which sensory (i.e. visual and auditory feedback was systematically removed. Children's acoustic speech signals are recorded and analyzed to assess speech rhythm patterns between the two groups of children. The results of this project will help provide a clearer picture of sensorimotor processes in childhood stuttering and inform the development of novel treatment approaches.

Amalia Rosenblum

College Affiliated: Michigan State University

Category: Psychology

Mentors: Karl Healey

Presentation Number: 2531

Title: THE 'AWKWARD GENIUS' STEREOTYPE: THE RELATIONSHIP BETWEEN BROAD AUTISM PHENOTYPE AND MEMORY

Abstract: The Broad Autism Phenotype (BAP refers to traits and behaviors that resemble those of autism spectrum disorder (ASD in the absence of a formal diagnosis or significant functional impairment. Whereas diagnosed ASD is associated with memory deficits, in popular culture BAP is associated with the "awkward genius" stereotype. Is it really the case that where ASD predicts impairments, BAP predicts above-average ability? To investigate this seeming paradox, we had 1,218 undergraduates complete a memory task followed by the Autism-Spectrum Quotient inventory, a validated, widely used measure of BAP. Memory performance had a non-linear relationship with BAP traits, with evidence of both deficits and elevated abilities at different points on the spectrum. Individuals with very few autistic traits had the lowest memory scores. Memory was best in those with modest BAP scores and declined towards the middle of the spectrum until the highest BAP decile, where performance increased. The results suggest that the "awkward genius" stereotype may be partially accurate. Further research into the relationship between BAP and memory will deepen our understanding of memory function and cognitive variability on the spectrum.

Ha Tran

College Affiliated: Michigan State University

Category: Psychology

Mentors: Karl Healey

Presentation Number: 2532

Title: HOW MEMORY AGES: A LONGITUDINAL ANALYSIS OF FREE RECALL DATA

Abstract: For almost everyone, memory gets worse with age. But this simple statement elides the fact that memory is not a single process. Rather, it comprises many functions, including encoding, storage, and retrieval. Older adults do not experience uniform deterioration across all aspects of memory; instead, some memory components show age-related stability, while others decline. For example, while temporal organization and intrusion control decline substantially, semantic organization remains stable. This multidimensional pattern raises the question of whether different types of memory deficits appear at different points in one's life. We address this question using data from the Health and Retirement Study, a longitudinal household survey conducted by the Institute for Social Research at the University of Michigan. By examining the timing and nature of memory changes within this large sample and analyzing different memory effects, such as primacy, recency, and temporal contiguity effects in free recall data, we aim to offer a more precise understanding of cognitive aging.

Mavery Allen

College Affiliated: Eastern Michigan University

Category: Psychology

Mentors: Ryan Wessell

Presentation Number: 2533

Title: THE BYSTANDER EFFECT PRESENTED IN EARLY ADULTHOOD AT EASTERN MICHIGAN UNIVERSITY

Abstract: In research investigating altruism and helpfulness, it was found that 53% of study participants were more likely to help in a situation where an individual was highly distressed and the participant deemed it difficult to escape the situation (Carlo et al., 1991. Similarly, work done by Bellmore et al., finds that school-age children are more likely to confront an adversary if their peer is the one being victimized. Otherwise, they were worried about the social consequences of reporting the situation. In examining the role of kindness, familiarity, and environment in bystander helpfulness, this study hopes to further this area of research. The study will include a subsample of undergraduate students from Eastern Michigan University (N = 24, and use a chi-square analysis to determine the significance of prosocial behavior in bystander interventions.

Megan Nichols, Robbie Kado

College Affiliated: Michigan State University, Michigan State University

Category: Psychology

Mentors: Brooke Ingersoll Thuan Tran

Presentation Number: 2534

Title: EXAMINING THE RELATIONSHIP BETWEEN PROVIDER PERCEPTION AND OBSERVED FIDELITY FOR A CAREGIVER-IMPLEMENTED NATURALISTIC DEVELOPMENTAL BEHAVIORAL INTERVENTION (NDBI.

Abstract: Introduction: Caregiver-implemented NDBI for children with social communication delays has gained increasing attention. Instead of direct provider-child interaction, providers now coach caregivers to implement strategies in everyday environments, increasing intervention opportunities. Given this model, child and family outcomes depend in part on providers delivering the intervention with fidelity. However, prior research suggests providers often report inadequate training, lowering their self-efficacy. Studies also show providers overestimate their intervention delivery compared to their fidelity scores, potentially affecting caregiver implementation. This study examines whether providers' self-reported practices and perceived self-efficacy align with observed fidelity. Methods: Provider-level data (n=90 were derived from RISE, a multi-site study (MI, IL, WA, MA exploring parent-implemented intervention in community settings. Providers completed a self-reported Provider Practices Survey at baseline prior to intervention training and were later scored on fidelity during consultations. Self-reported efficacy on intervention strategies was collected post-training and at six months. Results: Planned analyses include correlations between fidelity scores and self-reported practices to assess alignment between perception and use. A paired-samples t-test will evaluate change in self-efficacy from post-training to T2. From prior literature, we anticipate low correlation between self-report and fidelity, reflecting perceived gaps in training. Conclusion: Caregiver-implemented interventions rely on providers' ability to coach caregivers in intervention strategies. Understanding providers' perceptions compared to their actual fidelity scores is essential to supporting children/families with social communication delays. This study helps identify any misalignment between perception and reality-an important first step in informing decisions about training and support for effective strategy usage.

Brooke Soulliere

College Affiliated: Michigan State University

Category: Psychology

Mentors: Brooke Ingersoll

Presentation Number: 2535

Title: QUALITATIVE EXAMINATION OF CLINICIAN REPORTED ADAPTATIONS TO A PARENT MEDIATED INTERVENTION FOR AUTISM

Abstract: Community-based clinicians delivering parent-mediated interventions (i.e., clinicians teach caregivers evidence-based intervention strategies for social communication delays report often adapting programs to improve engagement and cultural fit (Barnett et al., 2019. The current study examines adaptations (i.e., changes to the program clinicians made to improve the cultural fit of Project ImPACT, a social-communication parent-mediated intervention for children with autism or social communication delays.Community-based clinicians (n=162 who implemented Project ImPACT in their usual practice within the past six months completed an online survey. Clinicians provided open-ended responses on adaptations made to improve the cultural fit of the intervention. An inductive thematic analysis was employed. Two researchers independently reviewed and coded the responses to identify initial themes and patterns. Final themes were revised through iterative discussion. A total of 83.3% of clinicians reported making adaptations to improve the cultural fit of the intervention. Seven themes were identified, including adapting for 1 different family structures (integrating extended family members, support networks, 2 cultural preferences regarding child-focused strategies (views on play and letting the child lead the activity, 3 parenting styles and cultural norms (directive styles, use of animation, 4 program language (simplify terms, translation 5 integrating conversations around goals, values and expectations, 6 adjusting coaching to fit family preference and expectations 7 flexible delivery of sessions and scheduling. Findings reflect clinicians are flexibly adapting the intervention to fit the family's culture and preferences. Understanding how clinicians make adaptations can inform best strategies for implementation, especially among underrepresented families.

Morgan Gaston

College Affiliated: Michigan State University

Category: Psychology

Mentors: Jan Brascamp

Presentation Number: 2536

Title: THE BATTLE OF BISTABILITY - IDENTIFYING THE PERCEPTION OF AMBIGUOUS STIMULI USING INVOLUNTARY EYE MOVEMENTS

Abstract: When faced with ambiguous stimuli the brain must make inferences to decide which precept is "correct". Most of the inner workings of this perceptual inference process remain unknown. Our project seeks to deepen the understanding of these processes by showing participants an ambiguous rotating cylinder that can be perceived as rotating rightward or leftward. In many existing studies, participants reported their perception of such stimuli via left and right key presses. This allows researchers to examine perceptual inference (which determines perception, but not in isolation from behavioral decision making (which determines which key to press. Aiming to isolate perceptual inference from behavioral decision making, we examined whether involuntary eye movements known as OKN (Optokinetic nystagmus can identify perception, even without any key presses. OKN includes involuntary eye following movements with which people unconsciously track moving objects or patterns in front of them. For objects with an ambiguous movement direction, such as our stimulus, these following movements may track theperceived direction, allowing researchers to infer perception without key presses.By comparing the OKN eye movements to the self-reported rotation direction, we are examining whether OKN can reliably be used for this purpose. If so, then we will use OKN to further investigate the perceptual inference process in isolation from behavioral decision making.

Social Sciences

Maralgoo Ariunbaatar

College Affiliated: Albion College

Category: Social Sciences

Mentors: Connie OBrien

Presentation Number: 2601

Title: INCREASING RECOVERY RATES OF ORGANIZATIONS IN BANKRUPTCY

Abstract: This study examines how businesses in the United States recover from bankruptcy, exploring why some succeed while others struggle. Through comparative analysis, detailed case studies, and quantitative examination of financial metrics, the research investigates recovery strategies and outcomes. By analyzing financial statements, court filings, and market trends, the study identifies factors influencing recovery and offers practical recommendations for stakeholders. The anticipated outcomes include a nuanced understanding of recovery strategies and actionable insights for businesses facing financial distress.

Charvi Bagewadi Ellur, Nivi Medum

College Affiliated: Michigan State University, Michigan State University

Category: Social Sciences

Mentors: Vashti Sawtelle

Presentation Number: 2603

Title: TRANSFER SENSE OF BELONGING - CONNECTING SENSE OF BELONGING TO TRANSFER STUDENT EXPERIENCES

Abstract: We document transfer students' transitional journeys, toward defining explore defining Transfer Sense of Belonging (TSB in a way that reflects the lived experiences of transfer students as they transfer from associate's degree gaining institutions (ADGI into Michigan State University, a bachelor's degree gaining institution (BDGI. Statistically, 80% of students who begin at an ADGI aim to earn at least a bachelor's degree, yet 29% actually achieve that within six years (Horn Skomsvold, 2011. Given, more than a third of most transfer students who begin at ADGI's also come from minority backgrounds (CCRC, 2021, improving TSB is a step towards equity. Through focusing on transfer students' voices, our research aims to explore the gap between institutional policies and the lived experience of transfer students and how it impacts TSB. Building on pre-existing literature on transfer student's lived experiences, we analyze interview data from mentors in MSU's TEMPO peer mentoring program. Using a narrative inquiry approach to students' transfer experience, we identify key moments in a student's transfer experience and identify common themes across transfer student interviews. We will present narratives and a thematic analysis of transfer student interviews to begin the work to define the Transfer Sense of Belonging for transferstudents.

Natalie Westrate

College Affiliated: Michigan State University

Category: Social Sciences

Mentors: Jonathan Wlasiuk

Presentation Number: 2604

Title: READING THE SIGNS: EXPLORING EMPLOYMENT RATES OF DEAF AND HARD OF HEARING ADULTS IN THE UNITED STATES

Abstract: As an Honors Option Project for LB 172, Lyman Briggs General Chemistry II, I completed a research paper and presentation at UURAF in the spring semester of 2025 titled "Reading the Signs: Exploring Deaf and Hard of Hearing Chemists in Research Fields." The goal of that project was to understand and explain roadblocks to deaf and hard of hearing chemists, as well as to propose relevant solutions. One of the roadblocks that was identified for that project was a study from the National Association of Colleges and Employers (NACE that stated employers placed verbal communication skills between very and extremely important in a potential employee. Additionally, a 2019 paper by the National Deaf Center on Postsecondary Outcomes (NDC identified that deaf adults are employed at a lower rate than hearing adults who graduated from the top five most popular majors in the United States. "Reading the Signs: Exploring Deaf and Hard of Hearing Chemists in Research Fields," found that more research should be done into the connection between employers valuing verbal communication and the relatively low employment rate of D/HH adults. This project is an attempt to examine that connection more closely.

Ty Smith

College Affiliated: Michigan State University

Category: Social Sciences

Mentors: Eddie Boucher

Presentation Number: 2605

Title: THE INDIAN TOUCH: DESIFICATION OF THE MOMO

Abstract: This research investigates the cultural, historical, and socio-economic significance of momos, a beloved dumpling dish that has become a culinary staple in Jaipur, India. With a population of over four million, Jaipur represents a vibrant hub of street food culture where momos have gained immense popularity, contributing over $3 billion annually to Northern India's food economy. Originally of Tibetan origin, momos have undergone a process of "desi-fication," a localized adaptation that reflects Indian tastes, ingredients, and cooking methods. This study seeks to understand how momos transitioned from a regional delicacy to a nationwide favorite by tracing their historical journey, examining changes in their recipe, and exploring how they integrate into local food systems. Using both sociological and historical lenses, this research examines how momos are perceived across different social strata, from street vendors to upscale restaurants. It investigates how this dish has contributed to cultural identity, food accessibility, and economic activity in Jaipur. Through interviews with vendors, restaurateurs, and consumers, along with an analysis of the momo supply chain, the study explores the sourcing of ingredients, evolving perceptions of authenticity, and the role of globalization in culinary exchange. Ultimately, this research sheds light on how a single dish can reflect broader themes of community, tradition, and adaptation in an increasingly interconnected food culture.

Faustina Zielonka

College Affiliated: Michigan State University

Category: Social Sciences

Mentors: Sheila Maxwell

Presentation Number: 2606

Title: BEYOND NUMBERS, A QUALITATIVE ASSESSMENT OF THE CHALLENGES OF REENTRY

Abstract: While research on offender rehabilitation has centered on the reentry of incarcerated individuals, the experiences of probationers remain underexplored, despite comprising a larger pool of offenders, estimated at 60% more nationwide. Although existing literature shows that offenders face challenges related to employment, housing, mental health, and social relationships, the context and fluctuations of these challenges are rarely documented. This project conducted a qualitative analysis of anonymized case notes of felony probationers who participated in the Second Chance program administered by Michigan Works! between 2019 and 2023. Through thematic coding and the construction of life-story narratives, the project examined common reentry challenges and identified the underlying barriers that made them difficult for participants to overcome. Thematic analysis revealed that probationers struggled to find work, housing, or stability when they lacked critical resources such as legal identification, childcare, and transportation. The results also showed that both personal and structural circumstances contributed to reentry barriers. These findings suggest the need for further research to develop services that effectively address these challenges within probation and community corrections.

Paige Meller

College Affiliated: Michigan State University

Category: Social Sciences

Mentors: Gabriel Wrobel

Presentation Number: 2607

Title: WHAT THE BONES REMEMBER: BUILDING A BIOLOGICAL PROFILE FROM SKELETAL REMAINS

Abstract: This case study focused on an individual (C-79, L1: Burial 33 locus 1019 excavated from the Caesarea Maritima archaeological site, an ancient medieval port city on the coast of the Mediterranean Sea. I developed a biological profile using standard forensic methodologies to determine the individual's sex, age, and stature at death.

Emma Huizenga, Lola Browne

College Affiliated: Michigan State University, Michigan State University

Category: Social Sciences

Mentors: Matthew Grossmann

Presentation Number: 2611

Title: BEYOND THE ACA: THE ROLE OF GENDER COMPOSITION IN STATE LEGISLATURES ON GENDER-SPECIFIC HEALTHCARE COVERAGE

Abstract: The Affordable Care Act (ACA, signed into law in 2010 and fully implemented in 2014, requires both public and private insurers to cover a minimum of ten essential health benefits for their policyholders, including ambulatory patient services, emergency services, hospitalization, maternal newborn care, mental health substance disorder services, prescription drugs, rehabilitative habilitative services devices, laboratory services, preventive wellness services chronic disease management, and pediatric services for oral and vision care. Additionally, the benefits of contraceptives and breastfeeding coverage must be provided, though anomalies to this rule exist. While these requirements cover an extensive range of care, some gender-specific health benefits are exempt from obligatory coverage, leaving the issue of mandated coverage to the states. Given that women's and transgender healthcare has been historically overlooked and highly politicized, it is crucial to examine whether the representation of marginalized identities in state legislatures influences the adoption of mandatory insurance coverage laws for gender-specific healthcare. Studying the effects of representation can help foster a more inclusive and fair policy system by promoting accountability and equity to address the systemic neglect of these issues. To answer this question, state-level insurance mandates for contraceptives, abortion, fertility treatments, vasectomies, erectile dysfunction, prostate cancer screenings, gender-affirming surgery, and transgender hormone therapy were compiled and analyzed to examine the relationship between the gender composition of a state's legislature and the passing of these policies.

Benjamin Lowen, Grace OMalley

College Affiliated: Michigan State University, Michigan State University

Category: Social Sciences

Mentors: Sarah Reckhow

Presentation Number: 2612

Title: CONTRASTING NARRATIVES OF INEQUALITY AND INSTITUTIONS IN US SECONDARY EDUCATION: THE POLITICAL DEVELOPMENT OF CIVICS CURRICULUM

Abstract: Civic education is charged with the responsibility of inculcating citizenship skills and civic efficacy in students (NCSS, 2013. Yet, the national conversation about civic education in recent years has been driven by political rancor and polarization. We explore state and local level changes to civic education in response to political movements from different ends of the political spectrum. We examine how the leading actors and goals of these movements compare and contrast, in order to better understand the nature and breadth of polarization in civic education, and the possibilities (if any for common ground or shared goals. Our first case, Chicago, IL, focuses on the adoption of "Reparations Won"--a curriculum required for Chicago Public School students as part of a reparations package adopted by the city due to decades of systematic police torture involving Chicago police officers.Our second case focuses on the adoption of Florida's Civics Literacy Excellence Initiative, a curriculum focused on increasing civic literacy and engagement by putting "the Constitution ... back into the classroom." We use newspaper content analysis paired with content analysis of all relevant curriculum documents in order to compare and contrast these cases to answer the following questions. How and why was a new approach in civic education adopted in each case? Which thematic elements related to citizenship, participation, equality, and institutions are emphasized in each case? Our conclusions will allow us to assess the political and curricular differences between conservative and progressive approaches to civic education in the state and local context.

McKenna Boykin

College Affiliated: East Tennessee State University

Category: Social Sciences

Mentors: Phillip Warsaw

Presentation Number: 2613

Title: FOOD ACCESS AND FIRST IMPRESSIONS: UNDERSTANDING SPENDING TRENDS AMONGST NEW AND ESTABLISHED FARMERS MARKET CUSTOMERS

Abstract: Farmers markets (FMs are increasingly serving as community hubs and vital access points for fresh, local food. Their popularity surged during the COVID-19 pandemic, which exposed vulnerabilities in the industrial food system and motivated many consumers to seek out more localized alternatives (Warsaw et al., 2022; 2023. This study investigates how spending behaviors differ between first-time and established FM customers to better understand consumer engagement and inform strategies that promote equitable access to local food systems. The central research question "How do spending behaviors differ from first-time and established farmers market customers?" aims to distinguish the habits of these two groups. This analysis can inform public health and market sustainability initiatives, particularly efforts aimed at enhancing racial equity. First-time customers, often from marginalized or economically disadvantaged backgrounds, may have different spending patterns and barriers that require tailored policy responses. Enhancing FM accessibility through increased support for WIC/SNAP benefits could significantly reduce food insecurity (Warsaw et al., 2021; Monticone et al., 2024. The research will use a mixed-methods approach over a four-week period. Participants will complete the Farm2Facts (F2F survey electronically. Quantitative data will be analyzed using descriptive statistics, t-tests, and variance measures to compare mean spending between groups. Thematic analysis will be used to explore qualitative responses. It is hypothesized that established customers will spend more than first-time buyers. If supported, this finding could guide marketing and policy strategies to expand FM use among low-income and minority populations, ultimately improving the equity and reach of local food systems.

Isabella Tyler

College Affiliated: Grand Valley State University

Category: Social Sciences

Mentors: Elizabeth Arnold

Presentation Number: 2614

Title: BETWEEN KINGS AND COMMONERS: AN ISOTOPIC STUDY OF THE ANIMAL ECOLOGY OF THE 19TH-CENTURY ZULU KINGDOM

Abstract: The Zulu Kingdomexisted as a monarchy in Southern Africa from1816 to 1897. Much of what is known about Zulu society is drawn from colonial records, and previous archaeological research has focused on capitals and battlefields. This emphasis on nobility and warfare overlooks the broader Zulu population. This study seeks to reconstruct animal use and management across the social hierarchy, considering cattle not only as food but as instruments of political power, trade, influence, and status. In Zulu society, both past and present, cattle are a principal form of wealth and central to exchange practices such as tribute and bride wealth, making them the focus of this analysis. Over the past three years, new archaeological surveys in the eMakosini, or "Valley of the Kings," a basin south of the White Mfolozi River, have identified new sites and animal remains for analysis. This study examines cattle teeth using strontium, carbon, and oxygen isotopes, with samples collected from museum collections and recovered during the new survey. Carbon and oxygen isotopes help identify diet and environmental conditions within which animals were managed, while strontium informs on the movement of cattle across the landscape.

Amanda Daniels

College Affiliated: Grand Valley State University

Category: Social Sciences

Mentors: Daniel Goldberg

Presentation Number: 2615

Title: AN ASSESSMENT OF MUNICIPAL COMMITMENTS TO ENVIRONMENT, LOCAL CULTURE AND RESIDENT QUALITY OF LIFE IN THE GREAT LAKES BIOREGION

Abstract: We are facing a global biodiversity crisis; species are vanishing at an alarming rate, primarily due to habitat loss driven by human development. Simultaneously, cities are grappling with homelessness, housing shortages, and affordability crises, increasing pressure to expand urban sprawl. As cities grow, habitat is consumed, accelerating species loss and climate change. Yet, when nature is prioritized within urbanized areas, both wildlife and humans benefit. Birds and reptiles inhabit wetlands, grasslands, and forests near human development. Birds, pollinators and other insects thrive where native plants are integrated into landscaping, while the plants filter runoff and protect cities from flooding. Cities with a robust tree canopy mitigate urban heat centers, consuming less energy. These examples show what is possible, but efforts are fragmented. City planners aiming to prioritize the inclusion of nature are without measurable standards or best practices to guide protecting or promoting biodiversity. This research surveyed 57 municipalities within the Laurentian Great Lakes bioregion, exploring the extent to which municipal plans prioritize ecological integrity, local cultural distinctiveness, and the quality of life of residents relative to economic growth and housing development pressures. Initial findings suggest that municipal priorities are largely centered on economic development and housing, while sustainability concerns are secondary, and biodiversity, localcharacter, and quality of life are rarely addressed explicitly. There is no current framework or assessment tool to evaluate how municipalities are supporting biodiversity. This research will inform the development of an open-source assessment and implementation tool for small and medium Great Lakes communities.

Savannah Slayton

College Affiliated: University of Oklahoma

Category: Social Sciences

Mentors: Sarah Reckhow

Presentation Number: 2616

Title: IS LEARNING THE PRIORITY? EDUCATIONAL ATTAINMENT AND THE FEDERAL EDUCATION POLICY AGENDA

Abstract: This research investigates whether student learning and educational attainment have remained sustained priorities in U.S. federal education policy. Using the Elementary and Secondary Education Act of 1965 (ESEA, the No Child Left Behind Act of 2001 (NCLB, and the Every Student Succeeds Act of 2015 (ESSA as key legislative benchmarks, alongside U.S. congressional hearing transcripts and scholarship on federalism in education, the project examines how federal priorities and policy discourse have evolved over time. The central question guiding this study is: To what extent has student learning been a core goal in K-12 federal education policy? Student learning and educational attainment are defined based on how members of Congress frame and prioritize these concepts in benchmark years. The project is grounded in the problems-versus-solutions policymaking framework (Park et al., 2023, which distinguishes between political grandstanding and substantive policy efforts. Through a qualitative thematic analysis of key education laws and congressional hearings, the research identifies shifting federal emphases, from equity and access under ESEA, to accountability under NCLB, to state flexibility under ESSA, and finally, to the pandemic response era. A quantitative content analysis examines how frequently student learning is discussed and whether that attention is framed as problem identification or solution-oriented action. Preliminary findings suggest that while student learning is frequently referenced, it is more rhetorical than a true policy priority. This research contributes to broader debates about the federal role in education and questions the extent to which federal policymakers are truly committed to improving student outcomes.

Troy Borrero

College Affiliated: Aquinas

Category: Social Sciences

Mentors: Angela Hall

Presentation Number: 2621

Title: ACCENTS IMPACTING PERCEIVED PROFESSIONALISM IN ASIAN AMERICANS

Abstract: Much of the research addressing workforce discrimination has focused on visual factors (ex., race, gender, and age, often overlooking innate auditory identifiers (ex., accents. There has also been a significant gap for Asian Americans in research relating to the workforce, primarily due to the model minority myth, suggesting there should be less research done on this population. The results of this research aim to answer the question: How do Asian Americans differ in perceived professionalism compared to White Americans when considering accents? As for data collection, a survey will be used and distributed through Amazon Mechanical Turk. Individuals who register to use this program will evaluate the performance and professionalism of workers (played by an actor with and without an accent. Each research subject will be randomly assigned to one of three groups: Asian American worker speaking in a native accent, Asian American worker speaking with a non-native accent, and White American worker speaking in a native accent. Subjects will receive a photo and audio recording of one of the workers and then be asked to rate the performance and professionalism of that worker. For each group, there will be two gender subgroups (men and women as covariates to account for intersectional differences. After collecting the data, a moderated regression analysis will be used to determine how accents moderate the relationship between race and perceived professionalism. Results for this are essential for further dismantling of stereotypes and discrimination within the workforce and overall society.

Presley Wood

College Affiliated: Michigan State University

Category: Social Sciences

Mentors: Emine Evered

Presentation Number: 2622

Title: VISUALS OF PROHIBITION

Abstract: Prohibition is often remembered as a failed social experiment driven by religious, cultural, and political motives. Less attention, however, is given to how prohibitionists mobilized the concept of family to legitimize and promote the movement. Prominent activist Frances Willard famously framed prohibition as "home protection," appealing to a broader public by casting alcohol as a direct threat to the family unit. Depictions of squandered wages in saloons, domestic violence, and the harmful effects of alcohol on unborn children were frequently employed to rally support. Through widespread publicity campaigns, the prohibition movement generated imagery that both reflected and shaped the era's demographic, cultural, and social anxieties. This poster explores how these visual representations not only mirrored those fears but also contributed to constructing them.

Chelsea Butler-Davis

College Affiliated: Eastern Michigan University

Category: Social Sciences

Mentors: Maria Luz Garcia

Presentation Number: 2623

Title: LIL' MISS IN-BETWEEN: HOW THE CONSTRUCT OF BLACKNESS IN DETROIT SHAPES MIXED-RACE IDENTITY

Abstract: Growing up as a mixed-race person in Detroit, there was no confusion in my household about race-I was Black. My mother was Black, and so I was as well. But in my community, things were often perceived quite differently. Others in Detroit's Black community sometimes received my claims to Black identity with skepticism while in other contexts I felt accepted without question. Later, as a researcher, it was clear to me that perceptions of race extend beyond phenotype. I began to consider the ways that ideas surrounding the category "mixed race," used to refer to people with only one Black parent, can help us to understand how Black people in Detroit understand Blackness as a racial category. In "Racial Situations: Class Predicaments of Whiteness in Detroit"(1999 and "Establishing the Facts of Whiteness" (1997 John Hartigan Jr. suggests that racial ambiguity has the potential to compel people to enforce racial boundaries. This idea challenges "mixed-race" as an independent category of racial identity and points to the importance of relationships among racial categories in constituting themselves and each other. In this research, I use ethnographic methods to take up Hartigan's arguments about racial ambiguity as I consider how Black communities understand ideas of Blackness, particularly by considering how they understand the category that is talked about as "mixed-race" in Black Detroit. I analyze how, in addition to shared evaluations of phenotype, perceptions about mixed-race people's experiences with Black culture and experiences of racism are important to understanding Black identities.

Antonio Green

College Affiliated: Grand Valley State University

Category: Social Sciences

Mentors: Angela Hall

Presentation Number: 2624

Title: HOW DOES FOCUSED CO-WORKING ENVIRONMENTS AFFECT PRODUCTIVITY AND PSYCHOLOGICAL WELL-BEING AMONG REMOTE WORKERS?

Abstract: 2021, was a year within our lives that changed the workforce. During this year, COVID-19 (a deadly infectious disease caused by the virus SARS-CoV-2 escalated to a global pandemic which caused organizations across the nation to shut down instantly, and adopt a remote workplace model. Fast forward to 2025, and the modern workplace is rapidly evolving towards a digitally integrated atmosphere, with hybrid co-working environments that are transforming how we network, communicate, and experience our careers. Co-working environments are communities of professionals gathering in unison (Digitally or physically to complete their personalized career tasks within their prospective professions. This advancement has increased the flexibility and autonomy of professionals worldwide. Nonetheless, these innovations have presented new challenges for Human Resource Professionals focused on increasing productivity, maintaining employee engagement, and improving the employee experience. During this study, I will be investigating how Focused co-working environments currently influence employee's productivity and psychological well-being during the workday. This research will contribute to the evolving field of strategic Human Resource Management by providing a comprehensive experimental design that gives way to deeper insights into innovative, inclusive, and positive-focused co-working environments.

Keymoni Coleman

College Affiliated: Dillard University

Category: Social Sciences

Mentors: Steven Chermak

Presentation Number: 2625

Title: DISTINGUISHING TERRORIST EXTREMIST FROM REGULAR VIOLENT OFFENDERS: A COMPARATIVE ANALYSIS OF RISK AND PROTECTIVE FACTORS.

Abstract: Although there has been a growing body of research exploring the characteristics of extremists who commit violent crimes, there is much less comparative research on this topic. Some work compares violent extremists to nonviolent extremists, to mass shooters, and non-offending extremists. There has yet to be a study that compares violent extremists to other violent offenders. This gap in the literature represents a critical limitation in our understanding of what distinguishes extremist violence from other forms of violent behavior, making it difficult to develop targeted prevention and intervention strategies. This study will compare violent offenders who commit an ideological homicide to those who do not. Data for this study will be extracted from the Risk and Protective Factor Database (RPFD, a systematically developed database that includes different types of extremists and many types of individual-level risk and protective factors. The analytical approach will employ several statistical techniques to identify distinguishing characteristics between extremist and non-extremist violent actors. Descriptive statistics will first be conducted to examine the distribution and central tendencies of all variables across both groups. Subsequently, chi-square tests will be performed for categorical variables to assess significant associations. This multivariate approach will help determine which combination of risk and protective factors most effectively differentiates between extremist and non-extremist violent individuals while accounting for demographic variables such as age, gender, socioeconomic status, and geographic location. Additionally, discriminant function analysis may be employed to develop a predictive model that can classify individuals into extremist or non-extremist categories based on their risk factor profiles. This analysis will provide insight into the relative importance of different variables in distinguishing between the two groups and may reveal previously unidentified patterns or combinations of factors that are uniquely associated with extremist violence.

Cloud Rimer

College Affiliated: Albion College

Category: Social Sciences

Mentors: Allison Harnish

Presentation Number: 2626

Title: MANOOMIN MONITORING AND MUSEUM INTERPRETATION

Abstract: This project set in motion methods of monitoring the wild rice (Manoomin found at the Albion College Whitehouse Nature Center (WNC, with respect to native traditions and beliefs. We utilized-and modified when needed-Tonya Kjerland's "Wild Rice Monitoring Handbook" and the "Medicine Wheel Framework for Wild Rice Restoration" from Cassandra Reed-VanDam. We also created a ten-minute interpretive program for WNC employees to use to educate and engage visitors. Throughout, we collaborated, sought input, and reported our progress to the Nottawaseppi Huron Band of the Potawatomi's Environment Department.

Anahita Dhar

College Affiliated: Michigan State University

Category: Social Sciences

Mentors: Shahnaz Masani

Presentation Number: 2627

Title: FINDING YOUR TRUE NORTH: A PURPOSE-DRIVEN APPROACH TO DEVELOPING STUDENTS' STEM CAREER SELF-EFFICACY, IDENTITY AND SENSE OF BELONGING

Abstract: For students in the sciences, there often seems to be only one pathway that combines their love of science and passion for helping people: medicine. But what if students approached their academic journey with a purpose-driven, as opposed to a destination-driven, mindset? Engaging in this type of exploration and reflection positively impacts students' STEM self-efficacy and identity, helping to close opportunity gaps by promoting retention and reducing the time to graduation. However, this work remains siloed as 'outside of class' work, or in career-specific courses that are separate from students' disciplinary courses, which allows students to see this work as important, but separate. In addition, this siloed approach means that only students who take these classes or engage with career services support individually have access to these opportunities. This opportunity gap is likely compounded for students from underrepresented and minoritized groups, creating a structural barrier where these students are expected to recognize the value and seek these opportunities in unfamiliar and often exclusionary environments. By integrating purpose-driven exploration and reflection into a student-centered biology classroom, we aim to engage students in purpose-driven planning, skill development and articulation within the context of their disciplinary learning experiences. Drawing on Social Cognitive Career Theory and Marcia's Identity Formation Model we designed and assessed the IRL (In Real Life lab curriculum, which was implemented in a student-centered introductory biology class across several semesters. Through the IRL lab, students engaged in activities that helped in (a Identifying and articulating their purpose, which we define as the intersection of their values, interests, skills, and the societal impact they prioritize in their work (b Purpose-driven exploration and planning and (c Making meaning of their in-class experiences within the context of their broader purpose and professional journey, and building professional networks.We assessed the impacts of this intervention, triangulating data from class assignments, focus groups, and semi-structured interviews collected across 2 semesters and identified three main themes. We find that engaging with IRL: (a Helps develop students' purpose driven lens, helping (b Impacts the career identity development process by developing their self-efficacy and outcome

expectations, and (c Increases their sense of access and belonging. STEM higher education is a choose your own adventure where only some students are equipped with the tools needed to navigate this new world. By engaging students in purpose-related exploration and reflection in a disciplinary, student-centered class, we break down this structural barrier by equipping tools and strategies they need to chart a path forward that aligns with their purpose, thus empowering ALL students to choose their own adventure.

Multiple Disciplines

Lily Ethington

College Affiliated: University of Michigan-Flint

Category: Multiple Disciplines

Mentors: Gergana Kodjebacheva

Presentation Number: 3201

Title: INCREASED AVAILABILITY OF REMOTE HEALTHCARE APPOINTMENTS AND TELEHEALTH TECHNOLOGICAL DEVICE LOANING PROGRAMS AS STRATEGIES FOR IMPROVING TELEHEALTH: OPINIONS BY ADOLESCENTS WITH DIFFERENT HOUSEHOLD INCOMES

Abstract: This study aims to understand adolescent opinions on ways to improve telehealth. Findings are separated by the family income of the adolescent. A total of 81 adolescents aged 14-17 across Genesee County, Michigan were recruited for semi-structured interviews with specific questions on adolescent suggestions to improve multiple elements of telehealth services. To gain a broader scope of experiences, individuals with and without telehealth experience were recruited. Those living in lower-income communities and who were Latinx and African American were purposely recruited. Parents/caregivers completed a socio-demographic survey about income, health insurance, and other factors for the household. Out of 81 participants, 37 (45.7% had Medicaid Health Insurance coverage in the last 12 months and 23 (28.4% had household incomes less than $40,000 annually. Adolescents from lower-income households suggested ways to overcome access barriers, while those from higher-income households sought to optimize telehealth by proposing better appointment structures. Lower-income participants more frequently suggested healthcare providers loan out smart devices with access to high-speed internet than high-income participants. Understanding adolescent opinions surrounding telehealth may lead to notable improvements in youth-focused medical care. Further randomized controlled trials should implement adolescent suggestions of telehealth optimization and device loan-out programs for a targeted adolescent population.

Natalie Altayeb

College Affiliated: Albion College

Category: Multiple Disciplines

Mentors: Ken Saville

Presentation Number: 3202

Title: INVESTIGATING THE EFFECTS OF E. COLI K12 ON THE GUT MICROBIOME OF DROSOPHILA MELANOGASTER

Abstract: The gut microbiome plays a crucial role in host health, influencing immune function and disease susceptibility. Through usage of Drosophila melanogaster (D. melanogaster, one is able to examine how exposure toEscherichia coli (E. coli affects gut microbial community structure. Flies were orally infected withE. coli through cotton ball feeding at controlled time points. Following exposure, flies were dissected, and DNA was extracted from their gut tissue. Polymerase Chain Reaction (PCR was used to assess the presence of bacterial DNA, and samples were prepared for 16S rRNA sequencing to characterize microbial diversity. Further experiments analyzed barrier integrity through Smurf assays and potential microbial interactions with a competition assay. This ongoing research aims to provide insights into host-microbe interactions and to model how environmental bacterial exposure may disrupt gut microbiome composition.

Aaditya Moudgil

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Andrew Keen

Presentation Number: 3203

Title: PERFORMANCE AND ENERGY EFFICIENCY ANALYSIS OF HPCG AND HPL BENCHMARKS ACROSS ICER'S HPC NODES

Abstract: High Performance Conjugate Gradients (HPCG and High Performance LINPACK (HPL are useful benchmarks for evaluating compute-bound and memory-bound behavior of modern HPC systems. At ICER, systematic benchmarking across air-cooled and water-cooled nodes reveals insights into performance, energy consumption, and thermal stability under real-world workloads.

Damilola Adissa

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Evan Reynolds

Presentation Number: 3204

Title: THE EFFECT OF SOCIAL DETERMINANTS ON HEALTH ON USE OF DIABETES-RELATED TECHNOLOGY IN OLDER ADULTS WITH TYPE 2 DIABETES

Abstract: Objective: We aim to determineassociations between social determinants1 of health (SDOH and use of diabetes-related mobile applications in older individuals with type 2 diabetes (T2D. Research Design and Methods:Weused data from the National Poll on Health Aging, a nationally representative survey of older adults in the United States. We identified persons that self-reported having T2D. Co-primary outcomes were use of mobile applications to (1 track diabetes medications and (2 track blood glucose levels. SDOH factors included income, education, insurance, lack of companionship or social isolation, and housing status. We fit logistic regression models to determine associations between SDOH factors and use of each mobile health application, adjusting for demographic information and access to technology. Results: There were 348 persons with T2D that completed the survey (mean (SD age: 65.4 (7.9, 44.0% female, 69.5% White, 13.2% Black, 13.5% Hispanic. We found 12.4% used mobile applications to track blood glucose and 5.5% used applications to track diabetes medications. Regression models revealed higher income associated with an increased odds of using mobile applications to track blood glucose levels (OR:52.02, 95%CI: 6.27-716.88. Additionally, older age associated with decreased odds of using applications to track medications (OR: 0.92, 95%CI: 0.84-0.995. Finally, we found owning a home associated with decreased odds of using applications to track medications (OR: 0.193, 95%CI: 0.03-0.91. Conclusions:We found that few older adults with T2D use mobile applications to assist in diabetes care, particularly among those with low income. Given the effectiveness of mobile health applications for diabetes outcomes, future studies are needed to identify barriers and facilitators of their use in these populations to develop future interventions.

Naga Dutta Raghavendra Ithihas Akondi

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Dan Salazar-Gallegos

Presentation Number: 3205

Title: SEARCHING FOR ASTROPHYSICAL NEUTRINO SOURCES NEAR THE CLASSICAL DWARF SPHEROIDAL GALAXY DRACO

Abstract: Dwarf spheroidal galaxies are ideal objects for our analysis of dark matter due to their relatively low number of astronomical objects and minimal gas content, which reduces the neutrino background noise in our data. Through our Dark Matter search, we have discovered that the classical dwarf Draco exhibits a neutrino excess compared to background. To determine the cause of this excess in neutrino flux, we have conducted an astrophysical source survey. We consider astrophysical sources beyond dark matter annihilation like Active Galactic Nucleus (AGN, Pulsar (Psr, Supernova (SN, and Supernova remnant(SNR that might explain this unexpected neutrino flux from a relatively empty galaxy. Through our research on the classical dwarf Draco, we have identified approximately 18 active galactic nuclei (AGNs located directly behind the Draco within a 1 degree radius. These AGNs correlate well with our neutrino chart from IceCube, suggesting a possible explanation for our observation.

Jagger Wraalstad

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Matthew Harkey

Presentation Number: 3206

Title: EVALUATING RECOVERY-STRESS STATES IN RELATION TO KNEE INJURY HISTORY IN DIVISION I FEMALE ATHLETES

Abstract: INTRODUCTION: Following knee injuries, only a small percentage of athletes will return to pre-injury levels of performance. Monitoring both physical and mental recovery may provide insight into long-term effects limiting performance in high level athletes. The Acute Recovery and Stress Scale (ARSS is a validated tool to assess athletes' recovery-stress states during training. PURPOSE: Explore the relationship between ARSS Recovery scores and knee injury history in Division I female athletes. METHODS: Fifty-four female athletes (age 20.04±1.39 years; height 169.38±9.26 cm; mass 67.73±11.24 kg completed a demographics survey, including injury history information, and the ARSS during an off-season testing session. A composite 'Recovery' score was calculated from ARSS subscales representing physical performance, mental performance, emotional balance, and overall recovery. Participants were grouped based on whether they reported a previous knee injury or not. An independent samples Welch's t-test was used to compare ARSS Recovery scores between groups. A multiple linear regression model was also conducted to adjust for any current injuries impacting ARSS scores. RESULTS: Athletes with a previous knee injury reported significantly lower ARSS Recovery scores than those without (p=0.033, Cohen's d=0.64, which remained significant after adjusting for current injuries (p=0.046. DISCUSSION: Knee injury history is associated with lower ARSS Recovery scores in Division I female athletes, suggesting long-term physical and/or mental effects. This highlights the need for additional monitoring and targeted interventions, even after athletes return to sport, to support recovery, enhance overall performance, and help athletes return to and exceed past pre-injury levels.

Aswath Karai

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Tuo Wang

Presentation Number: 3211

Title: SOLID STATE NMR COMPARISON OF CELL WALL POLYSACCHARIDES IN A. FUMIGATUS AND A. NIDULANS

Abstract: Aspergillus fumigatus and Aspergillus nidulans are fungal pathogens causing lethal infections in immunocompromised patients. Studies have been made using chemical treatment approaches to compare the cell wall composition and functions, but an in depth understanding of their differences still requires further investigations. As the cell wall consists of various polysaccharides and represents a promising target for antifungal drugs, characterization of the structure and dynamics of cell wall biomolecules is crucial for advancing drug discovery. We present studies using solid-state NMR and dynamic nuclear polarization (DNP to delve into the cell wall structure of A. fumigatus and A. nidulans. Our high-resolution solid-state NMR (ssNMR revealed that both fungal species have a similar composition of alpha-glucan, beta-glucan, and chitin in the rigid inner core of the cell wall. Moreover, we unveil the densely packed arrangements of glucans and chitins in A. nidulans. By shedding light on the intricate composition and the organization of the cell wall in these fungi we facilitate the valuable pathways for efficient future therapeutic advancements.

Vivian Michaels

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Lauren Stanley

Presentation Number: 3212

Title: GENETICS OF FLOWER COLOR: MIMULUS GUTTATUS

Abstract: Carotenoids are essential pigment compounds synthesized by plants, algae, and cyanobacteria that are utilized within the photosynthetic apparatus and as a precursor in vitamin A synthesis. Carotenoids have high nutritional value and are an essential component of animal diets, making them an important target for plant bioengineering projects. This study investigates the genetic basis of carotenoid pigmentation in yellow monkeyflower (Mimulus flowers through mutant analysis. We generated random mutations in seeds with a chemical mutagen, recovering apale yellow flower (pyf mutant. In this project, we backcrossed thepyfmutant to the wild-type and phenotyped the F2 to determine the genetic architecture of the trait. We then collected F2 plants with the mutant phenotype, performed DNA extraction, and pooled the samples for sequencing. In the future, we will use bulk segregant analysis and a series of knockout and rescue experiments to identify and confirm the causalPYF gene. This research will establish a greater understanding of the genetic regulation of carotenoid synthesis in plants, which can be used to inform metabolic engineering of crop plants for increased nutritional value.

Elif Yazgan

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Joseph Cesario

Presentation Number: 3213

Title: MEDIA INFLUENCE ON GENDER MICROAGGRESSIONS: EXPLORING THE IMPACT OF COUNTER-BIASED, NEUTRAL, AND GENDER-BIASED PORTRAYALS

Abstract: Microaggressions are subtle, often unintentional behaviors that convey derogatory messages to individuals based on their identities.Gender-based microaggressions particularly reinforce traditional stereotypes, diminishing women's self-esteem and impacting their mental health. Media sources such as advertisements, news, and social media play a critical role in shaping gender biases, yet little is known about how media may influence perpetuation of gender microaggressions. This study investigates whether exposure to gender-biased, counter-biased, or neutral media portrayals, specifically in advertisements, affects the likelihood of engaging in gender-based microaggressions. We hypothesize that biased media will increase microaggressive behaviors, while counter-biased portrayals will reduce them. Participants, approximately 250-300 students recruited via the SONA system, will be randomly assigned to view a short video representing one of three conditions: gender-biased, neutral, or counter-biased media content. Following exposure, participants will complete a gender microaggression scale and respond to behavioral vignettes designed to assess their likelihood of engaging in microaggressive behavior. All data will be collected in a single lab session using Qualtrics. Data will be analyzed using a one-way ANOVA to compare gender microaggression scores across the three media conditions. If significant differences are found, post-hoc tests will identify which groups differ. Behavioral responses to vignettes will be analyzed using similar group comparisons. This research is significant as it offers insights into mechanisms through which implicit biases are sustained and manifested in everyday interactions. Given that gender-based microaggressions often target women, the findings may help reduce the psychological burden and social inequality women face due to biased media portrayals.

Roberto Garcia

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Michael Ristich

Presentation Number: 3214

Title: COMPLEXITIES OF THE AMERICAN "LATINO VOTE"

Abstract: During every major election cycle in America, conversations about the "Latino vote" become ever more prevalent in political analysis and scholarships. As more generations of Latinos are born in or come to America, there are more Latine perspectives to consider. This name designation, however, fails to encapsulate the diversity of perspectives and experiences that make up this "Latino vote", which candidates work so strongly to convince. As Latinos in America vary in their perceptions, their views on how law and policy will affect them and their loved ones similarly change. This project explores the effect of disinformation, identity, and values and how combining these factors has led Latinos from the political left to the political Right. This presentation aims to provide analysts and policymakers with a more nuanced understanding of factors at play when Latinos make their way to the ballot box.

Ayat Alsoofi

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Camelia Suleiman

Presentation Number: 3215

Title: SKIN UNDER SIEGE

Abstract: This project examines the dermatological health impacts among Syrian refugees, exploring how conflict-driven displacement has exacerbated health vulnerabilities.Syria was chosen as the focus due to its ongoing humanitarian crisis - one of the largest and most unresolved in the world - which has left millions displaced and facing severe hardships. Additionally, the portrayal of Middle Eastern communities through Orientalist narratives has often overlooked the region's complex realities, making it crucial to shed light on the human cost of this crisis.With a focus on skin, hair, and nails, this project investigates how prolonged food insecurity and poor living conditions impact dermatological health in refugee camps.Analyzing these conditions highlights dermatology's role in crisis healthcare, with data drawn from recent studies on Syrian refugee populations. The findings emphasize that dermatological health serves as both a visible indicator of refugee well-being and a critical component of comprehensive care, suggesting that healthcare interventions in conflict zones should incorporate dermatology to improve health outcomes and dignity.By addressing these overlooked aspects, this project advocates for more targeted health responses in humanitarian settings. Despite the ongoing challenges, the resilience of the Syrian people offers hope for recovery and a stronger future.

Angela Lumaj

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Jenifer Fenton

Presentation Number: 3216

Title: SEASONAL VARIATION IN THE N-6:N-3 FATTY ACID RATIO IN PASTURE-RAISED EGGS: IMPLICATIONS FOR NUTRITIONAL QUALITY

Abstract: The ratio of omega-6 (n-6 to omega-3 (n-3 fatty acids plays a critical role in human health, with lower n-6:n-3 ratios linked to reduced inflammation and chronic disease risk. While pasture-raised eggs are often marketed as nutritionally superior to their conventional counterparts, limited research has examined how seasonal factors influence these nutritional qualities. This study investigates the monthly variation in n-6 and n-3 FA content and the resulting FA ratio in pasture-raised eggs from two Midwestern farms, Ohio and Indiana, over four months from September to December. The fatty acid profile was determined by gas chromatography. Each month, 24 yolks were collected and combined into 12 composite samples, which were then analyzed by gas chromatography.. The research showed a significant reduction of n-3 fatty acids across the season, particularly in the Indiana system, where the n-6:n-3 ratio increased 5x between early fall and winter. The Ohio system showed a more consistent ratio throughout the same period. These Findings suggest that environmental factors such as availability of forage and hens' diet may significantly influence the fatty acid profile of the eggs across the season of eggs with time. Awareness of seasonal trends is vital to both consumers seeking optimal food sources of omega-3s and farmers who desire consistent egg quality year round. This research highlights the influence of the production system and environmental factors on the nutritional value of pasture-raised eggs.

Jeanette Dompreh

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Benjamin Yoel

Presentation Number: 3221

Title: ON THE CAMPAIGN TRAIL ABROAD? U.S. SECRETARIES OF STATE AND PUBLIC DIPLOMACY DURING ELECTION SEASONS

Abstract: My research examines whether U.S. Secretaries of State increase their public-facing speech activity in the months leading up to presidential elections. By analyzing the timing and frequency of official speeches delivered by Secretaries of State over multiple administrations, this research explores patterns in public diplomacy that may reflect heightened political engagement or strategic communication during election cycles. The analysis aims to identify whether electoral considerations shape the foreign policy messaging timeline, offering insight into how domestic politics may influence the international posture of the United States.

Arnav Verma

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Daniel Woldring

Presentation Number: 3222

Title: IMPACTS OF THE BACTERIAL TYPE VI SECRETION SYSTEM AND IDENTIFICATION USING ALPHAFOLD/FOLDSEEK BIOINFORMATICS

Abstract: The type 6 secretion system (T6SS is utilized by Gram-negative bacteria for competition. The T6SS has a poison-spear mechanism; toxins called effector proteins, are loaded into the "spear" component, which stabs opponent bacteria, infecting them with the effectors proteins like DNases, peptidases, lipases, etc., that harm the enemy bacteria and result in death. Accidental infection of related/kin bacteria needs to be avoided for competitive fitness, so many bacteria create "immunity proteins" as a safeguard, which can bind and disable the effectors. These are shared across a species, so any accidental attack on a related bacterium will be nullified. Because of this attack and defense mechanism, the T6SS can severely alter bacterial populations in a microbiome, creating a threat to humans through gut dysbiosis, as many pathogenic bacteria can use this system. This presentation will discuss the impact of the T6SS on the gut microbiota and the identification of effector proteins using AlphaFold and Foldseek. Research shows that infecting mice with the T6SS using pathogen Aeromonas veronii caused an increased presence of other pathogenic bacteria while decreasing beneficial gut bacteria. This threat has led to research on how the AI bioinformatic tools AlphaFold2 and Foldseek can be used to predict effector/immunity protein pairs and the effectors' overall functions, which have been found with 90% accuracy. Future work can be done using the newer AlphaFold3 for more accurate and advanced predictions. It is also important to focus on discovering methods to inhibit the T6SS to minimize the threat to human health.

Lawpan Toe

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Craig Gross

Presentation Number: 3223

Title: MAXIMIZING NODE EFFICIENCY AND ACCESSIBILITY ON THE ICER HPCC

Abstract: The ICER High-Performance Computing Center (HPCC operates under a hybrid resource model: individual research groups "buy in" dedicated nodes for guaranteed access, while a shared community pool remains available to all. Our work over the past weeks has been to examine HPCC accounting data to quantify how buy-in nodes are actually used, how often they sit idle, and how community users consume spare capacity. The ultimate goal is to propose policies and tools that preserve buy-in owners' priority while making productive use of any idle capacity.

Michal Borek

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Mahmoud Parvizi

Presentation Number: 3224

Title: AI AGENT FOR SLURM

Abstract: High-performance computing (HPC users frequently make errors when writing batch job submission scripts, e.g. syntax errors, references to unavailable software installations and/or data files, inappropriate resource requests for the given cluster. These errors generally result in failed submissions or worse, jobs failing after having spent significant time in a queue or after having run for some time on the cluster, leading to wasted compute cycles with unnecessary energy consumption and needlessly prolonging the research cycle. This project aims to help HPC users increase efficiency and productivity by employing an HPC hosted large language model (LLM as an Agentic-AI framework designed to examine batch submission scripts and advise users on potential errors in syntax, software/file refences, and resource allocation prior to submission. We first focus our efforts on the Michigan State University High-Performance Computing Center, using the 'codellama' family of LLMs. This is an ICER Project to 'Plan and Develop' this framework using Data Machine GPUs.

Manasi Kulkarni

College Affiliated: Michigan State University

Category: Multiple Disciplines

Mentors: Natoshia Cunningham

Presentation Number: 3225

Title: ASSESSING THE FEASIBILITY OF ALLIED PROFESSIONALS DELIVERING CBT FOR PEDIATRIC PAIN: A SYSTEMATIC REVIEW

Abstract: Pediatric chronic pain affects 11-38% of children, leading to profound consequences such as mental health challenges, impaired academic performance, and a heightened risk of opioid misuse. While Cognitive Behavioral Therapy (CBT is a proven, non-pharmacological treatment, access remains limited, particularly in underserved communities, due to geographic, financial, and systemic barriers. This study investigates whether allied health professionals can feasibly deliver CBT after structured training. A scoping literature review highlights the potential for allied professionals to enhance accessibility to CBT through evidence-based training programs. The findings emphasize that training improves provider confidence and patient outcomes, including reduced anxiety and increased coping strategies among children. Family feedback highlights the importance of culturally tailored approaches to improve treatment adherence and equity. This work underscores the potential to reduce healthcare disparities by empowering allied professionals to provide equitable, non-pharmacological pain management solutions in underserved areas.

Asmita Tuladhar

College Affiliated: University of Michigan

Category: Multiple Disciplines

Mentors: Nidhi Tigadi

Presentation Number: 3226

Title: SOUTH ASIAN AMBITION AND ANXIETY: THE RELATIONSHIP BETWEEN CONSCIENTIOUSNESS AND SELF-REPORTED ANXIETY

Abstract: This study aims to explore the relationship between conscientiousness and anxiety, as well as provide further correlational data on how gender and level of education impacts self-reported anxiety levels in South Asians.There were 114 South Asian participants recruited (60.5% Male, 39.5% Female; Mage= 30.82, SDage = 10.88; 0.88% Less than High School, 23.7% High School or Equivalent, 7.02% Associates Degree, 0.88% Vocational/Trade School, 47.4% Bachelors Degree, 14.0% Masters Degree, 2.63% Doctorate Degree, 3.51 % Professional Degree through Cloud Research. Participants completed a survey where they were asked to self-report anxiety and Conscientiousness levels through likert scale based questions, on a scale of how often the participant felt anxious or exhibited conscientious behaviors. The anxiety scores were then compared across Conscientiousness scores, gender, and education levels through a Multiple Regression Statistical Analysis. Results demonstrate that there is a statistically significant negative correlation between conscientiousness and anxiety. Additionally, women were more likely to experience anxious behaviors and education level did not have an impact on anxiety. This research indicates that the negative relationship between Conscientiousness and anxiety can be generalizable into the South Asian community, and can be used to further facilitate future research on the culturally specific methods of raising conscientiousness to decrease anxiety.

Student Index

Mentor Index

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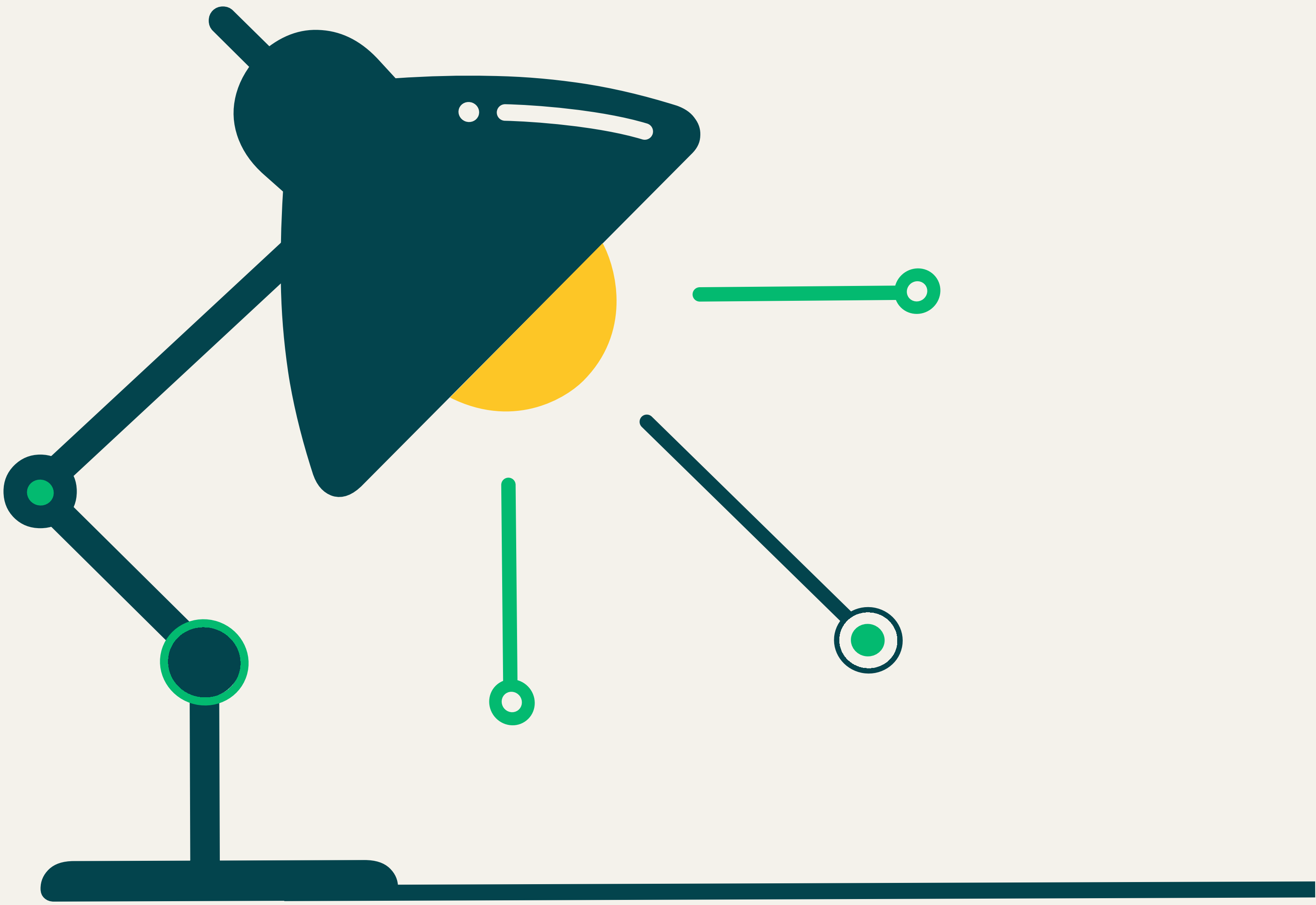

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