UNIVERSITY OF MINNESOTA

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Summer Undergraduate Research Expo

August 7, 2025
McNamara Alumni Center
Memorial Hall
9:30–11:30 AM

Undergraduate Poster Presentations
Listed Alphabetically by Presenting Author

Presenters should be at their posters at the following times:
9:30 – 10:30 odd numbered posters
10:30 – 11:30 even numbered posters

1.	**Hanan Abdi** *Expression of Calprotectin in Monocytes Exposed to Porphyromonas gingivalis* **Advisor:** Alpdogan Kantarci **Mentors:** Karen Johnstone & Tomaz Alves **Sponsoring Program**: LSSURP **Home Institution:** Hamline University **Abstract:** Calprotectin is an antimicrobial protein crucial to the innate immune response, particularly in the context of inflammation and bacterial infection. Porphyromonas gingivalis (P. gingivalis), a keystone pathogen in periodontitis, can evade host immune responses and disrupt normal cytokine signaling. Periodontal disease represents a group of oral inflammatory infections of the hard and soft tissue supporting the teeth and is a leading cause of tooth loss in older adults, impairing dental function and quality of life. This study investigates the regulation of calprotectin in THP-1-derived macrophages infected with P. gingivalis to better understand host-pathogen interactions in periodontal disease. THP-1 monocytes were differentiated using 20 ng/mL PMA and infected with live P. gingivalis at multiplicities of infection (MOI) of 50, with samples collected at 6-hour and 24-hour time points. Calprotectin expression was measured using qPCR, and cell viability was assessed via trypan blue exclusion. In-cell Western assays were used to evaluate calprotectin protein levels. Preliminary data suggest that calprotectin expression increases in a time-dependent manner and is associated with reduced macrophage viability at higher bacterial loads. These findings highlight the dual role of calprotectin in microbial defense and inflammation, with potential implications for understanding immune regulation in periodontitis.
2.	**Hafsa Ali** *Barriers and facilitators of access and use to smoking cessation resources in Somali American parents* **Advisor:** April Wilhelm **Sponsoring Program**: M-ASCEND **Home Institution:** Normandale Community College **Abstract:** American immigrants are less likely to be offered and to use cessation resources to quit smoking. Prior research has found that limited culturally and linguistically tailored resources, systemic inequities, and socioeconomic factors contribute to low access and use of smoking cessation resources in these groups. Cessation resource use is far better when cultural and cost barriers are addressed. However, the factors shaping African immigrant groups' use of smoking cessation resources are unclear. This study aims to examine facilitators and barriers to Somali parental receipt of smoking cessation support during their child's clinic visit. Six to seven focus groups (5-8 participants each) and 8-15 individual interviews will be conducted with Somali parents who smoke or live with a smoker (total n=48). Sessions will be transcribed, translated, and thematically analyzed. We expect to identify multi-level factors influencing Somali parent cessation resource utilization, including individual (e.g., gender-related stigma), community (e.g., benefits of Somali language materials), and structural (e.g., healthcare access) dimensions. Findings will directly inform the development of a culturally-tailored cessation program for Somali parents during pediatric visits. The study contributes to broader understanding of immigrant health disparities, and provides a framework for developing culturally-adapted tobacco cessation interventions.

3.	**Zukaina Al-Mohamed** *How People's Desires for Societal Freedom & Equality Can Feed Fascism's Hierarchical Nature* **Advisor:** Michael Goldman **Sponsoring Program**: Pathways **Home Institution:** University of Minnesota Twin Cities **Abstract:** This research explores the possibility of fascism having a parasitic relationship with democracy instead of being its direct result. When Benito Mussolini died, many believed his death would mark the end of fascist ideology. However, in the twenty-first century, many political leaders quote and praise Mussolini and other famous fascists. Proving that fascist groups and leaders still exist today. These political leaders govern societies that operate under democracies. This paper will determine whether fascism is borne from democratic principles. To tackle this question, this paper analyzes Mussolini's and his allies' speeches and articles, constitutions, and broadcasts by President Roosevelt and American fascist sympathizers as well as speeches and websites of today's Italian and American political leaders. This research shows that there is a solid connection between democracy and fascism. Fascist leaders exploit the nationalist identity and liberty granted by democracy to form an "out" group (i.e. Jewish people, socialists, Muslims, and immigrants). This exploitation allows them to overpower the current government. Identifying the ways our democracies can fail us can help policymakers and political leaders fortify our societies to prevent another person like Mussolini from coming to power again.
4.	**Sami Alsheikha** *CREB5 as a Regulator of Chemoresistance and Druggable Cell Surface Proteins in Basal-Like Breast Cancer* **Advisor:** Justin Hwang **Mentor:** Aiden Deacon **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Triple-negative breast cancers (TNBCs), which lack estrogen receptor, progesterone receptor, and HER2 expression, represent an aggressive subtype of breast cancer with limited treatment options and a poor prognosis compared to other subtypes. Roughly 70% of TNBCs are classified as basal-like breast cancers (BLBCs), which are frequently associated with metastasis and chemoresistance. Our recently published findings identified the transcription factor CREB5 as a potential oncogenic driver in BLBC, with overexpression linked to increased proliferation, epithelial-mesenchymal transition (EMT), and poor clinical outcomes. Furthermore, CREB5 overexpression upregulated the cell surface protein IL13RA2, a promising immunotherapeutic target. This project investigates the role of CREB5 in mediating chemotherapy resistance and explores how its interaction with IL13RA2 contributes to that resistance. Using BLBC cell lines with CREB5 or luciferase (control) overexpression, we will determine IC50 values following drug treatment. Once CREB5's role in chemoresistance is confirmed, RNA sequencing will assess IL13RA2 expression in resistant cells. We hypothesize that CREB5 overexpression leads to increased chemoresistance while maintaining elevated IL13RA2 levels. If confirmed, these findings would suggest CREB5 as a predictive biomarker for chemoresistance in BLBC and support IL13RA2 as a viable therapeutic target in resistant tumors.
5.	**Ebere Amadi** *The Quantification of VGF-Derived Peptide TLQP-62 Expression via Liquid Chromatography-Mass Spectrometry* **Advisor:** Patrick Rothwell **Mentors:** Ursula Girdwood & Anisha Adke **Sponsoring Program**: LSSURP **Home Institution:** Macalester College **Abstract:** Opioid Use Disorder (OUD) and depression affect millions of people in the United States and even more worldwide. Prior research suggests that the VGF gene may play a role in both depressive-like and opioid-induced behaviors. The VGF gene resides in the nucleus accumbens and is a neuropeptide precursor that cleaves into proteins, and acts as a mediator of plasticity for both adaptive and maladaptive symptoms brought on by depression and potentially OUD. However, current methods for measuring VGF protein expression, such as immunohistochemistry (IHC) and western blots, are limited in sensitivity and specificity. In this study, we investigated whether liquid chromatography-tandem mass spectrometry (LC-MS/MS) could serve as a viable alternative for quantifying the VGF-derived peptide TLQP-62. Brain tissue slices containing the nucleus accumbens were prepared and incubated in either artificial cerebrospinal fluid (ACSF) or potassium chloride (KCl) solutions. We hypothesize that KCl-stimulated samples will exhibit greater TLQP-62 expression than ACSF controls, due to increased neuronal activity. If confirmed, this will support the use of LC-MS/MS as a reliable method for measuring VGF-derived peptide expression in brain tissue.

6.	**Maria Anaebonam** *Development of Photocatalytic Proximity Labelling Probes to Investigate the Binding Efficacy of TRPGC HINT-1 Inhibitors* **Advisor:** Carston Wagner **Mentor:** Kostana Ligori **Sponsoring Program**: SCoPE **Home Institution:** Virginia Commonwealth University **Abstract:** In vivo data has shown that different HINT1 inhibitors, even though designed to bind and engage with the active site identically, results in different pharmacological responses. Prior data suggests that HINT1 exerts its catalytic effect not only through its active site, but through its surface interactions. Coupling the inhibitor with a photocatalyst promotes the ability to map extracellular interactions of the selective inhibitor induced pathways in as close to a radius as 20 Å, furthermore identifying what biomolecular interactions are contributing to the difference in modulations. Protein-protein interactions are short lived and transient, but are crucial for understanding the elicited pharmacological responses. We hypothesize that changes in the HINT-1 outer surface are triggered by interactions and recruitment from different binding partners, therefore resulting in different outcomes in the MOR-NMDAR crosstalk. This study used an Azide-Tryptamine linker to a Guanosine HINT-1 inhibitor [TRPGC] with a Riboflavin photocatalyst to map the modulation. Conservation of TRPGC's binding efficacy to the active site and probe functionality were crucial in this study. Ensuring that the coupling of the linker to the inhibitor did not alter the efficacy of the probe, nor the inhibitory functionality is what this project mainly focuses on.
7.	**Elli Anderson** *Study of Striatal Pathology in Spinocerebellar Ataxia Type 1* **Advisor:** Harry Orr **Mentors:** Lisa Duvick & Pragya Goel **Sponsoring Program**: LSSURP **Home Institution:** American University **Abstract:** Spinocerebellar ataxia type 1 (SCA1) is an autosomal dominant, fatal neurodegenerative disease, marked by olivopontocerebellar atrophy. Recent findings implicate the striatum as a structure potentially affected in SCA1, due to its significant role in Huntington's Disease (HD) pathology. Studies reporting similar patterns of tissue instability and gene dysregulation in both diseases suggest that striatal involvement may contribute to SCA1 pathogenesis. The current study uses western blotting and immunofluorescent staining to investigate changes in medium spiny neurons (MSNs) and key marker proteins, including Dopamine- and cAMP-Regulated Phosphoprotein (DARPP-32) and TAR DNA-binding protein 43 (TDP-43), in SCA1 mouse models. We hypothesize that striatal pathology is a feature of SCA1, with these marker proteins exhibiting altered expression or localization. Preliminary analyses reveal reduced DARPP-32 and phosphorylated TDP-43 levels, supporting the notion of striatal dysfunction. This supports the idea that the striatum plays a role in SCA1, but further research is needed to fully explore and understand the impact of the disease on striatal tissue. Ongoing work aims to expand this investigation by analyzing gene dysregulation within direct and indirect striatal pathways, incorporating additional marker proteins.
8.	**Jillian Armstrong** *Comparison of NMDA-Induced Nociceptive Responses in GluN2B-KD mice across multiple ages.* **Advisor:** Carolyn Fairbanks **Mentors:** Oanh Nyguyen **Sponsoring Program**: UMN Pain Consortium **Home Institution:** University of Wisconsin–Madison **Abstract:** Spinal glutamate neurotransmission contributes to chronic pain. This process can be modeled acutely through the introduction of N-methyl-D-aspartate (NMDA) to the intrathecal space of mice. The GluN2B subunit of NMDA receptors is highly expressed in nociceptive pathways and plays a key role in the development and maintenance of chronic pain. In the present study, we used the intrathecal NMDA behavioral assay to assess the persistence of GluN2B mRNA across multiple ages of GluN2B-knockdown and wildtype control mice and correlated the responses to spinal GluN2B mRNA. At time of weaning, grin2b-floxed mice received either an intrathecal injection of saline (control) or AAV-cre (GluN2B-KD). Control mice demonstrated robust responses to 0.3 nmol NMDA in young, middle-aged, and aged mice. A much higher dose (1 nmol) was required to elicit comparable responses to NMDA in the same age groups in GluN2B-KD mice. A second cohort of aged mice demonstrated that control and GluN2B-KD mice responded to 0.3 nmol NMDA similarly, suggesting that the knockdown may not have persisted in that cohort of mice. Studies to quantify GluN2B mRNA in the hippocampus and lumbar spinal cord are ongoing to determine whether the behaviors correlate to the level of GluN2B-KD.

9.	**Hans Arvidson-Hicks** *Training computer-vision phenotyping models for grape breeding traits* **Advisor:** Soon Li Teh **Mentors:** Erin L. Treiber & Madan Pandey **Sponsoring Program**: SOAR-REEU **Home Institution:** Metro State University **Abstract:** Efficiently identifying prominent grapevine phenotypic traits such as canopy, fruit color, and fruit size is a critical part of grape breeding. Phenotyping is both time-intensive and relies on direct observations to determine the severity of disease symptoms. The phenotyping process can be expedited by using high-resolution images that can be manually annotated for valuable traits and subsequently trained on a convolutional neural network (CNN) to enable future prediction of disease symptoms/scores based on the acquired images. This would allow quicker, efficient, and objective phenotyping. At the University of Minnesota's Horticulture Research Center, this technology is being used to phenotype diseases and other breeding traits, including berry color and cluster size. A utility vehicle fitted with a stereo camera was used to photograph a family of 955 grapevines. Select photographs were evaluated using image-based plant phenotyping to assess and annotate the breeding traits. In the future, the annotated images and field observations will be used to train a CNN model that can identify common diseases and other valuable traits with less time and resources for accelerating breeding programs.
10.	**Nardos Ashenafi** *Lifespan and Motility Effects on C. elegans from Antioxidants* **Advisor:** Michele Allen **Mentors:** Lynn Nguyen & Greg Summers **Sponsoring Program**: M-ASCEND **Home Institution:** Highland Park Senior High School **Co-presenter:** Ava Daniel, Roosevelt High School **Abstract:** Oxidative stress and nutrient deficiencies are linked to aging and reduced vitality in humans and other organisms. Dietary antioxidants, such as multivitamins and creatine, are widely used with the hope of improving health span; yet, their actual effects on longevity and physical function remain contentious. This study aims to determine whether antioxidant supplementation increases lifespan and motility in the nematode C. elegans, focusing on the wild type (N2) and shc-1 (BR5082) strains. Synchronized populations of wild type and shc-1 worms were grown on plates containing either multivitamins, creatine, or no supplement (control group). Thrash rate was evaluated in 30-second intervals to determine the effectiveness of treatments. Creatine appears to provide evidence of longevity in motility, whereas multivitamin supplement shows no significance.
11.	**Fatimah Bah** *Deletion of CK2α' Ameliorates Transcriptional Dysregulation of Circadian Rhythm Genes in Huntington's Disease* **Advisor:** Rocio Gomez-Pastor **Mentor:** Ross Pelzel **Sponsoring Program**: LSSURP **Home Institution:** Rutgers University **Abstract:** Huntington's disease (HD), a devastating neurodegenerative disease, manifests in several motor, cognitive, and sleep deficits. This hereditary disease is caused by an excessive cytosine-adenine-guanine (CAG) sequence repeat. Our previous research has focused on the role of Casein Kinase 2 (CK2) in Huntington's pathology. Gomez-Pastor et al. demonstrated that the alpha prime subunit of CK2 is upregulated in HD medium spiny neurons. However, the genetic deletion of CK2α' has alleviated some of HD's neurobehavioral and pathological deficits. CK2 also phosphorylates important regulators of circadian rhythms. However, the interaction of CK2 and circadian rhythms in the context of HD has yet to be explored. In this project, we aimed to determine how the genetic deletion of CK2α' impacts this relationship. Specifically, we conducted qPCRs to measure the expression of a complex of genes downstream of CK2. We observed that the depletion of CK2α' rescued the significant dysregulation of the period genes caused by HD. These results suggest CK2α' may be a possible pathway to modulate to reverse the transcriptional dysregulation of specific circadian rhythm genes in HD.

12. **Gabriella Baltes**

Dual Targeting Pancreatic Cancer Treatment: COX2-Promoter Controlled Mesothelin-Targeting Oncolytic Adenovirus

Advisor: Masato Yamamoto

Mentor: Mizuho Sato-Dahlman

Sponsoring Program: LSSURP

Home Institution: Illinois Institute of Technology

Abstract: Pancreatic ductal adenocarcinoma (PDAC) is one of the most devastating cancers with a median survival of 4 months and a 5-year survival rate of 13%. The current set of treatment for pancreatic cancer includes chemotherapy followed by surgical resection. However, only about 80% of patients are surgical candidates because at the time of diagnosis, most patients present with locally advanced or metastatic forms of the disease[1]. Thus, there is a strong need for additional treatment options more effective at slowing tumor growth and metastasis by systemic administration. Oncolytic adenovirus (OAd) has been developing as an effective therapeutic vector for pancreatic cancer and has shown selective and exponential viral replication in cancer cells causing oncolysis and immune activation[2,3]. Previous studies of fiber-modified viruses, including mesothelin-targeting viruses, have shown improved cancer cell specificity and tumor accumulation[4]. Although, one obstacle for the FDA approval of clinical trial systemic usage of OAd is regulation of viral replication to minimize potential toxicity in other organs. In response to this, we hypothesize that the regulation of virus replication and infection can both improve cancer specificity and reduce off-target toxicity. In this study, we have generated a conditionally replicative cyclooxygenase-2 promoter controlled, mesothelin-targeted adenovirus by homologous recombination.

13. **Sanjana Basava**

Patterns of X-linked Inheritance: A New Approach for the Genome Era

Advisor: William Dobyns

Sponsoring Program: Independent Research

Home Institution: Northwestern University

Abstract: The concepts of X-linked (XL) dominant and recessive inheritance originated long before the dosage compensation was understood but now have no scientific basis. Despite advances in genetics, the terms dominant and recessive continue to be widely used for XL disorders, contributing to persistent misconceptions. To re-evaluate XL inheritance, we reviewed data on 57 XL disorders, examining rates of disease expressivity, disease severity, gene product (protein) function, and X chromosome inactivation (XCI). Our analysis demonstrated substantial expression of disease among heterozygous females, even in disorders considered to be "recessive." Female expression of disease was found to be related to the severity of the condition in males, XCI patterns, the ability to share gene products between cells, and rare cell-to-cell incompatibility. Therefore, the conventional classification of XL inheritance into dominant and recessive subtypes is biologically flawed and should be retired. A more nuanced framework for understanding XL disorders is needed to account for the underlying biological complexity. We propose four new groups of XL disorders with different patterns that should improve genetic diagnosis and counseling in families with XL disorders. This updated approach provides a clearer foundation for genetics education and supports precise clinical treatment in medical practice.

14. **MaKenna Beaver**

The Development of Tools to Support Implementation of Comprehensive Medication Management (CMM) for Patients with Cardiovascular-Kidney-Metabolic Syndrome

Advisor: Wendy St. Peter

Mentor: Lindsay Sorge

Sponsoring Program: SCoPE

Home Institution: St. Olaf College

Abstract: Adults with chronic kidney disease (CKD) oftentimes suffer from diabetes, hypertension or other cardiovascular diseases encompassed in the Cardiovascular-Kidney-Metabolic syndrome (CKM). Persons with advanced CKM typically have complex medication regimens and experience poor health outcomes. Comprehensive Medication Management (CMM) offers a patient-centered approach to optimize medication use and improve patient outcomes, yet CMM implementation remains inconsistent across health systems. The Med-Opt CKM study used an implementation science framework to conduct health care practitioner focus groups in 5 health systems to identify gaps in, and barriers and facilitators to implementing a CMM practice. Findings were mapped to the CMM Implementation System Pathway and Consolidated Framework for Implementation Research (CFIR). My project aimed to translate these findings into a practical, implementation-ready change package to support CMM delivery for patients with CKM. Actionable tools were aligned with each step, prioritizing usability, workflow fit, and accessibility. The resulting change package is a structured, flexible resource designed to support pharmacists and care teams in delivering consistent, high-quality CMM for patients with CKM.

15. **Sibley Boyum**

Pharmacokinetic assessment and exposure-response relationships of an investigational drug in a phase I/II study in advanced hepatocellular carcinoma

Advisor: David Stenehjem

Sponsoring Program: SCoPE

Home Institution: University of Minnesota Duluth

Abstract: Hepatocellular carcinoma (HCC) is the most common liver cancer and third leading cause of cancer deaths worldwide. Active Wnt-signaling drives advanced HCC, with 40% of patients harboring Wnt/β-catenin pathway mutations. Tegavivint is an investigational small molecule inhibitor of Transducin β-like Protein 1 (*TBL1*), a downstream Wnt/β-catenin pathway target, assessed in a phase I/II study in advanced HCC patients whose disease progressed following prior systemic therapy. Twenty-four patients received tegavivint IV weekly via 4-hour infusion at doses of 3, 5, and 6.5 mg/kg. [DS1] Non-compartmental pharmacokinetics analysis evaluated first dose (Cycle 1, Day 1) and steady-state (Cycle 2, Day 1) concentrations by dose level. Exposure-response assessment examined serum hemoglobin changes by dose and exposure (AUC). The median half-life was 51 [DS2] hours. C_{max} and $AUC_{0\text{-}168hr}$ increased with rising doses, with median time to Cmax approximately 4 hours. A dose-dependent increase in patients experiencing >2 g/dL hemoglobin decrease correlated with exposure. The half-life supports weekly dosing and demonstrates dose-proportional pharmacokinetics. The exposure-correlated hemoglobin decreases suggest a pharmacodynamic relationship informing optimal dosing strategies.

16. **Kate Brandli**

Cloning, purification, and binding affinity assessment of artificial ATP binding proteins simulating prebiotic polypeptides

Advisor: Burckhard Seelig

Mentor: Peter Winslow

Sponsoring Program: UROP/URS

Home Institution: University of Minnesota Twin Cities

Abstract: Proteins are fundamental to life on Earth and were likely the bridge between abiotic molecules and early life. Guided by the most plausible chronology of amino acid incorporation into the genetic code, previous members of the Seelig Lab made four libraries of 80-mer polypeptides composed of the first 5, 9, 16, and 20 amino acids; amino acids code for peptides that make up proteins so these libraries serve as a model for prebiotic proteins. Each library was put through a selection process to find those that bind to Adenosine Triphosphate (ATP). In an attempt to study the strongest binders from this selection we chose the three most abundant and relatively enriched variants from each library; abundance is the frequency of a particular protein from the library population after selection, and relative enrichment is a measure of the increase in frequency of a protein from the population relative to other proteins, between selection rounds. Expression testing of these variants in the DnaK knockout E. coli strain, EN2, optimized protein yield and efficiency. The variants were purified with affinity chromatography columns and quantified and analyzed. ATP binding assays were performed and structural analysis will follow.

17. **Caden Caligiuri**
Dual Antigen targeting using novel modular triKE-PACCs enhances NK cell activation against AML
Advisor: Martin Felices
Mentor: Anders Matson
Sponsoring Program: Independent Research
Home Institution: Saint Johns University
Abstract: Acute myeloid leukemia (AML) is an aggressive blood cancer with high mortality, causing an estimated 140,000 deaths globally in 2024. A major clinical challenge is refractory disease driven by tumor heterogeneity and antigen escape, underscoring the need for improved therapies. Natural Killer (NK) cells, innate immune lymphocytes, are a promising immunotherapeutic platform due to their ability to recognize and kill malignant cells. However, lack of antigen specificity, limited persistence, and suppression by the tumor microenvironment reduce their clinical efficacy. To address these challenges, we developed a novel dual-antigen targeting therapy: the Tri-Specific Killer Engager (TriKE)–Poly Antigen Cytokine Complex (PACC). This biologic enhances the recognition and killing of AML cells by NK cells, directing them toward tumors that express specific tumor antigens. We evaluated the anti-tumor activity of AML-targeting TriKE-PACCs in engineered AML cell lines expressing relevant antigens. Functional assays showed increased NK cell activation, degranulation, and cytotoxicity against target cells. These findings highlight TriKE-PACCs as a promising strategy to overcome antigen escape and improve immune clearance in refractory AML, paving the way for more effective NK cell–based immunotherapies.

18. **Kayla Calles Leiva**
The Effects of Alcohol on N2 C. elegans *Behavior and Thrash Rates*
Advisor: Michele Allen
Mentors: Greg Summers & Vanessa Luz Severino
Sponsoring Program: M-ASCEND
Home Institution: Brooklyn Center High School
Co-presenter: Champa Somphavanh, Washington Technology Magnet School
Abstract: Ethanol significantly impacts human physiology, disrupting various systems and organ functions. Despite the difference between humans and organisms, research on the response in this model organism, Caenorhabditis elegans, to alcohol remains limited. This study aims to evaluate behavioral changes by measuring thrash rates via exposure to various ethanol concentrations (500 mM, 1000 mM, 2500 mM, 5000 mM). Using a dose-response curve method on N2 wild-type C. elegans on 60 mm agar plates, data were collected over several timed minute intervals (0, 1, 5, 10, and 15) with additional droplets of specified ethanol solutions(6 µL) every 3 minutes. While recording the thrash rates and behavior through microscopes for 30 seconds. It is predicted to show that the higher dosage of ethanol concentration will leave the N2 wild-type nematode movements sluggish. The effects of different ethanol concentrations are anticipated to be significantly different. At 0 mM, there is likely to be an average rate of thrashing and movement. In contrast, at 5000 mM, the movement is likely to resemble seizure-like movement and end sluggishly. This study not only enhances the understanding of ethanol's impacts but also positions C. elegans as a possible model for future research into alcohol's effects on living organisms.

19. **Brooklyn Champagne**
Prolonged Inflammation in the Midbrain After TBI Suggests Region-Specific Neuroimmune Responses
Advisor: Tom Molitor
Mentors: Maxim Cheeran & Venkatramana Krishna
Sponsoring Program: LSSURP
Home Institution: University of Minnesota Twin Cities
Abstract: Traumatic Brain Injury (TBI) causes direct brain damage and triggers an inflammatory cascade involving cytokines, chemokines (e.g., IL-1β, IL-6, CCL2, TNF-α, TGF-β), and neurotransmission-related genes such as GABRB2. These responses are associated with long-term neurological disorders, including Alzheimer's, Parkinson's, and epilepsy. Although acute inflammation following TBI is well characterized, it remains uncertain whether this response persists and spreads beyond the injury site. We hypothesize that inflammation persists beyond the acute phase and reaches distal brain regions. To test this, mice received a craniotomy, and a subset underwent a controlled cortical impact (CCI) to the prefrontal cortex (2 mm flat tip, 6 m/s velocity, 1 mm depth, 100 ms dwell time). Brains were collected at 3 and 30 days post-injury (dpi), separated into hemispheres, and dissected into the cortex, thalamus, midbrain, hippocampus, and olfactory bulb. At 3 dpi, IL-1β, IL-6, CCL2, TNF-α, TGF-β, and GABRB2 levels were elevated across all regions. By 30 dpi, IL-1β, IL-6, TGF-β, and GABRB2 expression decreased in the cortex and thalamus but remained elevated in the midbrain. These results suggest prolonged, region-specific inflammation post-TBI. Sustained GABRB2 expression in the midbrain may contribute to ongoing neurotransmission disruption and increased risk of post-traumatic epilepsy.

20.	**Kahleesia Chapman** *Ethnic Identity, Flow, and Flourishing: A Cross-Sectional and Longitudinal Analysis Among Black Women* **Advisor:** Melissa Ertl **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** Flow is a mental state of deep focus and enjoyment, which is associated with greater well-being (Csikszentmihalyi, 1990), but little research has explored its role in the lives of Black women. This study investigated whether flow accounts for the relationship between ethnic identity and flourishing, a measure of overall psychological well-being. 216 Black women (ages 18-79) completed a survey at baseline and again 6 months later. Measures included ethnic identity, flow, flourishing, and demographic variables. Using statistical models, it was clear that women who felt more connected to their ethnic identity were more likely to experience flow, and those who experienced more flow reported higher levels of flourishing. This connection remained consistent when all variables were measured simultaneously. However, when looking at changes over time, flow did not explain the relationship as clearly. Still, it was clear that how people felt about their well-being at the start was the strongest predictor of how they felt 6 months later.
21.	**Allen Chen** *Personality Traits as Predictors of Workplace Theft: A Meta-Analysis* **Advisor:** Deniz Ones **Sponsoring Program**: Pathways **Home Institution:** University of Minnesota Twin Cities **Abstract:** This study investigated the relations between personality traits and employee theft. The authors inspected 23,626 studies, from which 91 of them met the criteria for inclusion in this research. This was supplemented by an examination of 649 articles from 10 previously conducted meta-analyses. Forty-two articles were eventually coded, providing data from 56 independent samples. Preliminary findings support compound personality traits of integrity and locus of control to be strongly predictive. Relations of agreeableness, conscientiousness, neuroticism, and anger were lower, but still noteworthy with theft.
22.	**Jeffrey Choi** *Who Defines "Typical" Brain Development? Racial Bias in Normative Modeling* **Advisor:** Mark Fiecas **Mentors:** Kelly Duffy, Kirsten McKone, & Ellery Island **Sponsoring Program**: Equitable Data Science **Home Institution:** New York University **Co-presenter:** Enrique Almeida Ruiz, University of New Mexico **Abstract:** The Adolescent Brain Cognitive Development (ABCD) study is the largest ongoing longitudinal study on adolescent neurodevelopment, making it an ideal study for creating brain development charts. Normative modeling enables the creation of these charts to visualize variation in brain phenotypes across age, providing a reference for an individual's neurodevelopment relative to the population. For these to be clinically useful, the models that generate these brain charts should perform equitably for all population subgroups. The youth in the ABCD Study were 9-10 years old at baseline. In this study, we used the MRI data collected at baseline and 2- and 4-year follow-up. We implemented the Generalized Additive Models for Location, Scale, and Shape to model the neurodevelopmental trajectories of cortical thickness and cortical surface area. We fit sex-stratified models that excluded race, from which we obtained subject-specific residuals. We consistently observed higher residual errors on Black, American Indian/Alaska Native, and Native Hawaiian/Pacific Islander subgroups relative to the white subgroup, ranging from 3% to 28% higher. These results suggest that the brain charts derived from normative models are biased across racial groups. Without addressing these biases, brain charts derived from normative models will reinforce longstanding racial disparities in clinical research and practice.

23.	**Corrinne Ciesla** *The Impact of Early Life Adversity on Cortical Thinning* **Advisor:** Mark Fiecas **Mentors:** Ellery Island & Mustafa al'Absi **Sponsoring Program**: Equitable Data Science **Home Institution:** California State University, San Bernardino **Co-presenter:** Hannah Willingham, University of Michigan–Ann Arbor **Abstract:** Early life adversity (ELA) — exposure to negative experiences during youth — is associated with adverse mental and behavioral health outcomes. Prior research indicates these outcomes are mediated by cortical surface thinning, which occurs naturally during brain development but may be accelerated in youth exposed to ELA. This relationship was examined using MRI and ELA data from 7,502 participants (ages 9-10 at baseline) from the Adolescent Brain Cognitive Development study. Due to the many intercorrelated ELA measures in the dataset, two variable reduction techniques were tested: sum scoring based on intuitive classifications of experiences (e.g. discrimination, caregiver psychopathology) and categorical principal component analysis. Sum scores and principal components were used in separate linear mixed models to predict two-year change in cortical thickness. Significant associations were found between several sum score categories – trauma, environmental safety, socio-economic status, and discrimination – and cortical thinning. Multiple PCA dimensions (highlighting trauma, low caregiver support, family dysfunction, and socio-economic disadvantage), were also significantly associated with cortical thinning. Despite a loss of interpretability, the PCA model avoided collinearity seen within the sum score model. Positive community conditions were explored as potential mitigating factors, suggesting a promising direction for future research.
24.	**Maya Coates Cush** *Doxorubicin-Induced Senescence in THP-1 Cells: A Model to Investigate the Effects of Immunosenescence on Cardiovascular Health* **Advisor:** Beshay Zordoky **Mentors:** Marianne Grant & Mary Raphel Daniel **Sponsoring Program**: M-ASCEND **Home Institution:** Smith College **Abstract:** Immunosenescence is characterized by declined immune cell function. Immunosenescent-cells secrete senescence-associated secretory phenotype (SASP). SASP is a pro-inflammatory factor that impacts aging, age-related diseases, and gene-expression. Doxorubicin (DOX), a chemotherapeutic agent, induces immunosenescence and cellular senescence across multiple cell types. DOX's capacity to induce senescence specifically in THP-1 monocytic cells and implications for downstream SASP release remain underexplored. We hypothesize treatment of THP-1 cells with DOX induces immunosenescence in a concentration-dependent manner, shown by senescence-associated β-galactosidase (SA-β-gal) activity. THP-1 cells were exposed to DOX at concentrations of 0.025 μM, 0.05 μM, and 0.1 μM for 24 hours, then cultured for four days to become senescent. SA-β-gal staining conducted to detect senescent cells. Total cell lysate measured senescence-related proteins. SA-β-gal-positive cells indicated concentration-dependent increase; Minimal staining was detected at 0.025μM, and pronounced senescence at 0.05μM and 0.1μM DOX concentrations. DOX induced senescence in THP-1 cells and increased expression of senescence-related proteins p21 and p-p65 at higher concentrations. Findings show optimally 0.05 μM of DOX induces immunosenescence in THP-1 monocytic cells with minimal cytotoxicity. Future studies will utilize a co-culture with cardiomyocytes, endothelial cells, and cardiac fibroblasts to investigate how immunosenescent-cells influence cardiovascular cell function and aging.

25. **Kaycie Cowden**
The Effects of Opioid Exposure on Motor Function in Mice
Advisor: Brady Atwood
Mentors: Davian West & Yinan Wang
Sponsoring Program: LSSURP
Home Institution: Lycoming College
Abstract: In 2023, there were nearly 80,000 deaths that were the result of an opioid overdose, about 76% of all drug overdose deaths. Our study investigated the effects of opioid exposure on motor function in mice, examining whether this resulted in neural inflammation and cell death in areas of the brain responsible for motor coordination and control. We hypothesized that the administration of clonidine could help alleviate some of these impairments caused by opioid exposure due to its anti-inflammatory and anxiolytic properties. Clonidine has been used to help treat neonatal opioid withdrawal, but its potential other clinical uses require further study. We conducted a series of behavioral tests to assess general locomotor function, motor coordination, balance, and motor learning. We then performed Western blots and cytokine arrays to evaluate the levels of protein and cytokine expression in the different brain regions of interest. By combining biochemical analysis with behavioral testing, this study can help clarify the impacts of opioids on motor function and whether clonidine can help mitigate some of the effects on the brain.

26. **Quianah Cox**
Comprehensive Medication Management (CMM) for Patients with
Advisor: Alonso Guedes
Sponsoring Program: LSSURP
Home Institution: Florida A&M University
Abstract: Osteoarthritis (OA) is a chronic, degenerative joint disease in cats marked by inflammation, pain, and compromised mobility. Chondrocytes are central to cartilage preservation, but the long-term impact of COX-2-selective inhibitors on their survival remains unclear. Given the limited drug options for chronic pain in cats—compounded by the fact that Robenacoxib is only FDA-approved for short-term use (up to three days post-surgery)—this study explores how Robenacoxib, Meloxicam, and Soluble Epoxide Hydrolase inhibitor (SEH) affect feline chondrocyte apoptosis in vitro. Primary chondrocytes were isolated and treated with Robenacoxib and Meloxicam at IC_{50}, IC_{80}, and $10\times IC_{80}$ concentrations, and SEH at IC_{50}, IC_{95}, and $10\times IC_{95}$. Apoptosis was assessed using ELISA targeting histone-associated DNA fragments. SEH inhibits degradation of epoxyeicosatrienoic acids (EETs), which are anti-inflammatory and cytoprotective. Unexpectedly, all three compounds reduced apoptotic markers in a dose-dependent manner, challenging the initial hypothesis. This suggests that Robenacoxib and Meloxicam may have chondroprotective properties under specific conditions, while SEH reinforces cell survival through its biochemical pathway. These findings underscore the need for research into safe, long-term therapeutic strategies in feline OA management beyond current NSAID limitations.

27. **Norah Dillner**
Characterization of a Putative Guanine Riboswitch in Enterococcus faecalis
Advisor: Julia Willett
Mentor: Celeste Phillips
Sponsoring Program: LSSURP
Home Institution: Carleton College
Abstract: *Enterococcus faecalis* is a Gram-positive commensal bacterium in the GI tract. However, it can also function as an opportunistic pathogen causing infections in wounds, the oral cavity, and other sites. *E. faecalis* biofilms and antibiotic resistance contribute to its success as a pathobiont and a contributor to endodontic diseases. Previous studies have shown that purine biosynthesis is upregulated in *E. faecalis* biofilms. There is also a computationally predicted guanine riboswitch in *E. faecalis* positioned to potentially regulate genes involved in purine salvage. Riboswitches are RNA sequences that control gene expression via a secondary structure change in response to ligand binding. However, the role of the predicted guanine riboswitch in *E. faecalis* and its potential ties to biofilm formation are unknown. This study aims to characterize the putative riboswitch by conducting biofilm assays and growth curves using a range of purines. We will compare a control strain of *E. faecalis* (OG1RF) isolated from the oral cavity to two riboswitch mutants. Understanding how exogenous purines influence *E. faecalis* biofilm regulation may improve strategies for preventing oral infections and help identify novel drug targets that contribute to the crucial pursuit of new treatments against highly antibiotic-resistant bacteria.

28. **Rose Dinh**
Neuroanatomical Characterization of CRF Projections to the Nucleus Accumbens
Advisor: Julia Lemos
Mentor: Kasey Bertelsen
Sponsoring Program: LSSURP
Home Institution: Lewis & Clark College
Abstract: Corticotropin-releasing factor (CRF) is a neuropeptide recognized for initiating the stress response and producing aversive states. However, emerging studies now suggest CRF also functions in reward-related circuits, particularly within the nucleus accumbens (NAc), raising questions about how one molecule can mediate seemingly opposite functions. Among brain regions, the paraventricular thalamus (PVT) and basolateral amygdala (BLA) provide the strongest CRF+ projections to the NAc. Glutamatergic PVT neurons to the NAc have been linked to avoidance and negative affects, while glutamatergic BLA inputs promote reward-seeking. In contrast, long-range GABAergic BLA neurons expressing CRF suppress reward-seeking behavior, highlighting a novel pathway. However, the neurochemical identity and function of CRF+ neurons in the PVT remain unclear. To investigate the identity of CRF+ projections from the PVT and compare them to known CRF+ inputs from the BLA, we used Cre-dependent viral tracing in CRH-Cre mice and looked at whether CRF+ neurons from the BLA and PVT synapse onto different types of cells within the NAc.. However, due to off-target viral injections in several mice, our results were inconclusive. While some viral expression was observed, we could not confidently determine postsynaptic connectivity. This leaves questions about how CRF shapes motivation through NAc circuitry.

29. **Abraham Dunford**
Alcohol, Drugs, Gambling, and Sex: Concerns at The High School Athlete Level
Advisor: Sarah Kaja
Sponsoring Program: Pathways
Home Institution: University of Minnesota Twin Cities
Abstract: Overall, sport participation supports adolescent health. However, studies suggest student-athletes may have high rates of certain adverse health behaviors. We examined associations between students' sport participation and nicotine, marijuana, alcohol use, risky sexual behavior, (informal) gambling, and sports betting. We used data from students who completed the 2022 Minnesota Student Survey (N=100,836) to calculate prevalences of behaviors among student-athletes and nonathletes, then used logistic regression to determine whether student-athletes were more or less likely to report each behavior, stratifying by sex and controlling for grade (8th, 9th, or 11th). Prevalence of nicotine use was lower among female student-athletes than nonathletes (9% vs. 14%), as was prevalence of alcohol (10% vs. 12%), marijuana use (4% vs. 9%), and risky sexual behavior (4% vs. 5%). Differences were statistically significant (p<.001). Gambling and sports betting were more common among female student-athletes than nonathletes (17% vs. 15% and 12% vs. 5%, respectively; p<.001). Male student-athletes were less likely (p<.001) to use nicotine (7% vs. 8%%) or marijuana (5% vs. 6%) than non-student athletes. Gambling and sports betting were common among male students-athletes at 37% and 28%. Adults should address and prevent gambling and illegal sports betting among student-athletes.

30. **Alan Escalante**
Combination of Focus Ultrasound with CD200 Directed Immunotherapy for the Treatment of Central Nervous System Tumors
Advisor: Michael Olin
Mentor: Meghna Saxena
Sponsoring Program: LSSURP
Home Institution: Hamline University
Abstract: Malignant primary brain tumors are the leading cause of death from solid tumors in children and the third leading cause of death from cancer in adolescents and adults. We developed a method of targeting an activation receptor overpowering the suppressive effect of tumors (ARL200). We hypothesize that the combination of focused ultrasound (FUS) with ARL200 immunotherapy will enhance the treatment of Central Nervous System (CNS) tumors. To test our hypothesis, C57B6 mice were injected with GL261 cells and started receiving treatment one week after implantation. Mice were treated with FUS or FUS + ARL200. Mouse weight was tracked to monitor animals' overall health. Tumor growth was measured in vivo with an IVIS imaging system. Mice were perfused, brains were harvested and 5µm coronal tissue sections were used for H&E staining. Image analysis was done using ImageJ and tumor size was quantified in H&E stained sections. In our study we observed that after FUS treatment, in one week there was a change in tumor size. Additionally, IVIS imaging data shows a difference in tumor luminescence.

31. **Mirelys Estopinales**
Beneath the Surface: How Cover Crops, Burial Depth, and Duration Shape Rhizoctonia Solani Dynamics.
Advisor: Megan McCaghey
Mentor: Hunter Kluegel
Sponsoring Program: SOAR-REEU
Home Institution: Florida International University
Abstract: Cover crops are known for their contributions to crop production, with ongoing research investigating their influence on soil-borne pathogens. One such fungal pathogen, Rhizoctonia solani, causes seedling blight across a range of Minnesota crops. Management of this pathogen is complicated due to its persistence in soil as sclerotia. However, cover crops may help suppress soil-borne pathogens by altering soil health. This study investigated how cover cropping influences the viability of Rhizoctonia solani sclerotia. Field trials were established in Crookston and St. Paul, Minnesota in 2023, and planted to brown mustard and winter rye in fall of both 2023 and 2024. Sclerotia were incubated beneath each cover crop at depths of both 10 cm and 30 cm. Mesh bags containing sclerotia were buried for one season following a previous year of cover cropping, while others remained in the soil for both years. All bags were retrieved at planting in spring 2025. After two years in Crookston, sclerotia viability was higher at 30 cm than 10 cm ($p = 0.02$), with no impact from cover crops. This research contributes to a better understanding of how cover crops influence pathogen persistence, with broader implications for plant and soil health management.

32. **Olivia Evers**
Characterizing School-Age Attention-Deficit/Hyperactivity Disorder (ADHD) Symptoms and Diagnosis Rates in the Infant Brain Imaging Study (IBIS) Sample
Advisor: Casey Burrows
Sponsoring Program: UROP/URS, MN-LEND
Home Institution: University of Minnesota Twin Cities
Abstract: Siblings of autistic children (high-likelihood siblings, HL) are at an increased likelihood for both autism spectrum disorder (ASD) and other neurodevelopmental disorders such as attention-deficit/hyperactivity disorder (ADHD). ASD and ADHD may share similar developmental pathways and familial heritability. This project aimed to compare diagnostic and sex differences in the rates of ADHD diagnosis and symptoms in a HL sample. Participants included 351 children with high- and low-familial likelihood for ASD from the Infant Brain Imaging Study (IBIS). Participants attended visits in early childhood and again at school-age. Participants were grouped into HL participants who met ASD criteria at any point (HL-ASD), HL participants without ASD (HL-noASD), and low-likelihood (LL). ADHD symptoms and diagnosis were collected using parent-reported ADHD symptoms, the KSADS-Comp, and past diagnosis via chart review. On all measures, HL-ASD participants showed the highest levels of ADHD symptoms, p's<.05. HL-noASD participants showed higher severity of ADHD symptoms, and rates of ADHD diagnoses compared to LL participants, p's<.05. No significant sex differences were observed. Familial liability to ASD may extend to increased likelihood for ADHD. Childhood screening for co-occurring ADHD is critical for HL siblings. Future directions include creating an ADHD composite and examining early predictors of ADHD symptoms.

33. **Aisha Faqid**
Automated Detection of Voice Disruptions in Adductor Laryngeal Dystonia
Advisor: Jesse Hoffmeister
Sponsoring Program: McNair
Home Institution: University of Minnesota Twin Cities
Abstract: Adductor Laryngeal Dystonia (AdLD) is a neurological disorder that causes vocal fold spasms during speech. This results in voice disruptions that cause reduced intelligibility and a breakdown of communication. AdLD has no cure. Patients experience some improvement with symptomatic treatment via injection of botulinum toxin (BTX) into the larynx every 3-4 months for life. A key barrier to improving treatment is the difficulty of objectively and efficiently evaluating the efficacy of new interventions. The current gold-standard approach involves manually measuring voice disruptions, which is both time-intensive and susceptible to human error. The use of automated detection to identify and measure disruptions could address this by increasing the objectivity and efficiency of voice analysis in AdLD. The purpose of the current study is to determine the accuracy of automated detection of voice disruptions. Manual analysis will be completed by 2 human raters. Accuracy of automated detection will be measured with intraclass correlation coefficients between the automated detection and manual measurements. Results will help determine whether this tool can be used in the analysis of voice for treatment response monitoring in AdLD. This could aid the vetting of novel alternatives to BTX.

34. **Elissa Frankel**
Testing the Impact of TGFβ Inhibitors on Estrogen Receptor (ER) Expression in a Model of Invasive Lobular Carcinoma
Advisor: Julie Ostrander
Mentor: Chinasa Ufondu
Sponsoring Program: LSSURP
Home Institution: Case Western Reserve University
Abstract: Invasive lobular carcinoma (ILC) is the second most common type of breast cancer, affecting 47,500 patients per year in the US. One of the molecular hallmarks is the presence of estrogen receptors (ER), which is found in 70-80% of breast cancer cases. In addition, ILC is hallmarked by the loss of E-Cadherin (gene name CDH1). One major hurdle in understanding early factors in developing ILC is the lack of human mammary epithelial cell models with endogenous ER expression. Here, we test the effectiveness of transforming growth factor beta (TGFβ) inhibitors on inducing endogenous ER expression in an immortalized cell line model. Prior reports show TGFβ inhibitors increase ER expression in human breast epithelial cells. Our ILC model was established using 184AA3 cells, a cell line known to induce luminal type B ER+ adenocarcinomas when xenografted into mice. Here, we used both sub-confluent and post-confluent cell culture methods to assess the impact of TGFβ inhibitors on ER expression. A CRISPR-Cas9 knockout of CDH1 was performed to model its hallmark loss in ILC. Sub-confluent culture and post-confluent cultures were treated three times with TGFβ inhibitors over 6 days. Cells were tested for ER levels through Western Blot, immunofluorescence, and qPCR.

35. **Ivy Garrity**
Characterization of Anxiety- and Depression-Like Behaviors in Environmentally Impoverished Mouse Dams
Advisor: Laura Stone
Mentors: Anna Kauffman & Peter Lee
Sponsoring Program: UMN Pain Consortium
Home Institution: Macalester College
Abstract: Limited bedding and nesting (LBN) produces fragmented maternal care. LBN results in chronic anxiety-like behaviors in both mouse pups and dams. However, limited research has been conducted on depression-like behaviors and cognition in LBN dams. This study aims to determine the impact of environmental impoverishment on anxiety- and depression-like behaviors in mouse dams. At postnatal day (PND) 2, pups were sexed and cross-fostered if necessary to ensure 6 pups for each dam (3 males and 3 females) across 8 cages (n=4 per condition). From PND2 to PND9, control cages were given standard nesting materials, while half of a nestlet square and an elevated mesh platform were provided in LBN cages. Dam nesting behaviors were assessed during this period. Approximately one month after the weaning of pups, dams were further tested for anxiety (open field (OF) and elevated plus maze (EPM) assays), depression (sucrose splash test (SST)), and cognitive impairment (novel object recognition test (NOR)). LBN dams showed an increased trend in the number of exits from the nest between PND3 to PND6, indicating fragmented maternal care. Trends were also observed as increased anxiety-like behaviors in OF, EPM, and SST, but depression-like behaviors and memory were not significantly affected.

36. **Joseph Gibbs**
Educational Diplomacy: a look at US-China relations through the University of Minnesota
Advisor: Kevin Luo
Sponsoring Program: Pathways
Home Institution: University of Minnesota Twin Cities
Abstract: The purpose of this research is to identify how the work of Universities as sub-national entities helped facilitate and inform US-China relations since the seventies. Using the University of Minnesota as a case study, this research illustrates the ways in which a public American university engaged in educational exchange and joint educational programs with China. Rather than just looking at the shifting aspect of the US-China relationship as a result of governmental politics, this study examines how The University of Minnesota pushed for more connections with China and dealt with various political and institutional challenges along the way. I utilize materials including internal documents from individual departments and the established China Center to observe different stakeholders and their perspective on the Universities programs working with the PRC. I argue that many of these exchange programs were constructed and proposed by the University departments themselves, in collaboration with the private sector in Minnesota and the Chinese government. This study suggests that Universities were able to make their own international connections and use those to make it more beneficial for local officials to have positive relationships with China, sometimes in step and other times ahead of US government policies.

37.	**Gema Gomez** *Improving Soil Health in High Tunnels: The Role of Legume Cover Crops and* Rhizobia *Inoculation* **Advisor:** Julie Grossman **Mentors:** Thanwalee Sooska-Nguan & Benjamin Tanner **Sponsoring Program**: SOAR-REEU **Home Institution:** California State University Monterey Bay **Abstract:** High tunnels (HTs) are increasingly used by Minnesota farmers to increase crop productivity, protect against extreme weather, and extend growing seasons. These structures create a unique microclimate which varies in temperature, humidity, and soil moisture compared to open-field environments. To monitor these conditions, we used temperature data loggers inside and outside the HTs to track soil and air temperature fluctuations. Limited rainfall in HTs can lead to nutrient buildup from manure fertilizer use. A potential alternative to manure fertilizer is legume cover crops (CC), which fix nitrogen and enhance soil fertility, allowing for reduced fertilizer use. To compare legume CC on N availability, we collected soil from Grand Rapids, Minnesota HT with two legume CC: hairy vetch (*Vicia villosa*) and austrian winter pea (*Pisum sativum subsp. arvense*), then measured Potentially Mineralized Nitrogen to assess soil quality. To further explore nitrogen fixation potential, we evaluated the effects of rhizobia inoculants on two additional legume CCs: crimson clover (*Trifolium incarnatum*) and field pea (*Pisum sativum*) in an open field by measuring nodulation and plant biomass. These experiments contribute to understanding of how legume CC can be integrated into HT systems to improve soil fertility and sustainable nutrient management.
38.	**Keya Guteta** *Swimming Through Toxins: Effect of Heavy Metals on Movements in Wild-Type and Mutant BB3* C. elegans **Advisor:** Michele Allen **Mentors:** Lynn Nguyen & Greg Summers **Sponsoring Program**: M-ASCEND **Home Institution:** Central Senior High School **Co-presenter:** Abigeya Akalewold, Roosevelt High School **Abstract:** Heavy metal pollution from elements like zinc (Zn), copper (Cu), and cadmium (Cd) can severely impact the environment and human health, potentially causing nerve damage, muscle dysfunction and even cancer. While their cellular toxicity is well known, little is understood about how genetic variation influences responses to these metals. This experiment displays the effects of these metals on the thrash rate of C. elegans, comparing Wild-type (N2) worms with adr-2 mutants (BB3), which have impaired chemotaxis. Understanding their responses offers insights into genetic sensitivity to toxins. Worms were exposed to Zn, Cu and Cd, and their thrash rate, a measure of their movement, was observed. All metals affected movement, with copper having the greatest impact on Wild-type worms and cadmium affecting adr-2 mutants most strongly. The adr-2 mutants were more sensitive overall than their counterparts. The results emphasize the importance of genetic factors in environmental toxin responses. As heavy metals are widespread in soil, water and food often because of industrial runoff, electronic waste and pesticide use, understanding their biological impact will be critical. C. elegans provides a valuable model to study how these toxins might affect human health and stress response mechanisms.
39.	**Bella Gutierrez** *CD8 T Cells in the Aged Environment* **Advisor:** Sara Hamilton Hart **Mentors:** Erin Lucas & Claire Thefaine **Sponsoring Program**: LSSURP **Home Institution:** St. Olaf College **Abstract:** CD8+ T cells are a part of the adaptive immune system, which form stable memory populations in an organism to protect against re-infection. Central memory T cells (TCM) and long lived effector cells (LLEC) are two subsets of the CD8+ T cell memory population. Aging affects how well T cells are able to function in many ways. We hypothesized that the aged environment influences the transcriptome in aged TCM and LLEC compared to the young environment. To test this hypothesis, we sorted TCM and LLECs from mice 30 days post-infection with a model pathogen and sequenced the RNA. Through this data, we report that there are significant differences in gene expression between young and aged TCM and LLEC. We concluded that aged TCM take on a more effector-like transcriptional phenotype compared to young TCM. We also tested if naive and memory T cells are differentially affected by the aged environment by transferring cells from young mice into aged mice. At day 40 post transfer, we harvested splenocytes from the recipient mice and stained for PD-1 + /Tox + , which are associated with T cell dysfunction. We find that naive T cells are less protected from the aged phenotype than memory T cells.

40. **Shahd Hagelsafy**
Ubiquitin-Proteasomal Pathway in Removal of Cisplatin-Induced DNA–Protein Crosslinks (DPCs)
Advisor: Natalia Tretyakova
Mentor: Cesar Iturerere Cyuzuzo
Sponsoring Program: M-ASCEND
Home Institution: University Of Minnesota Twin Cities
Abstract: Each year in the U.S, about 10,000 people are diagnosed with Glioblastoma, the most common and aggressive malignant brain tumor. Unfortunately, nearly 70% of these cases are expected to return, often with resistance to existing treatments. One of the main therapies, platinum-based compounds like cisplatin, works by inducing DNA–protein crosslinks (DPCs), a type of DNA damage where a protein becomes covalently attached to DNA. DPCs are toxic because they block vital DNA metabolism (i.e., replication, transcription, and repair). Left unrepaired, they lead to cell death, genome instability, and increased cancer risk. Despite their clinical importance, the cellular mechanisms used to recognize and repair DPCs remain poorly understood, which limits the discovery of new combination therapy targets. Towards this goal, my project combines human cell culture and DPC extraction assay to probe the role of the ubiquitin-proteasomal pathway in repairing cisplatin-induced DPCs. Our preliminary results indicate that when this pathway is blocked, more DPCs accumulate, suggesting that it plays a crucial role in facilitating the removal of these lesions by cells. The ultimate goal is to identify potential therapeutic targets that could enhance the efficacy of platinum-based treatments and reduce the risk of tumor relapse.

41. **Sydney Hansen**
Functional Brain Network Topography is Associated with Language Skills in Adolescents
Advisor: Damien Fair
Mentor: Sanju Koirala
Sponsoring Program: MIDB
Home Institution: Augustana University
Abstract: The human cortex can be divided into large-scale functional networks that coordinate complex cognitive processes. Recently, variation in such network organization has been linked to psychopathological behaviors (Lynch et al., 2024; Koirala et al., in prep). Here, we examine whether similar variation in network topography (size) relates to language abilities in adolescents. We focused on the ventral attention network (VAN), which overlaps with the language network described by Fedorenko et al. (2024). Individualized networks were derived from ABCD study participants (age 9-10) using a template-matching approach (Hermosillo et al., 2024) and split into ARMS1 ($n = 2467$) and ARMS2 ($n = 2668$) for replication. Language skills were quantified using the NIH Toolbox Picture Vocabulary Test (PVT) and Oral Reading Recognition Test (ORRT). General Additive Mixed Effects Models (GAMMs) tested whether network size predicted scores. VAN size was not significantly related to PVT or ORRT ($p > 0.05$). However, post-hoc analysis of all 15 networks showed that parietal-occipital network (PON) size significantly predicted both measures ($p < 0.05$). The null findings for VAN may suggest its role in complex language processing, while PVT and ORRT assess vocabulary and word recognition. These exploratory results suggest a novel role for PON in adolescent language development.

42. **Evelyn Her**
Access and Accreditation in Wisconsin Lung Cancer Screening
Advisor: Abbie Begnaud
Sponsoring Program: M-ASCEND
Home Institution: University of Wisconsin–La Crosse
Abstract: Low-dose CT (LDCT) for lung cancer screening (LCS) reduces mortality. The American College of Radiology (ACR) offers accreditation for expertise with imaging acquisition, interpretation, and management of findings is needed to ensure quality screening and minimize harm. The optional nature of this accreditation means there is no systematic/accessible means of identifying imaging centers conducting high-quality LCS. Objective: to assess geospatial distribution of CT scanners and extent of ACR designation among facilities offering lung cancer screening in Wisconsin. ACR and GO2 Foundation LCS center lists were cross-referenced with Wisconsin Department of Health Services (DHS) records of registered CT scanners. All 255 facilities were contacted to confirm scanner, LDCT use, and screening protocols. Data was collected and managed using REDCap. Of 524 CT scanners across 255 facilities, only 16.7% were ACR-designated for LCS. Despite lacking designation, several facilities reported offering LDCT, indicating potential quality and oversight concerns. There is a significant gap between lung cancer screening and ACR-recognized facilities in Wisconsin, particularly in rural areas. Enhancing designation among capable sites and addressing access barriers improving equitable screening and lung cancer outcomes statewide.

43.	**Madelyn Highfield** *Understanding the Exposome Through Hemoglobin Adducts* **Advisor:** Natalia Tretyakova **Mentor:** Erik Moran **Sponsoring Program**: SCoPE **Home Institution:** The Ohio State University **Abstract:** Nearly 80% of lung cancer cases occur in smokers, but about 15% of people who smoke will develop lung cancer. However, it is unknown which individuals are at risk. To understand this discrepancy, we looked at contributing factors, such as environmental exposures, diet, and lifestyle (the exposome), contributing to individual lung cancer risk. We assessed human exposures to electrophiles by the measurement of covalent modifications (adducts) of hemoglobin. Hemoglobin is highly abundant in human blood and has a lifetime of about 3-4 months, allowing quantification of exposure over longer time periods compared to current methodologies. In this project, we utilized two methods to quantify N-terminal hemoglobin adducts: analysis of N-terminal valine following modified Edman degradation utilizing fluorescein-5-isothiocyanate (FITC), (FIRE method), which allows for higher throughput; and reverse-phase LC-MS of propionylated N-terminal hemoglobin peptides. With the FIRE method, we observed several hemoglobin adducts, including novel modifications previously undetected in our lab. We observed successful propionylation of tryptic peptides for control and electrophile-treated globin, which improved LC separation of modified and unmodified peptides, allowing for specific quantitation of peptide adducts. These results will aid us in quantifying hemoglobin adducts in smokers to understand the effects of the exposome on lung cancer risk.
44.	**Sydney Higley** *The Effects of Board Gender Diversity on Organizations' Environmental Sustainability* **Advisor:** Deniz Ones **Mentor:** Ziyu Ren **Sponsoring Program**: Pathways **Home Institution:** University of Minnesota Twin Cities **Abstract:** Effectively introducing environmentally sustainable practices into businesses is not only crucial for the effort against climate change, but also for improving the reputation and profitability of organizations. One avenue for influencing change is through an organization's board of directors. Characteristics of the board, such as gender diversity, are linked to the degree of environmental sustainability at the organizational level, but the direction and strength of this relationship are disputed. A meta-analysis was conducted to statistically combine findings and uncover the impact of board gender diversity across industries and environmental sustainability measures. Web of Science and APA PsycINFO databases were used to identify relevant studies that were published between 2012-2025 and reported correlation data. Preliminary findings suggest organizations with a greater proportion of women on the board have higher environmental sustainability. This timely meta-analysis captures the evolving nature of women in the workforce and the impact of the United Nations' Sustainable Development Goals, while distinguishing between environmental and social sustainability. Findings from this research will inform organizations of the impact of their current board composition and guide future decision-making to maximize environmental sustainability. Understanding gender differences in environmentally sustainable behaviors at the employee level is a rich area for future research.

45. **Moo Hset**
Coping Strategies and Support in Ovarian Cancer Survivors
Advisor: Rachel Vogel
Mentors: Katherine Brown & Helen Parsons
Sponsoring Program: M-ASCEND
Home Institution: University of Minnesota Twin Cities
Abstract: An ovarian cancer diagnosis often brings significant emotional challenges, including fear of recurrence and anxiety. This study describes resources and coping strategies used by ovarian cancer survivors and how they relate to distress. We conducted an analysis of an ongoing cross-sectional survey study among ovarian cancer survivors. Adults (18+ years) with self-reported ovarian cancer were invited to participate through ovarian cancer advocacy groups. Analyses focused on summarizing the coping resources and activities utilized by survivors and compared survivor distress by use of each strategy using t-tests. Our analysis included 46 ovarian cancer survivors (median age 57, range 29-84); 83% were White, 63% married/partnered, and 77% held at least a college degree. Participants reported an average distress score of 3.8±2.4. Over half used various coping strategies, including support groups, professional counseling, talking with loved ones, yoga, mindfulness, education, and online resources. Notably, writing was associated with significantly lower distress levels (2.8±2.3 vs. 4.3±2.4, p=0.04); physical therapy and legal support also were associated with lower distress. Ovarian cancer survivors in this study used various coping methods, with writing linked to reduced distress. More research involving a larger, more diverse group is necessary.

46. **Emaleigh Hulet**
Exploring the Influence of LHb Chemogenetic Activation on Aversion-related and Consummatory Behaviors in Long-Evans Rats
Advisor: Jocelyn Richard
Mentor: Klaiten Kermoade
Sponsoring Program: Pathways
Home Institution: University of Minnesota Twin Cities
Abstract: While little is known as to why only a subset of drinkers misuse alcohol, one possible explanation points to these individuals having a greater resistance to the negative effects of alcohol (i.e., sedation, hangover). The goal of this project was to interrogate the neural basis for alcohol-induced aversion using rodent models. The lateral habenula (LHb), a brain region known for aversion processing, is hyperactive in ethanol-induced conditioned taste aversion (CTA), a learning paradigm associating taste with experience. This led us to ask whether manipulation of the LHb alone could mimic the effects of ethanol in a similar paradigm. We hypothesized that chemogenetic activation of the LHb would induce CTA or exacerbate EtOH-induced CTA, which could provide further evidence for the mechanism of ethanol's aversive effects. We also tested whether prior chemogenetic activation would alter consumption of sucrose and EtOH separately. Results show that CTA was not achieved through activation of LHb with DCZ, nor with the addition of 1.25 g/kg EtOH with DCZ. This suggests that activation of the LHb may not be the primary mechanism of ethanol-induced conditioned taste aversion. Similarly, in the EtOH and sucrose tests, data indicates LHb activation did not significantly alter consumption.

47. **April Husbyn**
Exploring the Role of Self-Report and Informant-Report Neuroticism on Emotional Dysregulation and Variability
Advisor: Whitney Ringwald
Sponsoring Program: Psychology
Home Institution: University of Minnesota Twin Cities
Abstract: Neuroticism has been widely linked to emotional variability -- a proxy for emotional dysregulation-- but studies have primarily relied on self-reports. Consequently, it is unclear whether emotional variability is strictly an internal experience or if it is reflected in observable behavior. This project uses both self- and informant-reports of neuroticism to better understand aspects of neuroticism that relate to emotional dynamics. Our findings that both self- and informant reports of neuroticism correlate with average negative emotion suggest it reflects shared internal and observable aspects of neuroticism, while emotional variability is only related to self, not informant reports of neuroticism, suggesting it is tied primarily to internal experiences of neuroticism.

48. **Sabrina Hussein**
NTSR1 in the mPFC-NAc circuit: A candidate target for opioid relapse intervention
Advisor: Lauren Slosky
Mentor: Crystal Lemchi
Sponsoring Program: LSSURP
Home Institution: University of Minnesota Twin Cities
Abstract: Relapse to drug use following periods of abstinence is a risk factor for overdose and remains a major challenge in substance use disorder (SUD) recovery, affecting 30–90% of patients. The mechanisms that mediate this behavior are incompletely understood. Recent studies have implicated a glutamatergic circuit from the medial prefrontal cortex (mPFC) to the nucleus accumbens (NAc) in relapse to opioid-seeking. Inhibiting this circuit may be beneficial in the context of SUDs but may also produce side effects. Neurotensin receptor 1 (NTSR1), a neuropeptide receptor, has emerged as a promising therapeutic target for modulating a portion of the glutamatergic mPFC-NAc circuit. We hypothesized that NTSR1-expressing mPFC-NAc projections make up a majority of this pathway. Using retrograde tracing with a virus carrying green fluorescent protein (GFP), we identified a subset of neurons in the mPFC that project to the NAc. Using RNAscope in situ hybridization, we visualized and quantified NTSR1-expressing neurons in the mPFC and identified NTSR1 and GFP colocalization. Our results show that most neurons in the mPFC-NAc pathway express NTSR1, supporting our hypothesis. Identifying neuronal markers such as NTSR1 in this circuit could enable circuit-based interventions to prevent opioid relapse with minimal side effects and potentially save lives.

49. **Siham Ibrahim**
Assessing the acceptability and feasibility of collecting salivary biospecimen samples to measure tobacco smoke exposure in Somali families
Advisor: April Wilhelm
Sponsoring Program: McNair
Home Institution: University of Minnesota Twin Cities
Abstract: Objectively measuring tobacco smoke exposure (TSE) using biospecimens is important for confirming the effectiveness of behavioral interventions. However, there is limited knowledge about perceptions of the use of biomarker specimens in research and the facilitators and barriers to collecting these in certain groups. This study aimed to 1) determine the acceptability and feasibility of collecting salivary cotinine biomarker specimens and to 2) identify and characterize the facilitators and barriers to participation in salivary cotinine biomarker specimen collection for Somali families. Data includes 10 key informant interviews, 6 focus groups (n=40) with Somali parents, and interviews with 15 Somali American families from a broader household TSE reduction intervention. We will also be measuring participation levels in the biospecimen sample collection during a behavioral intervention to gauge the feasibility of collecting salivary cotinine samples. This research will guide more inclusive future research strategies for underrepresented research communities.

50. **Isabella Ikobe**
Investigating the Impact of Substrate Utilization Diversity in the Methylobacterium genus on Early Corn Growth
Advisor: Jannell Bazurto
Mentor: Anahi Cantoran
Sponsoring Program: McNair
Home Institution: University of Minnesota Twin Cities
Abstract: The aerial surface of plants, the phyllosphere, covers an area of one billion square kilometers on Earth and is the primary habitat for a multitude of microbes. One prominent genus in the phyllosphere microbiome, *Methylobacterium*, has a growth-promoting relationship with plants, as showcased by their ability to secrete plant growth hormones to stimulate plant growth. Reciprocally, they consume the one-carbon compounds plants release. Minimal research has examined how species-level differences in consuming different metabolic substrates (called substrate utilization diversity) can affect microbial colonization and benefit plant growth. This study aimed to determine how substrate utilization diversity within the *Methylobacterium* genus affects the growth of *Zea mays* (corn) by inoculating seeds with *Methylobacterium* species with differing substrate utilization profiles and monitoring their growth. To assess community dynamics, 16S rRNA sequencing will be utilized. The information gained gives insight on the utilization of microbes to generate healthier crops for more sustainable agriculture.

51.	**Katrina Jensen** *Attitudes towards democratic norms among young American men: Examining the interaction between age, gender, and educational attainment* **Advisor:** Howard Lavine **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** As the descent into authoritarianism has become salient in the United States, concerns over democratic backsliding have grown. This study focuses on the unprecedented antidemocratic beliefs of the younger generations of Americans and aims to provide a more comprehensive examination of these beliefs than previous studies by examining the interaction between age, gender, and educational attainment in attitudes toward democratic norms. Data from two 3-wave panel studies conducted by YouGov from 2020-2021 and Bovitz from 2022-2023, along with a cross-sectional Bovitz study conducted in 2025 were analyzed using software from R Studio and Stata. Participants answered batteries of questions that asked about their beliefs toward democratic "rules of the game," partisan violence, partisan spite, authoritarian rule, and conspiratorial thinking. Results are pending but will be available by Fall 2025.
52.	**Sarah Jimenez** *Smoking Prevalence and Cessation Among Menthol Smokers: Why We Need a Ban on Menthol Cigarettes* **Advisor:** Dorothy Hatsukami **Mentor:** Emily Hackworth **Sponsoring Program**: LSSURP **Home Institution:** University of Colorado Boulder **Abstract:** Smoking remains a leading cause of preventable death and disease. As the US government considers policies to reduce smoking, such as a menthol cigarette ban, understanding trends in smoking prevalence is crucial to determining impactful interventions. This study examines trends in smoking prevalence, menthol use, and quit rates from 1992-2023. Using weighted data from the Current Population Survey's Tobacco Use Supplement, participants (n=1,837,886) were categorized as current smokers (n=346,914) and former smokers (n=415,658). Current smokers reported smoking menthol or non-menthol cigarettes. Quit rates reflect the percentage of ever-smokers who quit in the past year, overall, and among menthol smokers. We examined trends in outcomes over time using regression models. Smoking prevalence declined from 25% in 1992-1993 to 9% in 2022-2023 ($p<0.001$). Menthol use among current smokers increased from 27% in 2003 to 46% in 2022-2023 ($p<0.001$). In 2022-2023, the quit rate for smoking was 3% and the quit rate for menthol was 1%. Sociodemographic differences were observed. Findings suggest that while smoking has declined, menthol cigarettes use among smokers has increased, indicating a menthol cigarette ban might improve public health. Sociodemographic differences emphasize the need for targeted interventions to reduce health disparities.
53.	**Sean Johnson** *Comparative Evaluation of Transparent Polylactic Acid Sheets for Clear Aligner Application* **Advisor:** Jae Sung Lee **Mentor:** Mayuri Parappullil Vellayappan **Sponsoring Program**: LSSURP **Home Institution:** Southern Methodist University **Abstract:** Clear aligner therapy is an orthodontic treatment that uses plastic trays to move teeth over time. Currently, aligners are made with non-biodegradable thermoplastics that pose a significant environmental burden. Due to this, there is a pressing need to switch to biodegradable and sustainable materials. Polylactic acid (PLA) is a biodegradable thermoplastic that is FDA-approved for medical devices and implants. This study examines the feasibility of using PLA as an aligner material. Briefly, this study investigates the thermal, mechanical, optical, and morphological properties of clear PLA sheets in comparison with other common thermoplastic aligner materials such as Essix Ace, Essix C+, Zendura FLX, and Zendura. The study compares each material's properties before and after treatment with artificial saliva in a simulated oral environment at 37 °C for the duration of 1, 7, and 14 days. For all these materials, the thermal properties were analyzed using Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA), while the optical properties were analyzed using UV-Visible spectrophotometry. Morphological properties were analyzed by Scanning Electron Microscopy (SEM), and finally, mechanical properties were analyzed using the Universal Testing Machine (UTM).

54. **Kurian Jos**

The Role of NCOR1 and NCOR2 in Skeletal Muscle: Insights from siRNA-Mediated Knockdown in C2C12 Cells

Advisor: Amy Hauck

Sponsoring Program: Independent Research

Home Institution: Macalester College

Abstract: The Nuclear Receptor Co-Repressor (NCOR) complex is an essential regulator of systemic lipid and glucose metabolism through the modulation of metabolic gene expression. Prior studies have demonstrated that hepatic NCOR deficiency leads to hypoglycemia and impaired adaptation to fasting. During fasting, the liver and skeletal muscle coordinate to maintain energy homeostasis: the liver initially breaks down glycogen, then engages in gluconeogenesis using lactate and amino acids supplied by muscle, and generates ketone bodies as alternative substrates. In parallel, skeletal muscle reduces glucose uptake and releases amino acids and lactate to support hepatic glucose production. Based on these established interactions, we hypothesized that NCOR1 and NCOR2 may also play key roles in regulating glucose metabolism within skeletal muscle. To investigate this, we utilized small interfering RNA (siRNA) to induce loss of function of Ncor1 and Ncor2 in C2C12 mouse skeletal muscle cells. Reverse transcription quantitative PCR (RT-qPCR) confirmed efficient gene knockdown, facilitating evaluation of downstream changes in metabolic gene expression. Our ongoing work assesses alterations in glucose and lipid metabolic pathways following loss of corepressor function. Future studies will involve skeletal muscle-specific knockdown of Ncor1 and Ncor2 in mice to assess their roles in both local muscle and systemic glucose metabolism.

55. **Aksinya Kamenshikova**

Cross-Generator Reweighting, A Study of a Model-Independent Solution

Advisor: Gregory Pawloski

Mentor: Colin Weber

Sponsoring Program: Pathways

Home Institution: University of Minnesota Twin Cities

Abstract: Neutrinos are known as "ghost particles," and rarely interact with matter. On the occasion that neutrinos do interact, it is through the weak force, which leads to the exchange of a $w^{+/-}$ or z^0 boson, either a charged current (CC) or neutral current (NC) interaction, respectively. The NOvA collaboration at Fermilab studies such neutrino interactions. These studies are aided by the use of Monte Carlo simulations, which are required due to the complexity of the underlying interactions. The generators, GENIE, NEUT, NuWro, and GiBUU, all operate based on empirical and theoretical physics models for particle interactions. Running these simulations is complicated, so it would be useful to be able to reweight the output of one generator to make it look like another without having to rerun the second simulation. However, there is no cross-generator weighting system that would allow one generator to mimic the results of another. This is the question we are investigating: whether or not such a weighting system is feasible with the intention of model comparison**.**

56. **Bhavya Kanagala**

Determining the role of ARHGEF2 in chimeric antigen receptor (CAR) T-Cells

Advisor: Craig Byersdorfer

Mentor: Elisabet Ampudia-Mesias

Sponsoring Program: CCRF

Home Institution: University of Minnesota Twin Cities

Abstract: Compound 991, an AMP-activated protein kinase (AMPK) agonist, has demonstrated promising improvements in CAR T-cell persistence and leukemia clearance in vivo, likely due to metabolic reprogramming by AMPK. A preliminary screen identified phosphorylation of the protein ARHGEF2 following 991 treatment. I hypothesize that AMPK activation upregulates cellular metabolism, in part through phosphorylating ARHGEF2. To determine ARHGEF2's role, I am pursuing a two-pronged approach. First, I am testing gRNAs to delete ARHGEF2 in human T-cells via CRISPR by amplifying a segment of the ARHGEF2 gene on which to test potential gRNAs ex-cyto. Once I identify a reliable gRNA, I will delete ARHGEF2 in 991-treated T-cells and compare their behavior to mock-treated T-cells to determine the necessity of ARHGEF2 in mediating Compound 991-related benefits. Second, I am using immunoprecipitation to confirm ARHGEF2's phosphorylation status in different 991 treatment conditions known to impact AMPK activation. As a pilot study, primary human T-cells were activated with Compound 991, followed by immunoprecipitation of native ARHGEF2 proteins using an anti-ARHGEF2 antibody. These lysates will next be tested on a Western-Blot using phosphoserine-specific antibodies. I plan to further confirm any 991-dependent phosphorylation by reversing the order and first immunoprecipitating with an anti-phosphoserine antibody and blotting against ARHGEF2.

57.	**Anya Kapitula** *Investigating the Role of Early Life Adversity on Risk for Substance Experimentation* **Advisor:** Mark Fiecas **Mentors:** Mustafa al'Absi & Ellery Island **Sponsoring Program**: Equitable Data Science **Home Institution:** Hope College **Co-presenter:** Sasha Laugen, Grinnell College **Abstract:** Early Life Adversity (ELA) refers to any factor in childhood and early adolescence that adversely affects an individual's development, mental wellbeing, or quality of life. Exposure to ELA has been associated with mental health impacts and negative behavioral outcomes later in life, such as substance abuse and other risk-taking behaviors. In this study, we investigated the connection between ELA and experimentation with alcohol, tobacco, and/or marijuana using data from the Adolescent Brain Cognitive Development (ABCD) Study. The ABCD Study investigates the brain and health development of almost 12,000 individuals across the United States from childhood into adolescence, collecting information on ELA factors, as well as reports on substance initiation. We categorized each question to create sum scores related to distinct domains of ELA and used them as predictors in mixed models to investigate the impact of exposure to assorted ELA domains on risk for experimentation with substances. Different types of ELA varied in their association with substance experimentation, with increased discrimination being associated with increased odds of substance use initiation. This research can be used as the foundation for future studies looking to identify at-risk populations for early substance experimentation and use.
58.	**Yona Ketema** *Modulating Cortical Traveling Wave Speed with External Current to Improve Cognition* **Advisor:** Alexander Opitz **Mentor:** Sangjun Lee **Sponsoring Program**: Pathways **Home Institution:** University of Minnesota Twin Cities **Abstract:** Cortical traveling waves (TWs) are a form of neural oscillation that propagate across the cortex, are responsible for sending information across regions, and play a large role in cognitive processes. As these waves have parameters such as speed and phase, TWs can be modulated during brain stimulation methods such as transcranial alternating current stimulation (tACS) to improve brain processes such as cognitive function. This study investigates how the speed of twtACS influences cognitive performance. Participants received either sham, fast, or slow twtACS during a visual attention task, and a memory task. Stimulation was given to the right frontal-parietal network, and EEG was recorded before, during, and after tasks. Accuracy and response time were analyzed, and spectral analysis was performed to confirm the presence of traveling waves that resulted from stimulation. It was found that after receiving stimulation, traveling waves were observed in EEG recordings, whereas none were found before stimulation. Further, participants tended to perform better in cognitive tasks when receiving stimulation; particularly slow twtACS. These findings suggest that under the current parameters, twtACS can modulate brain activity in a way that improves cognitive function, and serves as early evidence that twtACS may be able to treat certain cognitive dysfunction.

59.	**Ellie Ko** *Validation of a LC-MS/MS Method to Quantify Fentanyl and its Metabolites in Human Plasma using Fetal Bovine Serum Matrix* **Advisor:** Angela Birnbaum **Mentor:** Silvia Illamola **Sponsoring Program**: SCoPE **Home Institution:** University of Minnesota Twin Cities **Abstract:** Fentanyl is a schedule II opioid used for pain management and a major cause of drug overdose in the United States due to abuse of illegal opioids mixed with fentanyl. Overdose prevention requires a method that quantifies fentanyl and its metabolites to understand the pharmacokinetics of the drug. This study focuses on the development and validation of a liquid chromatography tandem mass spectroscopy (LC-MS/MS) method for measuring the concentration of fentanyl and its metabolites (Alfentanil, Carfentanil, Sufentanil, Norfentanyl, and Acetyl Fentanyl) using fetal bovine as a matrix. Compounds were extracted using solid phase extraction and separated by high-performance liquid chromatography using an Agilent Zorbax XDB-C18 (50 x 2.1 mm, 3.5µm) column with a gradient elution of mobile phase A (10mM Formate Buffer pH-3.0) and mobile phase B (acetonitrile) at a flow rate of 0.25mL/minute. The validation followed FDA guidelines, and the calibration curve ranged from 0.1 to 50 ng/mL for all compounds. Intra- and inter-assay precisions were below 15% across all concentrations. Accuracy values were within acceptable ranges (±20% at LLOQ and ±15% at higher concentrations). This validated method successfully quantifies fentanyl and its metabolites in human plasma for the application in pharmacokinetic studies.
60.	**Emma Krienke** *Multifunctional ADAM17-blocking TriKE-PACC Molecule Overcomes Immunosuppression in the Tumor Microenvironment of Ovarian Cancer* **Advisor:** Martin Felices **Mentor:** Melissa Khaw **Sponsoring Program**: Independent Research **Home Institution:** St. Olaf College **Abstract:** Natural killer (NK) cells mediate antibody-dependent cellular cytotoxicity (ADCC) through their activating receptor CD16. In ovarian cancer patients, NK cells found in ascites fluid (an immunosuppressive accumulation in the abdominal cavity) express lower levels of CD16 compared to NK cells in the blood. This reduction may be due to the activity of a disintegrin and metalloprotease 17 (ADAM17), which cleaves CD16 from the NK cell surface, impairing ADCC. To overcome this immune suppression, we assessed the therapeutic potential of a trispecific killer engager poly-antigen cytokine-receptor complex (TriKE-PACC) that blocks ADAM17. This multi-functional molecule is designed to simultaneously engage CD16 on NK cells, target tumors through B7H3 (an antigen highly expressed on ovarian cancer cells), induce proliferation via the cytokine complex IL-15/IL-15Ra, and inhibit ADAM17 to prevent CD16 shedding. Our findings demonstrate that when NK cells are co-cultured with ascites fluid and challenged with ovarian cancer cells, the ADAM17 TriKE-PACC maintains surface expression of CD16 on NK cells, thereby preserving their ability to mediate ADCC. Furthermore, the ADAM17 TriKE-PACC promotes NK cell proliferation and enhances cytotoxicity under these same conditions. These results support the ADAM17 TriKE-PACC as a promising immunotherapy for enhancing NK cell function in the ovarian cancer microenvironment.

61. **Dana Lara**
Optimizing Amyloid Beta Preparation and Measuring Stability
Advisor: Karunya Kandimalla
Mentor: Vaishnavi Veerarreddy
Sponsoring Program: SCoPE
Home Institution: University of South Florida
Abstract: Recent data shows that by the year 2050, the prevalence of Alzheimer's disease will have tripled worldwide. Amyloid beta is a protein fragment that accumulates abnormally in the brains of individuals with Alzheimer's disease. These fragments aggregate into plaques, which disrupt cell-to-cell communication and trigger inflammatory responses. This accumulation is a hallmark of Alzheimer's pathology and is believed to play a key role in neurodegeneration and cognitive decline. This study focuses on optimizing preparation of amyloid beta and assessing stability of these highly unstable peptides. Within the lab, these peptides are exposed to the cells and used to detect cell signaling pathways and the relationship with the brain blood barrier (BBB). We employed three primary techniques—Nanodrop spectrophotometry, Western Blot, and Silver Staining—to evaluate protein concentration and stability over time. NanoDrop provided rapid quantification, Silver Stain offered high-sensitivity visualization of amyloid beta stability on SDS-PAGE gels, and Western blot enabled detection and semi-quantitative analysis of specific amyloid beta species using targeted antibodies. This research lays the groundwork for improved protein analysis, particularly for applications involving aggregation-prone peptides.

62. **Julian Ledesma**
D3' domain of CDTb in Clostridioides difficile toxin and its effect on binding with bacteria
Advisor: Michael Sheedlo
Mentors: Victor Corral & Zachary Peterson
Sponsoring Program: LSSURP
Home Institution: University of Minnesota Twin Cities
Abstract: Clostridioides difficile is a gram-positive bacterium that is found to cause hospital-acquired diarrhea. It is responsible for over $ 4 billion in healthcare expenditures annually. C. difficile can infect humans via oral and fecal routes. Symptoms of C.difficile consist of colitis, inflammation of the inner lining of the colon, which can then result in diarrhea, abdominal pain, and bleeding. The symptoms of C. difficile are a result of activity from 3 main toxins with the toxin of interest being CDT, a bipartite toxin consisting of an enzymatic ADP-ribosyltransferase protein, CDta, and its translocating facilitation protein (pore forming delivery apparatus) CDTb. Within CDTb, we investigated the D3' domain (that is believed to be involved in binding with glycans on host cell surface) to determine whether it plays a role in interacting with bacteria. Using protein purification protocols, size exclusion chromatography and a fluorescent tracker dye (NHS ester fluorophore), we were able to track activity of the D3' protein on a DH5a e.colibacterial plate using fluorescent microscopy.

63. **Carlie Lee**
Optimizing HO-1–Enriched EVs for the Treatment of Vaso-Occlusion in a Sickle Cell Disease Model
Advisor: Greg Vercellotti
Mentors: John Belcher & Julia Nguyen
Sponsoring Program: LSSURP
Home Institution: Howard University
Abstract: Sickle cell disease (SCD) is a genetic disorder caused by a point mutation in the β-globin gene, leading to the production of sickle hemoglobin (HbS). Under hypoxic conditions, HbS polymerizes, causing red blood cells to deform, rupture, and obstruct blood vessels, resulting in vaso-occlusive crises. In addition to mechanical blockage, hemolysis releases free heme, which activates endothelial cells via Toll-like receptor 4 (TLR4) signaling and promotes inflammation. Heme oxygenase-1 (HO-1), an enzyme that degrades heme into anti-inflammatory byproducts, reduces inflammation and inhibits vaso-occlusion in SCD mouse models. However, methods for targeted HO-1 induction and delivery remain limited. One promising strategy involves extracellular vesicles (EVs)—lipid-bound nanoparticles naturally released by cells that facilitate intercellular communication. Because most cell types secrete and internalize EVs, they represent a reliable vehicle for therapeutic delivery. In this study, we aimed to optimize HO-1 expression in HEK293 cells and evaluate whether HO-1 could be packaged into secreted EVs. We observed increased HO-1 expression after 72 hours of hemin treatment. HO-1 was detected in EV samples from both the 24-hour and 48-hour post–overnight pulse groups; further optimization and the use of HO-1 plasmid transfection may enhance therapeutic potential. We hypothesize that HO-1– enriched EVs will have cytoprotective and anti-vaso-occlusive effects in SCD mice.

64. **Brooklyn Lennes**
Orthology and Sensory Gene Loss in Cavefish Lineages
Advisor: Suzanne McGaugh
Mentor: Danielle Drabeck
Sponsoring Program: Pathways
Home Institution: University of Minnesota Twin Cities
Abstract: While gene loss has previously been underappreciated by evolutionary biologists as a process with adaptive potential, recent research has revealed that it may be important in both loss of function and gain of function traits. Distantly related cavefishes have independently evolved cave-adapted traits including eye reduction and neuromast and tastebud expansion. This makes cavefish a promising system to study convergent gene loss. However, most species of cavefishes remain understudied, and the molecular mechanisms behind many adaptations remain unclear. Using 13 newly assembled cavefish genomes, this study aims to examine patterns of gene loss, pseudogenization, or degradation in eye, neuromast, and taste bud genes, and determine what role selection has played in these changes. To ensure reliable analysis, orthologs were confirmed by examining conserved gene order, or microsynteny. Confirmed orthologs were evaluated to determine protein function and signatures of selection. Preliminary results include exon loss in genes responsible for eye and neuromast development in at least two species of cavefish. Exon loss may render a gene nonfunctional, potentially helping to explain eye reduction and neuromast expansion in cavefishes.

65. **Karma Lhamo**
Characterizing Craniofacial Skeletal Defects in Mice Mutants
Advisor: Yasu Kawakami
Sponsoring Program: LSSURP
Home Institution: Augsburg University
Abstract: *Redacted due to patentable data*

66. **Vera Lindh**
Decoding Peripheral Visual Information from Foveal V1 Using fMRI and Machine Learning
Advisor: Cheryl Olman
Mentors: Qi Chen & Brock Carlson
Sponsoring Program: Pathways
Home Institution: University of Minnesota Twin Cities
Abstract: The fovea is a small depression in the retina responsible for central vision. This area is characterized by a disproportionately large representation in the primary visual cortex (V1). Evidence suggests that objects seen in peripheral vision are represented in the foveal region of V1. This phenomenon is attributed to feedback from higher-level visual areas that process the scene. However, the purpose of these feedback signals remains unclear, and prior studies have not used machine learning algorithms to investigate them. This study addresses these gaps by utilizing functional magnetic resonance imaging (fMRI) and a machine learning algorithm to investigate how feedback modulates brain activity patterns. We trained a support vector machine (SVM) to decode different images from brain activity patterns. The SVM was trained on foveal data, and then predicted images perceived peripherally. The SVM's accuracy was slightly above chance level, indicating that activity patterns in the foveal region of V1 contain limited information about peripheral stimuli. Noise in the data may also have impacted results. Next steps include testing different types of kernels and GLMs, and applying principal component analysis to denoise the data.

67. **Emily Lippert**
Masks Impact Speech Intelligibility acting as Low-Pass Filters
Advisor: Benjamin Eisenreich
Sponsoring Program: UROP/URS
Home Institution: University of Minnesota Twin Cities
Abstract: Masks play an important role in protecting the welfare of healthcare providers and patients.However, face masks can present significant communication challenges due to acoustic attenuation and the obstruction of visual cues used in communication. This research aimed to determine the particular frequency bands affected by wearing a surgical mask. We used 600 recorded audio files of standardized English sentences with both male and female voices. Half were recorded using a standard surgical mask, while the other half were recorded without any facial coverings. Similar to previous studies, we found that surgical masks act as a low-pass filter, impacting the upper speech bands (5KHz-8Khz). This research provides scientific evidence that a voice amplifier should be designed to enhance these frequency bands to overcome the impact of a mask.

68. **Adria Lockhart**
Whole Genomic Sequencing of Human Metapneumovirus Using a Tiled Amplicon Approach to Differentiate Between Strains A & B.
Advisor: Beth Thielen
Mentor: Bart Theelen
Sponsoring Program: LSSURP
Home Institution: American College of Thessaloniki
Abstract: Human Metapneumovirus (HMPV) is a major respiratory disease which infects both the upper and lower respiratory tracts. This virus is ubiquitous in most populations, though often goes undiagnosed and can cause serious illness to children, elderly, and immunocompromised patients. HMPV is widely under-researched, specifically in regard to the genotypic and mechanical differences between strains A and B. The purpose of this study was to optimize the whole genome sequencing (WGS) protocol of HMPV using a tiled amplicon approach. This included the design of virus-specific primers for the reverse transcription (RT) and PCR reactions of patient samples which tested positive for HMPV. Other parameters were assessed for optimization, such as reverse transcription incubation time, spiked-in vs. random hexamer RT primer comparison, and annealing temperature in PCR. These products were then quantified and prepped for sequencing in a MinION flow cell, which provided the unique genomes of each sample and identified them as HMPV. The resulting sequences confirmed that adjustments made to this tiled amplicon protocol were effective in the preparation of a whole HMPV genome sequence.

69. **Maria Makarova**
Effects of Chronic Ethanol Consumption on Low Back Pain in a Mouse Model of Intervertebral Disc Degeneration
Advisor: Laura Stone
Mentor: Mohammed Alshagawi
Sponsoring Program: UMN Pain Consortium
Home Institution: University of Minnesota Twin Cities
Abstract: Low Back Pain (LBP) is a leading cause of disability worldwide and a major contributor to reduced quality of life. A primary pathological contributor to LBP is intervertebral disc degeneration (IVDD). Chronic alcohol consumption has been associated with heightened nociceptive sensitivity and is a risk factor for chronic LBP. We hypothesize that chronic ethanol consumption will cause molecular and behavioral changes in a mouse model of LBP. SPARC (secreted protein acidic rich in cysteine) is important in IVD structure and function. SPARC-null mouse is a model of LBP associated with accelerated IVDD. 7-8 month old male SPARC-null and Wild Type (WT) mice were subjected to the Intermittent Access Two-Bottle Choice (IA2BC) ethanol paradigm. Mice had 24-hour access to 20% ethanol and water on alternating days, interspersed with water-only days. Behavioral assays were conducted to assess radiating leg pain, axial discomfort, and motor function at baseline and throughout 14 weeks of alcohol exposure. Ethanol consumption had no significant effect on body weight. However, ethanol exposure resulted in increased axial discomfort as evidenced by reduced grip strength in both strains. These findings indicate a potential link between chronic ethanol intake, IVDD, and LBP in male mice.

70. **Shelton Manning Jr.**
Comparative Morphology of First- and Second-Year Shoots in Three Rubus *Species*
Advisor: Matthew Clark
Mentor: Mike Patrick & Kate Fessler
Sponsoring Program: SOAR-REEU
Home Institution: South Carolina State University
Abstract: The genus *Rubus*, part of the rose family (Rosaceae), includes economically and ecologically important plants such as blackberries, raspberries, and dewberries. Despite their familiarity, many *Rubus* species are extremely difficult to distinguish due to frequent hybridization, apomixis (asexual seed production), and overlapping morphological traits. This research examines three species in the rose family from the *Rubus* genus: *Rubus alumnus, Rubus allegheniensis,* and *Rubus rosa.* Through a combination of field observations, specimen analysis, and comparative classification with the help of measuring software, this study focuses on contrasting the leaf and inflorescence structures of primocanes (first year growth shoots) and floricanes (second year growth shoots which bear fruit). The aim is to distinguish key traits that define species boundaries and improve differentiation among these closely related taxa. These findings will help clarify distinguishing characteristics, support species identification, and guide further research into species variation within *Rubus.*

71.	**Sudithi Manthati** *Noxa Regulated Signaling Pathways in Human CD8+ T Lymphocytes* **Advisor:** Ameeta Kelekar **Mentor:** Tingyuan Yang **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Human Noxa, the smallest member of the large Bcl-2 family of apoptosis regulator proteins, belongs to the BH3 only subgroup that is designated as "pro-apoptotic". However, in addition to its role as a death promoter, human Noxa has been shown to regulate proliferative metabolism and promote growth in both malignant and normal T lymphocytes. These dual opposing functions make it a potential target for immunotherapy. To better understand human Noxa's growth-promoting metabolic function, the Kelekar lab created a gene replacement (GR) human (h)*NOXA* mouse by replacing the entire mouse (m)*NOXA* gene/regulatory region with its human counterpart. Bioinformatic analyses of RNA-Seq and proteomics data revealed distinct differences in gene expression patterns between stimulated CD8+T cells from (h)*NOXA* and wildtype control mice, that support a role for hNoxa in pathways related to growth, proliferation, and cell cycle control. We are currently validating selected differentially expressed candidates in stimulated CD8 T cells isolated from GR and wildtype mice using western blot analysis and flow cytometry and will next confirm these results in human CD8+T cells. Our studies could offer insights into Noxa's role in regulating signaling pathways that are unique to the human T cell immune response.
72.	**Joel Markley** *Toward Personalized Conversational Moderation: The Design Methodology for an LLM-based Argumentative Dialogue System* **Advisor:** Harmanpreet Kaur **Sponsoring Program**: Pathways **Home Institution:** University of Minnesota Twin Cities **Abstract:** Conversational moderation systems have shown potential to maintain civility in online discussion spaces (e.g., Reddit, Discord). However, human implementations of these systems face scalability challenges which has caused research to investigate how language models can improve them. Existing LM-aided conversational moderation systems call on the social sciences for their designs, using techniques like Socratic dialogue or debate mediation strategies. We hypothesize that dialogue strategies driven by more holistic understanding of user goals can further personalize moderation strategies and improve the productivity of discussions in online spaces. In this work, we rely on Walton's taxonomy of 7 types of argumentation to design a large language model (LLM)-based dialogue system aligned with varied user goals that will be used as a conversational moderation system for an ongoing research project. Specifically, we detail our modular design of: (1) a dialogue routing system that accounts for each participant's perceived conversational goals, (2) LLM-human interactions that conform to seven models of dialogue, (3) conversationally natural LLM behavior, and (4) guardrails to ensure consistent interactions across dialogue contexts and user behaviors. The system design methodology in this paper lays the groundwork for prompt-tuning LLMs to adapt to user goals and establishes our research direction.

73.	**Jalene Marshall** C. elegans *Behavior and Quality of Life After Exposure to UV Light and E-cigarettes* **Advisor:** Michele Allen **Mentors:** Greg Summers & Lynn Nguyen **Sponsoring Program**: M-ASCEND **Home Institution:** Brooklyn Center High School **Co-presenter:** Estrella Vail Perez, Highland Park Senior High School **Abstract:** *C. elegans* are microscopic model organism used in many experiments due to its organized structure and comparable genetics to humans. Due to changes in atmospheric qualities, ecosystems are more susceptible to UV damage, observed in humans as melanoma. Human behaviors have shown increased use of tobacco, commonly through vaping using electronic cigarettes. The rise in ultraviolet exposure and e-cigarette usage is known to cause DNA damage to humans. This study investigates the impact of UV radiation and e-cigarette exposure on *C.elegans*, using the N2 wild-type strain and the mutants Jh1521 (Puf-8) and BR5082 (Shc-1). Nematodes are introduced to 30 seconds of UV-C light, equivalent to 30 minutes outdoors and 120 minutes for E-cigarette liquid. Our research found that 1 in every 5-10 worms develops an abnormal growth, suggesting a tumor. In addition, the majority tend to move more slowly following exposure and die within 72 hours. When the *C. elegans* were exposed to the E-cigarettes, they moved slower but after 120 minutes, the majority were deceased. Although UV exposure may have positive attributes such as vitamin D enhancement, the subjection to these substances produces stagnant mobility, toxicity, and abnormal growth.
74.	**Ailin Mayorga** *Models Matter: Generation of 3D Osteosarcoma Organoids Recapitulates Suppressive Tumor Microenvironment Factors Not Found in 2D Systems.* **Advisor:** Beau Webber **Mentors:** Sophie Wenthe & Prateek Thenge **Sponsoring Program**: LSSURP **Home Institution:** Rutgers University–Newark **Abstract:** Current osteosarcoma (OSA) models inadequately reflect the tumor's immunosuppressive nature, contributing to treatment stagnation for over 40 years. Three-dimensional organoids cultured within extracellular matrix scaffolds (Hyaluronan) better mimic in vivo conditions by preserving cell-matrix interactions that regulate immunosuppressive marker expression, unlike traditional 2D cultures that lack ECM complexity. We hypothesized that hypoxic organoid culture would enhance immunosuppressive activity compared to normoxic conditions by activating hypoxia-driven pathways, including HIF-1a, which can mediate PD-L1, TIM3, and CD47 expression to facilitate immune evasion. HOS, a human OSA cell line, were cultured under hypoxic (5% O_2) and normoxic (21% O_2) conditions before organoid formation. Cell count analysis revealed faster growth in normoxia, while hypoxia exhibited slower growth, suggesting a stressed, tumor-like microenvironment. After organoid formation and culture flow cytometry analysis, using fluorescently labeled antibodies, demonstrated increased expression of the immunosuppressive marker TIM3 in hypoxic compared to normoxic organoids. These findings support our hypothesis that hypoxia enhances immunosuppression in osteosarcoma organoids. The ECM-facilitated cell-matrix interactions under hypoxic conditions enhance the expression of physiologically relevant markers, offering a promising platform for developing more effective OSA treatments by better capturing the tumor's immunosuppressive characteristics.

75.	**Lucas Menendez** *The Role of PIEZO1 in Valvular Fibroblast-Mediated Inflammation* **Advisor:** Bryce Binstadt **Mentors:** Charlie Roll & Jenn Auger **Sponsoring Program**: LSSURP **Home Institution:** Florida International University **Abstract:** Rheumatic heart disease, caused by untreated strep throat, leads to inflammation and fibrosis of heart valves. It disproportionately affects the left side of the heart, particularly the mitral valve. This pattern is mirrored in K/Bg.7 mice, a model of systemic autoimmunity, in which the mitral valve, exposed to higher mechanical pressure, becomes inflamed, whereas the tricuspid valve does not. We hypothesize that the mechanosensitive cation channel PIEZO1 contributes to pressure-related inflammation. To test this, we used a tamoxifen-inducible Cre-lox system to delete PIEZO1 specifically in fibroblasts of K/Bg.7 mice. Cre expression was induced at 3 weeks of age, and mice were sacrificed at 8 weeks for analysis. Heart valve sections were immunostained for ICAM1 and VCAM1 to assess leukocyte adhesion and inflammatory signaling, Ki67 to evaluate cellular proliferation, and Caspase-3 to detect apoptosis. Marker expression was quantified using a custom MATLAB script. Preliminary results showed reduced valve thickening in PIEZO1-deficient K/B.g7 mice but no significant differences in ICAM1 or VCAM1 expression, suggesting that PIEZO1 promotes valve inflammation via mechanisms distinct from adhesion molecule expression. Ongoing analyses will investigate alternate pathways influenced by PIEZO1.
76.	**Alanis Mercado Hernández** *Characterizing Niraparib-Resistant High-Grade Serous Ovarian Cancer Cells* **Advisor:** Stefani Thomas **Mentor:** Trudy Philips **Sponsoring Program**: LSSURP **Home Institution:** University of Puerto Rico at Ponce **Abstract:** High-grade serous ovarian cancer (HGSOC) is the most aggressive subtype of epithelial ovarian cancer. Approximately 20–25% of HGSOC tumors harbor *BRCA1/2* mutations, making them sensitive to poly (ADP-ribose) polymerase inhibitors (PARPis) such as Niraparib, which induce synthetic lethality by exacerbating their inability to repair DNA. Clinical studies demonstrate that 40–70% of patients treated with PARPis eventually develop resistance, leading to recurrence and limited efficacy. This study aims to characterize Niraparib-resistant HGSOC cells as a model for investigating mechanisms of PARPi resistance. We hypothesize that Niraparib-resistant cells will exhibit decreased drug sensitivity and increased DNA damage response. *BRCA2*-mutant PEO16 HGSOC cells were treated with increasing Niraparib concentrations to generate acquired resistance. Drug sensitivity was assessed using Sulforhodamine B (SRB) and Growth Rate (GR) assays. DNA damage response was assessed by γ-H2AX expression (DNA damage marker) measured by Western blot. Proteomic analysis was performed in PEO16 cells and two patient-derived xenograft mouse models, PH077 and PH039, using Parallel Reaction Monitoring (PRM), a targeted mass spectrometry method. We characterized Niraparib-resistant cells by their higher IC_{50} and GR_{50} values, reduced γ-H2AX expression compared to Niraparib-sensitive cells, and differential abundance of proteins associated with DNA damage and repair.

77. **Carter Miller**
Evaluating American Hazelnut Husks as Mulch in Container Production: Impacts on Plant Growth, Soil Moisture, and Weed Suppression
Advisor: Brandon Miller
Mentors: Seth Wannemuehler & Herika Pessoa
Sponsoring Program: SOAR-REEU
Home Institution: South Carolina State University
Abstract: American hazelnut (*Corylus americana Marshall*) is gaining attention as a climate-resilient, regionally adapted nut crop with growing economic potential in the Upper Midwest. Hazelnut processing generates husks as a byproduct, which are typically discarded despite their potential value as mulch. This study evaluated the effectiveness of American hazelnut husks as a sustainable mulch alternative in container plant production. A greenhouse experiment using a randomized complete block design with seven blocks compared five mulch treatments: control (no mulch), American hazelnut husks, rice hulls, bark, and sawdust. Each block included one replicate of each treatment, one pot filled with a commercial substrate, planted with petunia, and inoculated with ryegrass (*Lolium spp.*) and white clover (*Trifolium repens*). Over 30 days, we recorded substrate moisture, substrate temperature, surface temperature, each weed emergence, and plant growth. Data were analyzed using ANOVA and Tukey's HSD for mean separation (a = 0.05). Compared to the commonly used mulch materials, hazelnut husks were as effective, or superior, in suppressing weed emergence while maintaining moisture and temperature and supporting plant growth comparable to conventional materials. Our findings highlight the possibility of repurposing American hazelnut husks as an effective, locally sourced mulch material for use in container production.

78. **Malia Miller**
Framing the Debate on Plea Bargaining: Reform, Rhetoric, and Resistance
Advisor: Eduardo Cornelius
Mentor: Kayla Cory
Sponsoring Program: McNair
Home Institution: University of Minnesota Twin Cities
Abstract: Understanding plea bargain reform efforts is crucial, as plea bargaining is a main driver of mass incarceration and mass criminalization, and also resists broader reform trends. While previous research shows the 2008 recession pushed politicians to lower incarceration costs, reforming plea bargaining could do the opposite by increasing scrutiny of deals, expanding defendants' rights, and raising the number of trials. This study examines how reformers justify altering a system seen as efficient and cost-effective during an era of "cheap on crime" politics. Using frame analysis, I explore how actors across the political spectrum frame plea bargaining's problems, potential solutions, and broader ideas about justice and punishment. As a case study, I analyze a collection of articles on plea bargaining reform published by the Federal Sentencing Reporter in 2019. Using qualitative analysis software, I employ inductive and deductive coding to identify the frames legal actors use in these discussions.

79. **Ayan Mohamed**
Muslim Political Participation: An Exploration of Intersecting Identities, Voting Behavior, and Political Power
Advisor: Kathryn Pearson
Sponsoring Program: Pathways
Home Institution: University of Minnesota Twin Cities
Abstract: Muslim Americans are a rapidly growing demographic with increasing political and electoral influence in the United States, with an estimated 2.5 million registered voters participating in the 2024 election. While this number represents roughly 1.44% of the national electorate, their concentration in key battleground states such as Michigan, Pennsylvania, and Georgia positions them as a potentially decisive voting bloc. However, Muslim Americans remain an understudied group in mainstream political science literature. Traditional analyses of voting behavior have historically relied on a wide array of demographic variables such as partisanship, age, race, gender, socioeconomic class, and religiosity, which have been successfully applied to other voting populations. Yet, much of the existing literature on Muslim voting behavior focuses primarily on religious affiliation, treating Muslim Americans as a monolithic group. The methodologies are largely reliant on quantitative surveys and are ill-equipped to uncover the competing racial, religious, and ideological interests that drive Muslim voting behavior, and therefore cannot explain recent shifts in Muslim voter behavior or provide insight into future electoral trends. A qualitative approach that centers lived experience and intersectionality is necessary to better understand Muslim Americans' voting behavior and the extent to which traditional predictors of vote choice differ for Muslims.

80. **Beverly Morgan**
Poa pratensis *Response to Germination Stimulants*
Advisor: Dominic Petrella
Mentor: Jillian Turbeville
Sponsoring Program: SOAR-REEU
Home Institution: Baldwin Wallace University
Abstract: Kentucky Bluegrass (*Poa pratensis*) is a cool-season turfgrass used widely on athletic fields, golf courses, and homelawns. A drawback to using Kentucky bluegrass is its slow and sporadic germination rate. Germination stimulants are frequently used to improve germination rate, but little is known on their effects on Kentucky bluegrass. One such stimulant is gibberellins, a class of plant hormones found endogenously in seeds. Smoke has also been found to be a germination stimulant as it is abundant in karrikin hormones. Kentucky bluegrass ('Tirem') seeds were imbibed in varying concentrations of liquid smoke, pure karrikin (KAR_1), gibberellin A1 (GA_1), GA_3, GA_4, or GA_7. Seeds were also imbibed in water (negative control) 0.20% KNO_3 (positive control). Following imbibition, seeds were placed on germination blotter paper in honeycomb boxes within a growth chamber (25°C day, 20°C night, 12 hr. Photoperiod, 100 µmol m^{-2} s^{-1}) to monitor germination rate. As the concentration of liquid smoke increased, the germination rate decreased. KAR_1 showed a similar effect to GA_4 and KNO_3 showed the largest germination rate. All gibberellins produced an increase in germination except for GA_1. Future experiments will examine the interaction between KNO_3 and $GA_{4/7}$ due to their positive, independent, effects on germination.

81. **Emily Morrin**
Identification of STAT5 as a Driver in Castration Resistant Prostate Cancer Using a STAT5 Tet-on Inducible System in 22Rv1-STAT5-DKO Cell Line
Advisor: Scott Dehm
Mentor: Songyan Qi
Sponsoring Program: LSSURP
Home Institution: Michigan Technological University
Abstract: Prostate cancer (PC) is the leading cancer diagnosis for men and is the second leading cause of cancer-related male deaths. Within PC, the androgen receptor (AR) acts as a main driver of cancer progression. Androgen deprivation therapy (ADT) is commonly used to combat advanced PC. However, extended ADT can result in the formation of castration resistant prostate cancer (CRPC), a lethal form of PC. In this project, we aimed to identify STAT5 as a potential pharmacological target in CRPC treatment. From previous experiments, we used CRISPR/Cas9 to knock out STAT5 and saw a decrease in the growth of CRPC cell lines. To confirm that STAT5 was responsible for this, STAT5 was then recovered to see if growth returned to normal. However, due to not returning STAT5 to endogenous levels the results could not confirm the effect on CRPC growth. We then aimed to create an inducible system using a tetracycline response element (tet-on) promoter for the controlled expression of STAT5. We report the successful creation of an inducible system in a STAT5 knock-out cell line. Preliminary observation of the cell growth assay indicates that STAT5 does in fact affect CRPC growth and can act as a potential therapeutic target.

82. **Josephine Mostek**
Borosin natural products within low-abundance cystic fibrosis microbes
Advisor: Michael Freeman
Mentor: Nisha Vishwanathan
Sponsoring Program: LSSURP
Home Institution: University of Minnesota Twin Cities
Abstract: Borosins are ribosomally synthesized and post-translationally modified peptides (RiPPs) characterized by a-N-methylation of the peptide backbone. Biosynthetic gene clusters (BGCs) that produce these borosin natural products are found in many archaea, fungi, and bacteria, including several low-abundance microbes associated with cystic fibrosis (CF). Although these BGCs are often transcriptionally silent under standard laboratory conditions, they may contribute to disease progression within the conditions of CF respiratory infections through their influence on microbial phenotypes or interactions. In this study, we aim to investigate the promoter activity of a silent borosin BGC in Burkholderia stabilis (Bst) by inserting an enhanced green fluorescent protein (eGFP) reporter gene into the native cluster using a suicide vector knock-in strategy. This work lays the foundation for future phenotypic screening of borosin activity in CF-associated microbes, with potential implications for understanding microbial contributions to CF pathophysiology.

83. **Pattarapol Muepae**

Dorsal Skin Fold Chamber Microvascular Thrombosis Model in JAK2V617F Mice

Advisor: Joan Beckman

Mentor: Julia Nguyen & Paul Krenik

Sponsoring Program: LSSURP

Home Institution: University of Minnesota Twin Cities

Abstract: Despite multiple transgenic *JAK2*$^{V617F+}$ mice being available, thrombosis-related research in myeloproliferative neoplasms (MPN) is limited by excess bleeding-related mortality observed with conventional thrombosis models. Dorsal skin fold chamber (DSFC) surgery, originally developed to assess vaso-occlusion in sickle cell disease, does not require laparotomy or other invasive surgeries. We evaluated if *JAK2*$^{V617F+}$ mice can survive DSFC assess thrombosis. We also hypothesized that *JAK2*$^{V617F+}$ mice would have increased pro-thrombotic markers. To validate our model and test our hypothesis, we implanted DSFC in 9 C57BL-6J mice and 17 heterozygous *JAK2*$^{V617F+}$ mice. Microvascular occlusion was stimulated with 0.5 µg TNF injection followed by assessment of microvascular flow for 4 hours. *JAK2*$^{V617F+}$ mice survived DSFC implantation without excess bleeding. Compared to C57BL6-J controls, *JAK2*$^{V617F+}$ mice exhibited increased microvascular occlusion. To determine thrombin generation, Thrombin-Antithrombin (TAT) complex ELISA was used along with immunofluorescent staining of lungs for thrombosis-related markers. Compared to C57BL6-J mice, homozygous *JAK2*$^{V617F+}$ mice had significantly higher TAT. C57BL6-J mice and heterozygous *JAK2*$^{V617F+}$ mice both had increased TAT after TNF. In lung histology analysis, even without TNF-a stimulation, *JAK2*$^{V617F+}$ mice have increased tissue factor, von Willebrand Factor, and platelets-fibrin(ogen) deposition on endothelium. DSFC is a valid model of microvascular thrombosis in MPN.

84. **Lukas Murdych**

Amelioration of Graft-Versus-Host Disease Through Suppression of Fatty Acid Oxidation in Murine T Cells

Advisor: Craig Byersdorfer

Sponsoring Program: CCRF

Home Institution: University of Minnesota Twin Cities

Abstract: Allogeneic bone marrow transplant is performed for a variety of indications including cancer, bone marrow failure, and primary immunodeficiency. Graft-versus-host disease (GVHD), where engrafted T lymphocytes attack host tissue, complicates 27% of histocompatible pediatric bone marrow transplants. Previous research has shown that alloreactive T cells rely on fatty acid oxidation (FAO), a process which can be suppressed through genetic deletion of carnitine palmitoyltransferase 1a (CPT1a). To evaluate the role of CPT1a in GVHD development, 25 B6xDBA2 F1 mice received a myeloablative dose of irradiation 24 hours prior to receiving an allogeneic T cell transplant from CPT1a wild-type or knockout (KO) mice on a C57BL/6 background. Post-transplant, weights were assessed twice weekly and clinical scores weekly. Mice transplanted with CPT1a KO T cells exhibited a trend towards improved survival (Mantel-Cox $p = 0.0896$) and lower clinical scores. However, the predictive value in this experiment was limited due to a marked increase in early deaths across both cohorts, results inconsistent with the typical survival of allogeneically transplanted mice in this model. Future experiments, following model optimization, will examine the anti-GVHD effectiveness of pharmacological FAO inhibitors and test for preservation of beneficial graft-versus-leukemia effects in FAO-impaired T cell transplants.

85. **An Nguyen**
Investigating the function of TLK1 kinase in R-loop regulation
Advisor: Hai Dang Nguyen
Mentor: Victor Corral
Sponsoring Program: LSSURP
Home Institution: University of Minnesota Twin Cities
Abstract: Genomic instability is a major hallmark of cancer, caused by DNA damage resulting from elevated R-loop levels. R-loops are structures composed of a RNA:DNA hybrid and a displaced single-stranded DNA. Because R-loops pose a significant threat to genome integrity, their resolution must be tightly regulated. RNaseH1 is a key enzyme that degrades the RNA moiety in RNA:DNA hybrid, but its regulation in human cells remains unclear. Preliminary results showed that Tousled-like kinase (TLK) 2 facilitates RNaseH1 phosphorylation in resolving R-loops. Given that TLK2 functions as a homodimer or heterodimer with TLK1, it is uncertain which complex mediates this phosphorylation. Therefore, I hypothesize that the TLK2-TLK2 homodimer facilitates RNaseH1 phosphorylation in R-loop regulation. To address this, we deleted the *TLK1* gene by CRISPR/Cas9 technology to eliminate the TLK1-TLK2 heterodimeric complex in human cells. After transfecting plasmids containing dual Cas9 and guide RNAs targeting TLK1 into HEK293T cells, puromycin was added to select for transfected cells. I confirmed successful *TLK1* knockout cells by using western blot. Importantly, *TLK1* deletion did not affect TLK2 protein expression. Future experiments will evaluate how TLK1-knockout cells affect RNaseH1 phosphorylation.

86. **Catherine Nguyen**
Effects of FGF2 on myonuclei in a muscle fiber during differentiation
Advisor: Linda Mcloon
Mentor: Laura Johnson & Austin Winker
Sponsoring Program: LSSURP
Home Institution: Pacific University
Abstract: Strabismus treatments frequently fail in the years after intervention, but the use of exogenous growth factors on extraocular muscles (EOM) presents a potential solution. Fibroblast growth factor 2 (FGF2) specifically has been shown to stimulate proliferation and inhibit differentiation in limb skeletal muscle satellite cells, but its effects on the EOMs, which are a unique muscle allotype, are not as well understood. In the study, PAX7 positive satellite cells isolated from mouse EOM and tibialis anterior (TA) muscles were cultured and treated with 10ng/ml FGF2, 40ng/ml FGF2, or no treatment (control), to assess FGF2's effect on the extent of myoblast fusion in vitro. FGF2 treated cells had different observed effects between EOM and TA samples. EOM control cells had greater numbers of total fused multinucleated cells than FGF2 treated cells, whereas TA control cells had fewer total fused multinucleated cells than FGF2 treated cells. The reduced number of multinucleated cells and myoblast fusion in the presence of FGF2 suggests that FGF2 affects myoblast fusion in EOM satellite cells. This is compared to no difference in the number of multinucleated cells and myoblast fusion in the TA.

87. **Chihuu Nguyen**
Association between use of financial and social support resources and self-reported financial hardship after an ovarian cancer diagnosis
Advisor: Helen Parsons
Sponsoring Program: M-ASCEND
Home Institution: University of Wisconsin–Madison
Abstract: Financial hardship is a growing challenge in cancer survivors and is associated with lower treatment adherence, worse quality of life, and higher mortality. Less is known about how financial and social support resources may lessen financial burden for ovarian cancer survivors. We surveyed ovarian cancer survivors nationwide through advocacy groups in July 2025 and examined the relationship between social and financial resource use and financial hardship (measured by the comprehensive score for financial toxicity (COST)) using Fisher's exact tests and t-tests. Among 46 respondents, 82.6% were white, 63% married/partnered, 24% had annual income <$50,000, 52.2% were employed, 4.4% were insured, and 69.6% had stage III/IV disease. 13.0% reported using financial assistance services, 6.5% used legal/insurance support service, and 39.1% engaged with social workers/patient navigators. Of the three social and financial resources, only legal/insurance support was associated with reduced self reported financial hardship (Mean COST Score (standard deviation): 32.3±2.3 in users vs. 23.3±10.5 in non-users, P=0.001). Financial and social resource usage is low among ovarian cancer survivors, but may play a role in reducing financial burden."

88. **Tammy Nguyen**
Density-Dependent Heterogeneity in Single-Cell Properties of Sickle Cell Disease
Advisor: David Wood
Mentor: Hannah Szafraniec
Sponsoring Program: McNair
Home Institution: University of Minnesota Twin Cities
Abstract: Sickle cell disease is characterized by polymerization of hemoglobin S under low oxygen, leading to red blood cell deformation and vaso-occlusion. While studies show heterogeneity in polymerization across oxygen tensions and between patients, the role of red blood cell density, a proxy for intracellular protein concentration and cell age, remains unclear. Given that hemoglobin S polymerization is concentration-dependent, density-based subpopulations are expected to show distinct polymerization profiles. In this study, red blood cell fractions were isolated using Percoll gradients and exposed to eight controlled oxygen tensions while flowing through a microfluidic device. Quantitative absorption cytometry measured single-cell oxygen saturation, mean corpuscular volume, and hemoglobin mass. Polymerized and soluble cells were quantified using a validated ResNet-50 algorithm. Preliminary results reveal significant differences in polymerized cell fraction and oxygen saturation between density groups, particularly under hypoxia, suggesting that cell density is a key contributor to polymerization heterogeneity in sickle cell disease.

89. **Godson Nkanginieme**
The Potential of & Mechanisms Behind PMA (Phorbol 12-myristate 13-acetate) for Uniform p53 Expression Dynamics and Homogenous Cell Fates in Breast Cancer
Advisor: Eric Batchelor
Mentor: Samuel Dallon
Sponsoring Program: LSSURP
Home Institution: Johns Hopkins University
Abstract: The tumor suppressor p53 and its downstream targets are crucial for cancer prevention. Previous studies have shown that Protein Kinase C (PKC) can upregulate p53, suggesting a tumor suppressive role for PKC in cells. However, recent data from our lab found that treatment of MCF-7 breast carcinoma cells with the PKC-activating compound Phorbol 12-myristate 13-acetate (PMA) actually lowered p53 levels, suggesting PKC acts in a tumor-promoting capacity through its suppression of p53. To resolve this apparent conflict, we sought to better understand the molecular mechanisms by which PMA affects the p53 pathway. We hypothesized that our observed PMA-dependent suppression of p53 was mediated by upregulation of the E3 ubiquitin ligase MDM2, a negative regulator of p53. To test this hypothesis, we used time-lapse fluorescence microscopy to track p53 and MDM2 levels simultaneously in single cells treated with PMA and the p53-stabilizer Nutlin-3. We found that PMA attenuated Nutlin-3-induced p53 accumulation. Furthermore, we observed faster accumulation, increased expression, and increased duration of expression of MDM2 with increasing exposure to PMA. Our results suggest PMA suppresses p53 activity through PKC-dependent upregulation of MDM2, and it identifies specific windows of time during which PKC inhibition might improve the efficacy of p53-stimulating cancer treatments.

90. **Sophia Nocho-Iverson**
Non-canonical atRA analogs function through CRABPI to modulate CaMKII and/or MAPK activity
Advisor: Li-Na Wei
Mentor: Liming Milbauer & Jennifer Nhieu
Sponsoring Program: LSSURP
Home Institution: University of Minnesota Twin Cities
Abstract: All-trans retinoic acid (atRA) is the active metabolite of vitamin A with functions in many biological processes and canonically acts through nuclear RA acid receptors (RAR) that regulate gene transcription. atRA is also utilized as a therapy for dermatological diseases and leukemias. However, deleterious side-effects due to off-target canonical activity limit its clinical potential. Wei Lab has proposed targeting non-canonical, RAR-independent activities to exploit its therapeutic potential while avoiding these side-effects. Non-canonical atRA activity is mediated by cellular retinoic acid binding protein 1 (CRABP1), which forms cytosolic protein complexes, "signalosomes," to modulate cell signaling. Two CRABP1 signalosomes are established: CRABP1-CaMKII and CRABP1-MAPK. I screened a library of synthetic retinoid compounds to characterize their effects on these signalosomes. Using P19 cells and western blotting, I determined compound effects on CaMKII and MAPK pathways via phosphorylation of CaMKII and ERK1/2. I determined that compounds in this library exhibited three distinct actions: selective modulation of 1) CaMKII, 2) ERK1/2 phosphorylation, or 3) both. These results provide a rational basis for designing retinoids that modulate CRABP1 signalosomes with selectivity for CaMKII, ERK1/2, or both, with potential applications in diseases linked to MAPK or CaMKII activity, such as cancer and neurodegeneration.

91. **Juan De Jesus Nogueron Hernandez**
Connection Between the Cerebellum and Morphine Addiction
Advisor: Marija Cvetanovic
Mentor: Crystal Clark
Sponsoring Program: McNair
Home Institution: University of Minnesota Twin Cities
Abstract: Opioid Use Disorders (OUDs) are of growing concern in the United States, as opioid related deaths have been increasing. Recent studies have shown a potential link between addiction and the cerebellum. Our study aims to explore this potential link between the cerebellum and addiction via the deep cerebellar nuclei (DCN), the main output from the cerebellum. We inhibited activity of DCN neurons in mice undergoing conditioned place preference (CPP) using a chemogenetic approach and expressing inhibitory designer receptor exclusively activated by designer drugs (DREADDs) in the DCN. Control mice (expressing mCherry) exhibited significant preference for the morphine chamber, this was not significant in DREADD mice which had their DCN neurons inhibited by CNO during the conditioning period.

92. **Tryg Oberg**
The Role of Supervision in Blood Pressure Monitoring Among Stroke Patients: A Comparative and Exploratory Analysis
Advisor: Emily Kringle
Sponsoring Program: Pathways
Home Institution: University of Minnesota Twin Cities
Abstract: Accurate measurement of blood pressure (BP) is important for the secondary prevention of stroke. However, many stroke survivors rely on unsupervised home BP monitoring (HBPM). This may compromise reliability due to poor adherence to standardized protocols. The study evaluates whether BP measurements vary between supervised and unsupervised conditions among stroke survivors. A subsample (n=49) from the teleABLE pilot R.C.T. completed both supervised and unsupervised BP measurements using the same validated device. Participants were -18 years old and had experienced a stroke within the past 12 months. Paired sample t-tests were used to compare mean differences between measurement approaches (α=0.05). Participants had a mean (SD) age of 62.3 years (14.3) and stroke chronicity of 5.8 months (3.3). The majority were female (52.1%) and 91.7% were white. Preliminary analyses revealed no statistically significant differences between supervised and unsupervised BP readings. The absence of significant differences between supervised and unsupervised BP readings suggests that home BP monitoring (HBPM) may be a feasible alternative to supervised assessments in stroke survivors. Although, continued emphasis on patient education and monitoring remains important to ensure accuracy and adherence.

93. **Omar Ocampo**
Enhancing Variant Detection of Oncogenes in a Patient with Rare Brain Metastatic Prostate Cancer
Advisor: Justin Hwang
Mentor: David Moline
Sponsoring Program: LSSURP
Home Institution: DePaul University
Abstract: Brain metastases derived from prostate cancer (PC) are rare and have poor outcomes. Ludwig et al., (2024) conducted a multi-omic analysis on a PC patient with two metastatic lesions in the brain. One lesion showcased neuroendocrine PC (NEPC) histology and the other located in the dural membrane, with adenocarcinoma histology. Prior DNA analysis detected unique and shared variants in several PC associated oncogenes across lesions, including TP53, PIK3R1, KMT2D. In this study, we aim to expand DNA variant detection by utilizing a variant calling tool named Strelka2, in addition to Mutect2, to confirm initial findings and potentially identify key variants specific to Mutect2. We found that the number of protein-impacting variants (i.e., missense or more severe) in PC genes increased in the primary tumor (n=27; up from 3), NEPC (n=23; up from 3) and Dura samples (n=30; up from 8). Strelka detected variants in several oncogenes for every tumor, which were not detected by Mutect2, including: FOXA1, KMT2C, RNF43, and NCOR2. Additionally, both Strelka and Mutect2 detected the same TP53 variant in each tumor. These findings highlight the benefits of using multiple variant callers to capture more variants and gain a better understanding of the genomic characteristics of tumor samples.

94.	**Nasib Omar** *Community Perceptions of Capacities and Barriers to Readiness for Equitable Research Partnerships* **Advisor:** Michele Allen **Mentor:** Angelica Koch **Sponsoring Program**: M-ASCEND **Home Institution:** University of Minnesota Twin Cities **Abstract:** This project examines how community readiness influences equitable research partnerships, centering the community's perception of what it means to be "ready" to engage in research. A targeted literature review of community-engaged research (CEnR) and community-based participatory research (CBPR) identified key indicators such as trust, power-sharing, institutional flexibility, and infrastructure. A community panel format, known as a CHAT (Community Health Authentic Talk) session, was co-facilitated by SoLaHmo, a community-driven research program, and engaged eight community members with prior research experience. Questions developed from the literature guided discussion, which emphasized lived experiences and community-defined criteria for readiness. Notes were analyzed using an inductive qualitative approach. Six key themes emerged: community voice and trust, relationship building, clarity of roles, mission alignment, cultural competence, and advocacy and empowerment. Findings reveal barriers and facilitators often overlooked in academic-driven models. Readiness was identified as a dynamic, relational process shaped by historical context, access to resources, and mutual accountability. These findings highlight the value of centering community perspectives when defining readiness. Next steps include developing and piloting a readiness assessment tool, grounded in community priorities, with community organizations and academic institutions to promote shared standards and sustainable partnerships.
95.	**Ian Palanga** *Investigating Controversy: Osteolytic Fibrosarcoma Only Sensitizes Small DRG Neurons* **Advisor:** Donald Simone **Mentor:** Viatcheslav Viatchenko-Karpinski **Sponsoring Program**: UMN Pain Consortium **Home Institution:** Macalester College **Abstract:** Bone cancer pain is driven by a combination of neuropathic and inflammatory mechanisms initiated by tumor cells, and nerve and bone damage. Simultaneously, nerve endings at tumor sites are in low-oxygen, acidic, high-calcium environments that strongly promote nociceptor sensitization. Such extreme environments may be capable of sensitizing not only primary nociceptors (pain-signaling cells) but non-nociceptive sensory neurons as well, and that crosstalk between neurons in the DRG (dorsal root ganglia) may also sensitize such cells. By measuring electrical properties of small nociceptive DRG neurons that innervate skin overlying an osteolytic fibrosarcoma tumor in the mouse paw (identified by fluorescent retrograde tracer DiI), we previously showed that they become more excitable in tumor-bearing mice with increased behavioral responses to painful stimuli on the plantar surface of the tumor-bearing paw. To test whether non-nociceptive neurons, which are distinctively larger than primary nociceptors, also experience electrophysiological changes in our model, we measured their properties using the same whole-cell patch clamping protocol, and observed no biophysical alterations between labelled or unlabeled neurons, as compared to neurons from naïve mice, suggesting that neither the tumor environment, nor crosstalk, sensitizes large DRG neurons. This reinforces small DRG neurons as drivers of peripheral nociception during bone cancer.

96.	**Amara Patel** *Community Health Workers' capacity and perspectives surrounding cancer and cancer prevention in the East African Community* **Advisor:** Ivan Wu **Mentor:** Shikha Bista **Sponsoring Program**: M-ASCEND **Home Institution:** UCLA **Abstract:** Somali and Oromo communities disproportionately face greater cancer mortality and low cancer screening rates. Low rates of screening are due, in part, to healthcare mistrust, stigma, and language barriers. Embedded within the community, Community Health Workers (CHWs) bridge the cultural gap between the healthcare system and their specific community to improve access and outcomes. Despite effectiveness, CHWs are underutilized in cancer prevention. We seek to enhance their capacity by developing a workshop tailored to the specific needs of East African communities. The overarching purpose of the parent study is to explore community and CHWs' perspectives related to cancer, and the objective of this project is to find themes that impact CHW's capacity to talk about cancer and prevention within the EA community. 4 semi-structured interviews were conducted to learn about CHW roles and training needs related to cancer prevention. An ongoing early-stage thematic analysis approach that combines deductive and inductive codes was used. Preliminary results show stigma stemming from fatalistic beliefs and fear contribute to low screening rates. Limited understanding of diagnosis proceedings and misinformation on how cancer develops also steer people away from screening. Results will inform a culturally-tailored CHW workshop prototype, guided by the community and CHW input.
97.	**Reagan Patterson** *Evaluating Differences Between European Committee On Antimicrobial Susceptibility Testing (EUCAST) and Clinical and Laboratory Standards Institute (CLSI) Zone Diameters for Nitrofurantoin (NIT) Disk Diffusion (DD) against E. coli* **Advisor:** Betsy Hirsch **Mentors:** Lindsey Collins & Tiffany Chang **Sponsoring Program**: SCoPE **Home Institution:** Radford University **Abstract:** NIT is a first-line agent for UTIs. DD remains widely used as a cost-effective method for NIT AST. However, regional differences in interpretive criteria - set by CLSI in the U.S. and EUCAST in Europe - complicate clinical decision-making due to differing disk concentrations and susceptibility criteria breakpoints. We evaluated agreement of DD methods against automated AST results via Vitek. DD was performed on 53 Escherichia coli (EC) clinical isolates from a single U.S. academic hospital, using NIT disk masses of 100 ug and 300 ug. Following overnight incubation, zone diameters were measured according to CLSI and EUCAST guidelines; Zone diameter measurements were compared with corresponding automated AST testing via Vitek to determine which standard has a higher level of comparability. Under CLSI guidelines, the categorical agreement with automated AST values was 96.2% with one minor error and one major error, in contrast, under EUCAST guidelines, the categorical agreement was 94.3 % with 2 very major errors. Comparison of CLSI against the automated AST values showed to be more accurate in contrast to EUCAST readings. These findings may support efforts toward standardization, enabling clinicians to make improved dosing decisions and ultimately enhancing patient outcomes.

98. **Emma Pithan**
Characterization of the Cell Surface Proteome of Malignant Peripheral Nerve Sheath Tumors
Advisor: David Largaespada
Mentor: Christopher Stehn
Sponsoring Program: M-ASCEND
Home Institution: College of Saint Benedict
Abstract: Malignant peripheral nerve sheath tumors (MPNST) are a rare and aggressive soft tissue sarcoma with a poor prognosis due to high rates of recurrence and mortality. Diagnosis is challenging, as MPNST lacks specific biomarkers to differentiate it from benign soft tissue tumors, histologically resembles other sarcomas, and poorly responds to chemotherapy and radiation. Risk factors for MPNST include neurofibromatosis type 1 (NF1) and prior radiation exposure, though it can occur sporadically. MPNST patients with NF1 often have a microdeletion of the NF1 gene as well as the SUZ12 or EED genes found in the Polycomb Repressor Complex 2 (PRC2). This leads to the loss of the complex's function and typically precedes malignant transformation. Defining the MPNST surface proteome using flow cytometry may reveal biomarkers that could drive the synthesis of more effective and precise treatments for MPNST. Flow cytometry enables this by using antibodies conjugated to a fluorescent dye to detect specific proteins commonly found on cancer cells, such as EGFR or HER2. Flow cytometry confirmed the presence of surface proteins on each tumor-derived MPNST cell line, suggesting that these proteins may be potential therapeutic targets.

99. **Matthew Plucker**
A Time-Capsule of Turmoil; A Phenomenological Study of Future Orientation of Gender and Sexual Minority Young Adults During the Early Days of the Trump Administration
Advisor: Michael Curtis
Sponsoring Program: McNair
Home Institution: University of Minnesota Twin Cities
Abstract: Sexual and gender minority young adults (SGM-YAs, aged 18-25) have worse outcomes compared to peers. Emerging evidence suggests that the current political climate has exacerbated these pre-existing disparities by cultivating unprecedented conditions and great concern among SGM-YAs. These socio-political factors may greatly impact the degree to which SGM-YAs plan, work, and aspire towards their future goals, also known as future orientation (FO). FO is associated with several positive outcomes including higher academic performance, lower impulsivity, and lower suicidal ideation. Few studies have been dedicated to examining how the political climate within which youth exist influences their FO. Fewer studies have examined FO among SGM-YAs, representing a critical research gap. To address this gap, we are conducting a qualitative interview study to understand how the current socio-political climate influences FO among SGM-YAs. We are currently conducting semi-structured qualitative interviews with a diverse sample of SGM-YAs (n=40: 10 Black, 10 Latinx, 10 White, & 10 Asian). Transcripts are coded utilizing a descriptive, phenomenological approach. While preliminary evidence suggests that the current socio-political climate has evidenced negative outcomes related to our participants' FO, community and other protective factors seem to mitigate these effects. Results are still pending.

100. **Kelly Pum**
Improving After-School Program Quality: An Observational Study
Advisor: Katherine Hendel
Sponsoring Program: UROP/URS
Home Institution: University of Minnesota Twin Cities
Abstract: After-school programs have a critical role in improving students' feelings of connectedness to peers and school, which is a protective factor for mental health. However, high quality programs with a focus on the social-emotional climate are necessary for students to experience benefits. We partnered with the St. Paul Public Schools Flipside middle school program and conducted observations of after-school program quality in two schools. We observed each of the 55 classes on two random days. We rated classes on a scale of 1-3 using a 12-item observation checklist adapted from the Youth Program Quality Assessment and provided qualitative evidence for ratings. We calculated program quality as a summation and averaged scores over observation days. We computed descriptive statistics and deductively coded qualitative observations. The mean program quality score was 28.84 ± 3.36 with a range of 19.5-32.5 (possible range 12-33). Lower quality scores tended to be driven by less involved staff. Qualitative data provided examples of high and low quality scores to help teachers improve the classes. The quality of after-school programs is impacted by the level of staff involvement, highlighting the importance of appropriate staff training in achieving high quality programs.

101. **Alondra Quiñones Santiago**
Sel1L-Hrd1 ER-Associated Degradation Complex as a Novel Therapeutic Target in Leukemia
Advisor: Peter Gordon
Mentor: Madison Gohman
Sponsoring Program: LSSURP
Home Institution: Interamerican University of Puerto Rico–San Germán
Abstract: Acute lymphoblastic leukemia (ALL) is the most common malignancy in pediatric oncology. While survival rates have improved dramatically over the past several decades, more effective and less toxic therapies are still needed. In healthy cells, protein homeostasis is tightly regulated, and disruptions in protein production or degradation can contribute to oncogenesis. The Endoplasmic Reticulum-Associated Degradation (ERAD) pathway is a key quality control mechanism responsible for identifying and eliminating misfolded or unfolded proteins. Within this pathway, the Sel1L-HRD1 complex facilitates the ubiquitination and proteasomal degradation of these aberrant proteins. Dysregulation of the Sel1L-HRD1 complex has been implicated in supporting cancer growth, suggesting it may serve as a novel therapeutic target. CP26 is a small-molecule inhibitor that targets the HRD1 complex, inhibits ERAD, and induces ER stress. To assess the cytotoxic potential of CP26 in ALL, we generated CP26 dose-response curves for multiple B-cell and T-cell ALL cell lines in vitro. Cellular ATP content was quantified using the CellTiter-Glo Cell Viability Assay and a luminometer to calculate the half-maximal inhibitory concentration (IC50) values for CP26. Our findings demonstrate that the observed ALL cell lines exhibit sensitivity to CP26, supporting further investigation of ERAD inhibition as a therapeutic strategy in ALL.

102. **Isabella Ramirez**
Characterizing Neuronal Activity in the Dorsal Raphe Nucleus during Pain Chronification with Alcohol Use
Advisor: Lucy Vulchanova
Mentor: Rachel Schorn
Sponsoring Program: LSSURP
Home Institution: Scripps College
Abstract: Alcohol use disorder (AUD) is the U.S.'s predominant substance use disorder, having high comorbidity with chronic pain (CP). Neural circuitry overlap of AUD and CP underpins their clinical comorbidity. Pain signaling modulation is mediated in the brainstem, which projects onto reward-processing regions implicated in AUD. Published works support the hypotheses that the dorsal raphe nucleus (DRN) of the brainstem has altered neuronal activity under CAE and that CP is mediated by an excitatory pathway from the DRN, highlighting the bidirectional relationship between AUD and CP. This study uses fluorescent in situ hybridization (ISH) to identify neuron types active in the DRN following CAE and CP. Male and female mice underwent chronic voluntary-intermittent alcohol or water treatment until sacrifice at 9 weeks, with a sham or sciatic nerve crush injury at week 6. Weekly von Frey testing measured tactile sensitivity, showing persistent pain phenotypes in alcohol-crush mice. Fresh frozen brain tissue was collected and active neurons were labeled by cFos expression. We examined for colocalization of vesicular glutamate and GABA transporters. Protocol optimization improved slide-tissue adherence and autofluorescence. Images were collected using a Keyence epifluorescent microscope and analyzed using FIJI-ImageJ, with ongoing ISH quantitative analysis.

103. **Sahith Reddy**
Deletion of Microglial Mutant ATXN1 Downregulates Magenta Module Genes in Mouse Model of SCA1
Advisor: Marija Cvetanovic
Mentor: Adem Selimovic
Sponsoring Program: LSSURP
Home Institution: Indiana University
Abstract: Spinocerebellar Ataxia Type 1 (SCA1) is an inherited neurodegenerative disorder caused by a CAG trinucleotide repeat expansion in the coding region of the ATXN1 gene. This mutation will produce a toxic polyglutamine-expanded ATXN1 protein, leading to progressive motor dysfunction, slurred speech, cognitive decline, and premature death. Microglia, the resident immune cells of the central nervous system, play a key role in maintaining brain homeostasis. However, chronic overactivation of microglia can exacerbate neurodegeneration. Previous studies have shown that selective removal of the mutant ATXN1 (mATXN1) gene from microglia alleviates disease symptoms by reducing microglial density and improving both motor coordination and spatial learning. The objective of this study was to identify gene networks most impacted by microglial mATXN1 deletion. We utilized Weighted Gene Co-expression Network Analysis (WGCNA) to identify co-regulated gene modules, followed by quantitative PCR (qPCR) to validate expression changes. Our findings indicate that genes within the Magenta module (Calbindin, Homer3, and RGS8) are significantly downregulated in response to mATXN1 deletion. Decrease in the expression of Magenta genes is used as a marker for Purkinje cell degeneration. As a result, a further decrease in expression of Magenta genes upon the deletion of mATXN1 indicates a worse Purkinje cell phenotype.

104. **Geanessa Reglos**
Exploring the Association Between Area Deprivation and Outcomes in Vulvar Cancer Treated With Chemoradiation
Advisor: Deanna Teoh
Sponsoring Program: M-ASCEND
Home Institution: University of Wisconsin–Madison
Abstract: The Area Deprivation Index (ADI) is a robust measurement of socioeconomic disparities. Higher scores reflect greater neighborhood disadvantage. This study assessed whether there is an association between ADI and overall survival for patients with vulvar cancer treated with primary chemoradiation therapy. This retrospective cohort study included patients who received primary chemoradiation therapy for locally advanced vulvar cancer. Demographics and cancer data were abstracted from medical records. ADI was calculated and dichotomized as <50 or 50+. Survival was analyzed using Kaplan Meier curves and log-rank tests. Fifty four patients met inclusion criteria. The median age at diagnosis was 64.5 years, 91% identified as White, and median ADI was 49.5. No association was found between ADI and disease recurrence (p=0.78). After adjusting for age (HR=0.61, 95% CI: 0.26-1.40, p=0.24), ADI was not significantly associated with overall survival. In this cohort, ADI was not associated with overall survival for patients with vulvar cancer treated with primary chemoradiation therapy. These data are part of an ongoing multi-institutional study to determine whether the lack of association between ADI and survival for locally advanced vulvar cancer is real or due to our limited sample size.

105. **Lydia Richwine**
Generating a Cell Line to Dissect the Regulatory Effects of the CCR4-NOT Transcription Complex Subunit 1
Advisor: Aaron Goldstrohm
Mentors: Katherine McKenney & Carmen Hernandes-Perez
Sponsoring Program: UROP/URS
Home Institution: University of Minnesota Twin Cities
Abstract: The CCR4-NOT (CNOT) deadenylase complex regulates the expression of thousands of genes (Raisch & Valkov, 2022). The protein CNOT1 acts as a scaffold for the rest of the CNOT complex and has vital roles in RNA decay (Dowdle & Lykke-Andersen, 2025; Ito et al., 2011). This experiment generated a cell line that will be used to investigate if human CNOT1 has distinct functions in RNA decay and poly-A metabolism. For this experiment the donor plasmid was cloned using Gibson Assembly and transfected into the HCT116 AtAFB2 cell line along with two different sgRNAs to undergo homology directed repair. Cells with successful DNA uptake were selected for with antibiotic and western blots indicated the polyclonal line incorporated the AID tag. Monoclonal cell lines will be generated with a cell raft machine and PCR will be used to select a homozygous line. Future experiments will use nanopore sequencing to measure poly-A tail lengths and RNA-seq to determine RNA levels in this cell line. Further research will degron tag and analyze the other CNOT subunits.

106. **Jean Rodriguez Garcia**
LAT1 Inhibition Impairs Metabolism and Proliferation in Colorectal Cancer
Advisor: Subree Subramanian
Mentors: Travis Gates & Luis Ramirez
Sponsoring Program: LSSURP
Home Institution: Florida International University
Abstract: There is a critical unmet need to provide novel therapies for Colorectal Cancer (CRC) patients resistant to current treatment options. Immune checkpoint inhibitor (ICI) therapy is a novel modality for CRC treatment; however, most CRC patients (85%) have microsatellite stable (MSS) CRC, which makes them ineligible for current ICI treatments. Our lab has demonstrated that large amino acid transporter 1 (LAT1; SLC7A5) expression is enriched in CRC tumors compared to matched adjacent normal tissues. Furthermore, JPH203, a LAT1 inhibitor, was determined to reduce amino acid uptake, suppress cellular proliferation, slow tumor growth, and promote immunogenic tumor microenvironment formation in syngeneic in vivo tumor models. We wanted to functionally validate these observations by conducting knockdowns of LAT1 expression using a lentiviral vector to assess the role of LAT1 in CRC. Using LAT1 knockdown cell lines (shLAT1), we performed experiments to determine cellular proliferation, amino acid uptake, and metabolic energy phenotype in comparison to scramble control and wild-type cells. We found that shLAT1 significantly decreased cellular proliferation, reduced glycolytic energy potential, and reduced cellular amino acid uptake compared to scramble control and wild type CRC cells. Future studies will assess how shLAT1 influences immune cell infiltrates in orthotopic in vivo animal models.

107. **Nikita Roldan-Levchenko**
Optical Gain Through Metallic Electro-Optical Effects
Advisor: Tony Low
Mentor: Duarte Sousa
Sponsoring Program: Pathways
Home Institution: University of MInnesota Twin Cities
Abstract: Optical gain is critical in today's technology, as it is the process which allows for lasers in manufacturing and transistors in computing. Optical gain is most often achieved when excited electrons emit light, a process known as stimulated emission. In this theoretical study, we find a resonant transverse-electric (TE) mode in biased two-dimensional metallic systems which leads to optical gain in the absence of stimulated emission. We do so by first modeling the system's optical response using Boltzmann non-equilibrium transport theory and then simulating the scattering problem using a scattered-wave formalism. Assuming that the system may possess a Berry curvature dipole (BCD) and a non-zero Magnetoelectric tensor (MET), we find that the optical gain has a non-trivial dependence on the applied bias direction, which allows for probing the TE mode. After analyzing the system with one of each of the effects, we find that the resonant TE mode is only accessible when both effects are present. Further studies are necessary to find materials with a suitably large BCD and MET, in order to realize the predictions within this study. This study paves the way for developing novel optical gain mechanisms.

108. **Luis Rosete Gallardo**
Cardiovascular-Kidney-Metabolic Syndrome
Advisor: Amy Hauck
Sponsoring Program: DRP
Home Institution: University of Minnesota Twin Cities
Abstract: The human body exhibits precise metabolic rhythms that allow us to meet and balance changing energetic needs throughout the day. These metabolic rhythms are driven in large part by gene expression patterns and are heavily impacted by circadian rhythms as well as feeding and fasting, allowing the body to efficiently express and use metabolic enzymes when we need them. However, the complex interplay between tissue-specific and systemic metabolic rhythms remains unclear. To address this question, we measured metabolic gene expression in mouse skeletal muscle in fed and fasted mice over a 24-hour cycle, and compared these expression patterns with other known key metabolic tissues such as liver tissue. A fast was started in mice at ZT0 (7AM), and then samples were collected every 4 hours from the fasting group and an ad-libitum fed control group. As expected, glucose and lipid metabolism genes displayed diurnal expression patterns throughout the day in both the liver and skeletal muscle. Furthermore, preliminary results show elevations of fatty acid oxidation markers in both tissues after 8 hours after fasting. These studies will help understand the role skeletal muscle and liver play in coordinating the metabolic adaptation to feeding and fasting.

109.	**Tristen Rothrum** *Beyond the Superficial Cortex: Directed Protein Evolution of Current FRET-Opsin GEVIs for Deep Tissue Multipopulation Voltage Imaging* **Advisor:** Ganesh Vasan **Mentor:** Samuel Morris **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Genetically Encoded Voltage Indicators (GEVIs) have recently emerged as a superior alternative to Genetically Encoded Calcium Indicators (GECIs) for in vivo population imaging of neuronal activity. GEVIs enable cell-type-specific detection of action potentials, subthreshold voltage fluctuations, and hyperpolarization with millisecond-scale temporal resolution. However, current GEVIs are limited in their ability to image beyond the superficial layers of the neocortex due to suboptimal performance in deep tissue. To address this limitation, we implemented a semi-automated, high-throughput mutagenesis pipeline for the directed evolution of fluorescence resonance energy transfer (FRET)-opsin indicators, Ace and its reverse polarity variant, pAce, to enhance fluorescence response in spiking HEK cells. This platform evaluates GEVI variants for brightness, voltage sensitivity, and fluorescent kinetics. In parallel, we applied point mutation and truncation mutagenesis to Bacteriorhodopsin (BR), a red-shifted opsin, for pairing with red and near-infrared fluorescent proteins (RFPs and NIRFPs). These red and NIR-shifted GEVIs (emission: 620–900 nm) reduce tissue autofluorescence, absorption by hemoglobin and water, and scattering, thereby improving imaging depth and signal fidelity. Through the directed evolution of Ace, pAce, and BR-based constructs, this work aims to develop GEVIs with enhanced FRET kinetics and optimized performance for deep tissue voltage imaging beyond the superficial cortex.
110.	**Yaretzi Rubio Martinez** *Characterizing Serotonin receptor expression in the Cerebellum in health and disease models* **Advisor:** Martha Streng **Mentor:** Christine Chau **Sponsoring Program**: LSSURP **Home Institution:** San Diego City College **Abstract:** The cerebellum is a brain region critical for motor coordination, balance and posture. Serotonin (5-HT) is a neuromodulatory neurotransmitter, and contributes the third largest source of afferent input into the cerebellum. Its functional roles and receptor distribution remain poorly understood, particularly in the context of neurodegenerative diseases. Spinocerebellar Ataxia Type 1 (SCA1) is a hereditary disease characterized by lack of coordination, tremors, deterioration of fine motor skills and balance difficulties, leading to progressive degeneration of cerebellar Purkinje cells. Preliminary RNA sequencing data of a SCA1 mouse model *f-ATXN1*$^{175Q/2Q}$ shows downregulation of *htr1b*, the gene encoding the 5HT1B receptor, suggesting disrupted serotonergic signaling as the disease progresses. However, the spatial localization and protein-level expression of 5HT1B in the cerebellum remain uncharacterized. Our work is optimizing immunohistochemistry (IHC) protocol to detect protein level of the 5HT1B receptor expression in healthy and SCA1 cerebellar tissue of a new, humanized SCA1 mouse model, *f-ATXN1*$^{146Q/2Q}$. This work lays the foundation for assessing how serotonergic modulation can be altered in cerebellar degeneration and may help identify new therapeutic targets. Future directions include pairing our IHC data with wide-field cerebellar serotonin imaging in awake behaving animals to explore the relationship between serotonin signaling and behavior.

111. **Maren Rusk**
Aggregating Asian Americans Masks Subgroup Variation in Adolescent Psychopathology
Advisor: Mark Fiecas
Mentor: Ellery Island & Kirsten McKone
Sponsoring Program: Equitable Data Science
Home Institution: Pomona College
Co-presenter: Sarah Thomson, Macalester College
Abstract: Using the monolithic "Asian American" (i.e., Asian American, Native Hawaiian, Pacific Islander) race label overlooks significant disparities between specific Asian ethnic and sociodemographic groups. Collecting and reporting disaggregated ethnoracial data is essential for identifying, prioritizing, and understanding the experiences of individuals at risk for various psychopathologies. Using data from the Adolescent Brain Cognitive Development (ABCD) study, we investigated the roles of ethnic identity and intersectional sociocultural factors that may influence Asian American experiences, and how these identities contribute to the prevalence of psychopathologies among Asian American adolescents. We disaggregated Asian American participants by ethnicity and latent classes based on socioeconomic and cultural indicators. Then, we examined psychopathology outcomes of the subgroups using mixed linear and logistic regression models. Finally, we investigated the utility of incorporating disaggregated Asian subgroups into race-based mixed models instead of typical aggregated models. The disaggregated models reveal that different Asian American subgroups do not follow the same pattern as a monolithic Asian American group when compared with other racial identities, across all examined psychopathology measures. For this reason, we conclude that disaggregating Asian Americans in race-based models is essential to accurately assess psychopathology risks for vulnerable subpopulations that may be overlooked by aggregated analyses.

112. **Celine Sackih**
Determining the Genes Necessary for Gelatinase Activity in Enterococcus faecalis
Advisor: Julia Willett
Mentor: Ruth Isenberg
Sponsoring Program: McNair
Home Institution: University of Minnesota Twin Cities
Abstract: *Enterococcus faecalis* is a bacterium that causes many different types of infections in humans, including endocarditis and catheter-associated urinary tract infections. The extracellular protease GelE is a significant virulence factor of *E. faecalis*. Its primary function is to degrade extracellular peptides and proteins. While the function of GelE for virulence and biofilm formation has been well studied, there is much to be understood about the genes that contribute to its regulation and activity. Therefore, the primary aim of this project is to determine the genes responsible for gelatinase expression and activity in *E. faecalis*. I am screening an *E. faecalis* transposon mutant library to determine mutants that do not degrade gelatin. So far, I have identified 44 potential mutants that are required for gelatinase activity. The mutated genes encode peptidases, response regulators, and cold shock proteins. Identifying the genetic factors that influence GelE expression and activity will give us a better understanding of *E. faecalis* virulence and provide potential pathways in treating enterococcal infections more effectively.

113. **Yukti Sah**
Assessing Nephrectomy as a Tool for Identifying Kidney-Innervating Sensory Neurons
Advisor: Lucy Vulchanova
Sponsoring Program: UROP/URS
Home Institution: University of Minnesota Twin Cities
Abstract: Renal function is essential in cardiovascular health and relies on renal innervation, where sensory neurons transmit kidney-derived signals to the central nervous system. This neural feedback helps regulate sympathetic activity in the human body and maintain homeostasis. While retrograde tracing is a common method for identifying neuronal projections to/from a target, current observations of tracing variability within the kidney prompt exploration of alternatives such as nephrectomy-induced ATF3 expression as a marker of neuronal injury. C57BL/6 wild-type mice were injected with wheat germ agglutinin tracer (WGA) into the kidney. Six days later, unilateral nephrectomy of the injected kidney was performed to induce neuronal injury by axotomy of the renal nerves, followed by the harvest of dorsal root (DRG) and nodose ganglia one day post-surgery. Tissue was sectioned and stained for ATF3, followed by epifluorescence imaging and colocalization analysis of WGA and ATF3. Initial imaging confirmed successful WGA tracer uptake in kidney-innervating neurons in the DRG and nodose ganglia. Immunohistochemistry revealed colocalization of WGA and ATF3, indicating neuronal injury in the traced population. These findings demonstrate that nephrectomy reliably induces ATF3 expression in kidney-innervating neurons and colocalizes with WGA after intrarenal injection.

114. **Asia Said**
Monitoring Parasitoid Populations in Lonicera *Across Urban and Rural Landscapes*
Advisor: Mary Rogers
Mentor: Jay Delacy
Sponsoring Program: SOAR-REEU
Home Institution: St. Olaf College
Abstract: *Drosophila suzukii*, or spotted-wing drosophila (SWD), is an invasive fly distinguished by its serrated ovipositor used by females to lay eggs directly into ripe or ripening fruit. SWD prefers berries and stone fruit but can also survive on nearby non-crop plants such as *Lonicera spp.* (honeysuckle). This alternative host provides resources for the pest when fruit crop hosts are not present. Lonicera spp. plants fruit sooner than many other hosts, making them favorable. To manage this pest, researchers explored its native habitat in Southeast Asia and identified several parasitoid wasps. One of them, *G. kimorum*, is a specialist that attacks SWD and was recently approved for biological control releases. Simultaneously, a generalist parasitoid, *L. japonica*, was detected in the U.S. This study aims to identify and investigate parasitoid populations in *Lonicera* spp. fruit across rural and urban areas to determine the relative efficacy of parasitism for biological control to suppress SWD populations.We conducted this research by collecting samples weekly from six sites,three urban campus sites and three rural. At each site, we collected thirty fruits from a single branch. Samples were incubated to allow parasitoid emergence, and PCR analysis was used to accurately identify species.

115. **Elisha Sanchez**
Looped In: How Modifying Flexible Loop 3 Changes APOBEC3 Enzyme Activity and Structure
Advisor: Hideki Aihara
Mentor: Patricia Hernandez
Sponsoring Program: Independent Research
Home Institution: University of Minnesota Twin Cities
Abstract: APOBEC3 is a family of proteins that act as DNA cytidine deaminases, these enzymes can change specific cytosine bases C in DNA or RNA into Uracil and this mutation activity can block viral replication or trigger the destruction of the virus's DNA. We investigated the activity of "miniloop 3" variants of A3A and A3B that are more readily crystallized than the wild-type proteins due to changes in the flexible loop 3 region. We compared the activities of 4 A3B variants including two miniloop 3 constructs by the RADD assay, which measures cytidine to uracil conversion in a DNA substrate. From the RADD assay we observed that the wild-type (WT) A3A showed the highest deaminase activity compared to all other constructs tested, and A3B WT had higher activity than its miniloop 3 mutants, showing the trend that miniloop alterations reduce enzymatic function which is consistent across both fluorescence and gel-based readouts. The loop 3 region is important for normal APOBEC3 enzyme activity. However, the A3A and A3B miniloop 3 variants still show deaminase activity, making them useful for studying enzyme structure and testing potential inhibitors. Learning how these mutations affect function could also help in developing treatments for diseases like cancer.

116. **Selena Savatdy**
Motivational Impacts of Midbrain Acetylcholine Release
Advisor: Kurt Fraser
Mentor: Serena Miller
Sponsoring Program: McNair
Home Institution: University of Minnesota Twin Cities
Abstract: Motivation involves complex neural circuits, especially within the midbrain and striatum, where neurotransmitters play key roles in shaping reward-driven behavior. Recent findings suggest that acetylcholine (ACh) release in the ventral tegmental area (VTA) is a critical modulator of reward-seeking. This study investigates how manipulating ACh levels in the VTA influences motivation toward natural rewards. To explore this, we employed behavioral paradigms including reward consumption, Pavlovian conditioned reward-seeking, contextual renewal, and sensory-specific satiety. Pharmacological manipulations targeted cholinergic activity in the VTA. Twenty-three Long Evans rats (11 male, 12 female) were surgically implanted with cannulae for direct VTA drug delivery. Rats received infusions of saline (control), mecamylamine (nicotinic receptor antagonist), physostigmine (acetylcholinesterase inhibitor), or scopolamine (muscarinic receptor antagonist) prior to testing. These treatments were used to isolate the contributions of specific cholinergic receptors to motivation. We hypothesize that enhancing ACh tone via physostigmine will increase reward-seeking and consumption, while blocking ACh signaling with scopolamine or mecamylamine will reduce these behaviors. This research addresses a gap in understanding how cholinergic signaling in the VTA contributes to motivation and its potential interaction with dopaminergic pathways in regulating reward-related behaviors.

117.	**Bella Sciara** *Regulation of the Bcl-2 Protein Noxa in Stimulated Human T-cells* **Advisor:** Ameeta Kelekar **Mentor:** Tingyuan Yang **Sponsoring Program**: LSSURP **Home Institution:** University of Wisconsin–Madison **Abstract:** The human Bcl-2 protein and canonical death-promoter, Noxa, is transcriptionally induced in epithelial cells and solid tumors following cell stress but constitutively expressed in hematological cancers, where it plays pro-apoptotic and pro-survival roles. Noxa is also induced in stimulated CD8+ T-cells and highly expressed during expansion and contraction phases of the immune response. The lab previously showed that, in T-ALL cells, Noxa's pro-apoptotic function is inhibited by phosphorylation. However, little is known about its posttranslational regulation in normal T-cells. We hypothesized that, in stimulated, proliferating T-cells, Noxa resides as a phospho-protein in the mitochondria, promoting growth metabolism but, preceding the contraction phase, moves into the cytosol where it is dephosphorylated and promotes apoptosis. To test this hypothesis, we monitored donor T-cells by flow cytometry post-stimulation and generated cell extracts at key timepoints for Mitochondrial/Cytosolic Fractionation and Western Blot analysis. Our data revealed a small mobility shift in Noxa between 2 and 4 days post-stimulation, indicating dephosphorylation. This shift corresponded with a decrease in pNoxa and an increase in the apoptosis marker cleaved-caspase3. Noxa appeared to be largely restricted to the mitochondria during the immune response. Improved understanding of Noxa regulation in human T-cells could provide strategies for advancing current immunotherapies.
118.	**Nomar Serrano** *The Role of Midbrain Acetylcholine Release in Aversion* **Advisor:** Kurt Fraser **Sponsoring Program**: LSSURP **Home Institution:** Albizu University **Abstract:** This project focuses on the role of midbrain acetylcholine release in aversive learning and fear expression, focusing on its interaction with dopaminergic neurons in the ventral tegmental area (VTA). While acetylcholine is commonly associated with memory processes, it also modulates dopamine release in regions like the striatum and VTA, influencing both reward and aversion. Recent findings suggest that dopamine neurons in the VTA respond not only to reward-predictive cues but also to aversive stimuli, challenging traditional views of dopamine function. Using a rodent model, this study investigates how intra-VTA manipulation of acetylcholine receptors affects both the acquisition and expression of conditioned fear. Rats receive infusions of receptor-specific drugs (scopolamine, mecamylamine, physostigmine, or saline) prior to fear conditioning and cue discrimination tasks. Fear learning is measured through behavioral responses to conditioned cues and shock contexts, while fear expression is evaluated via a nose-poke task under varying cue conditions predicting danger, uncertainty, or safety. This research aims to identify receptor-specific pathways through which acetylcholine influences dopaminergic activity during aversive learning, providing insights into the neurochemical basis of fear processing and its relevance for anxiety-related disorders.
119.	**Jeriel Sevilla** *Intermittent Fasting Alleviates Pulmonary Vascular Disease Severity in a Rat Model of Pulmonary Hypertension due to Lung Disease* **Advisor:** Sasha Prisco **Mentor:** Benjamin Kremer **Sponsoring Program**: LSSURP **Home Institution:** Hartnell College **Abstract:** Pulmonary hypertension (PH) due to lung disease is the second most common type of PH with a median survival of 2.5-3 years and has limited therapeutic options. As we previously demonstrated that intermittent fasting (IF) prolongs survival in another category of PH, pulmonary arterial hypertension, this study aims to investigate whether IF alters PH severity and/or right ventricular (RV) function in PH due to lung disease. Male Sprague-Dawley rats were randomly assigned to Control, Bleomycin-monocrotaline (MCT), and Bleomycin-MCT-IF groups. Rats received bleomycin (2.5 mg/kg) or PBS (1 mL/kg) via intratracheal instillation on days 0, 3, and 6. On day 14, rats were administered a subcutaneous injection of MCT (60 mg/kg) or PBS. The day after MCT injection, Bleomycin-MCT-IF rats were fasted every other day until endpoint analysis on day 38. Echocardiography and invasive pressure-volume loops assessed PH severity and RV function. Lung and RV tissues were evaluated histologically. IF reduced PH disease severity and augmented RV function without altering pulmonary fibrosis. IF alleviated PH and enhanced RV function in the Bleomycin-MCT rat model. Future studies will delineate the mechanisms by which IF mitigates PH due to lung disease.

120. **Quinn Shink**
Real-world treatment patterns and health outcomes in patients with pancreatic adenocarcinoma
Advisor: David Stenehjem
Mentor: Pegah Farrokhi
Sponsoring Program: SCoPE
Home Institution: University of Minnesota Duluth
Abstract: Pancreatic cancer is the third leading cause of cancer deaths in the United States, with a 5-year survival rate of ~3% in the metastatic setting. Real-world treatment patterns and factors driving treatment selection remain poorly understood. This retrospective study utilized electronic health record data from the nationwide Flatiron Enhanced Datamart. Adult patients diagnosed with metastatic pancreatic adenocarcinoma between January 2019 and May 2024 were included. Overall, 9,439 patients were included. Treatment patterns showed 32.5% received Gemcitabine-based regimens, 32.8% received Fluorouracil-based regimens, 1.2% received other treatments, and 33.6% received no treatment within 180 days. FOLFIRINOX (24.1%) and Gem-NabP (27.5%) were the most common treatments.Patients receiving Gem-NabP were significantly older than those receiving FOLFIRINOX (70.4 vs. 64.8 years; $p<0.001$). Most FOLFIRINOX patients had better ECOG scores of 0/1 compared to Gem-NabP patients (91% vs. 81%; $p<0.001$). More FOLFIRINOX patients had de novo metastatic diagnosis compared to Gem-NabP (86% vs. 67%; $p<0.001$). More Medicaid patients received Gem-NabP than FOLFIRINOX (40% vs. 29%; $p<0.001$). This analysis provides insights into treatment patterns and patient characteristics influencing therapy selection, informing strategies to optimize clinical outcomes.

121. **Alyson Sprague**
Comparison of Extremotolerant mRNAs for Protecting Human Tissues From Radiation Damage
Advisor: Ameya Kirtane
Mentors: Chi-Wei Huang & Nelish Ambhore
Sponsoring Program: SCoPE
Home Institution: Viterbo University
Abstract: Nearly all head-and-neck patients undergoing radiation therapy experience oral mucositis, which is a result of nonspecific damage to tumor-adjacent healthy tissue. Radiation kills healthy cells by causing damage to their DNA. Extremotolerant organisms, such as tardigrades, express unique proteins that preserve DNA integrity under harsh conditions, including radiation exposure. We aimed to evaluate the radioprotective potential of various mRNAs encoding extremotolerant proteins in human oral epithelial cells. We used lipid nanoparticles (LNPs) for the intracellular delivery of mRNAs. An optimal LNP composition was identified by screening a panel of formulations in human oral epithelial cells. Our lead LNPs yielded significantly higher mRNA delivery compared to a commercially used LNP formulation, while causing minimal toxicity. Using in vitro transcription, candidate mRNAs were synthesized and encapsulated into the lead LNP. Indeed, lead LNP-mediated delivery of the mRNAs resulted in the expression of extremotolerant proteins in human cells, and this expression was significantly greater than that obtained with the commercial formulation. Future work will involve comparing the radioprotective efficacy of various extremotolerant mRNAs and their combinations in vitro using different cell culture models and in vivo in mice.

122. **Layla Stenson**
Erosion Mats: Capturing Soil and Nutrient Movement in Perennial, Cover Crop, and Conventional Systems
Advisor: Anna Cates & Jessica Gutknecht
Mentors: Kat LaBine & Leah Hallett
Sponsoring Program: SOAR-REEU
Home Institution: Hamline University
Abstract: Erosion of nutrient-rich topsoil across cropping systems poses a problem for soil health and water quality. Measuring runoff, however, is challenging due to the cost and complexity of field monitoring equipment. In this study, we tested a high-throughput method using erosion mats to assess soil and nutrient loss under different cropping systems: perennial, cover crop, and conventional. The mats, 6 x 6" fabric squares pinned to the soil, were deployed before and during the early planting season to align with peak erosion risk from spring rainfall. Mats were deployed at three sites (one at Farm at the Arb, MN, and two in Redwood Falls, MN) for the 2024 and 2025 planting seasons. In Year 2, an ion-exchange resin packet was added to the Redwood Falls sites' mats to capture nitrate (NO_3^-) from surface runoff. While no significant difference was found between sites, concentrations did differ significantly between deployments. Soil movement was quantified by the mass of soil collected from mats after deployment. Movement was greater in conventional systems, but there was no significant difference in the collected soil's C:N ratios across cropping systems. Sediment from mats was slightly correlated with total precipitation during each deployment across years.

123. **Sybil Subiaur**
Studying allergic responses to food in neonatal mice
Advisor: Ryan Nelson
Sponsoring Program: LSSURP
Home Institution: Johns Hopkins University
Abstract: Food allergies are on the rise and currently affect millions of people worldwide. Clinical trials such as the LEAP study have shown that, in at-risk children, early exposure to peanuts significantly decreased the frequency of the development of a peanut allergy. To further investigate the underlying mechanisms of oral tolerance to ingested food proteins, we utilized food protein-derived peptide and major histocompatibility class II (p:MHCII) tetramers to detect CD4+ T cell responses specific to food antigens in mice. We first asked whether there was a difference in T cell response to the same food antigens in young mice (prior to weaning) and adult mice. Despite repeated oral gavage with whole ovalbumin (OVA) protein, there was no clonal expansion of OVA p:MHCII-specific T cells or an allergic IgE response to OVA in either young or adult mice. This suggests that the T cells did not encounter sufficient antigen presentation to undergo clonal expansion. Another possibility is that the T cells recognize the food antigens but aren't sufficiently activated without additional signals.

124. **Mihika Survase**
Effect of Wwc2 Deletion on Cardiomyocyte Proliferation in Neonatal Hearts
Advisor: Jop van Berlo
Mentor: Natalia F. Araujo
Sponsoring Program: UROP/URS
Home Institution: University of Minnesota Twin Cities
Abstract: Cardiomyocytes in the adult mammalian heart have limited regenerative capacity, leading to permanent cell loss after injury and contributing to heart failure. In contrast, neonatal hearts retain proliferative potential shortly after birth. We recently identified WW and C2 Domain Containing 2 (Wwc2), which has been identified in vitro as promoting cardiomyocyte cell cycle exit and maturation. However, Wwc2's in vivo role in neonatal cardiomyocyte proliferation remains unclear. This study investigated whether cardiomyocyte-specific deletion of Wwc2 increases proliferation during neonatal stages. We used Wwc2^fl/fl Nkx2.5-Cre mice to examine proliferation at postnatal days 3 and 7 (P3, P7) via immunofluorescence staining for Ki67 (cell cycle activity), phospho-histone H3 (pHH3; G2-M phase), and Aurora Kinase B (cytokinesis). Wwc2 deletion did not significantly change proliferation marker expression at either time point. pHH3 and Ki67 staining showed slight, non-significant increases in the percentage of Cre+ cardiomyocytes at P3, with no differences at P7. Aurora Kinase B staining showed no differences at P3 or P7, suggesting cytokinesis was unaffected. Overall, Wwc2 deletion did not enhance neonatal cardiomyocyte proliferation. Future studies should aim to investigate earlier timepoints, such as postnatal day 1 and embryonic stages, to clarify Wwc2's role in cardiomyocyte proliferation.

125. **Sara Tekeste**
Chemical Hair Straightener Damage to Reproductive Organs of C. Elegans Repaired by Co-Enzyme Q10
Advisor: Michele Allen
Mentors: Lynn Nguyen & Greg Summers
Sponsoring Program: M-ASCEND
Home Institution: Highland Park Senior High School
Co-presenter: Ireland Duncan, Highland Park Senior High School
Abstract: Chemical hair straighteners are commonly used by black women to permanently straighten hair. However, conflicting research relating to effects of chemical hair relaxer on reproduction is present. Co-Enzyme Q10 has been tested for benefits in reproduction, but there is less research into the possibilities of repairing damage already present. This study describes damages done to reproductive rates in C. Elegans by hair relaxer and how damage can be repaired with COQ10. A wild type and mutated shc-1 will be tested with a concentration of hair relaxer (50% 1g relaxer to 25ml M9). After 5 minutes of exposure half the trials will be fed 20µL of COQ10 concentration (4 pills to 500µL M9). After 72 hours, the L1/L2 stage will be examined. The results showed both strains were negatively affected by the relaxer when not treated with COQ10. When compared to the nontreated that received COQ10 treatment, they had more successful reproduction. Overall, the results strongly supported the idea that COQ10 improves reproduction in C. Elegans. In conclusion, there is reason to believe that chemical hair straighteners cause negative reproductive effects. COQ10 was proven to be effective at offering a protective layer so the damages do not worsen.

126. **Blake Thackeray**
Building a Path: From Archived Pathology Reports to Machine Readable Data
Advisor: Logan Spector
Mentor: Michelle Roesler
Sponsoring Program: CCRF
Home Institution: University of Minnesota Twin Cities
Abstract: As use of digital pathology reports in cancer research grows, the need for accurate and accessible abstraction tools becomes evident. While growth in abstraction automation continues, their accuracy is contingent on the scanned document's quality. Using a database of 41,919 scanned pathology reports from Children's Oncology Group ACCRN07 along with the Unified Medical Language System (UMLS) and string matcher QuickUMLS, a robust method was developed to triage OCR-converted pathology reports. A five point quality score was created and tested on a random sample of 170 hepatoblastoma pathology reports. Reports were converted to text with OCR-Tesseract and NLP-PIER. QuickUMLS computed the number of UMLS-matched terms within each report per kilobyte of file data. Average terms/KB for each score was graphed and a trendline equation was used to calculate the estimated terms/KB at score 2 as a quality cutoff. Quality was found to explain 92% of the variation in average terms/KB in the hepatoblastoma sample. The cutoff calculated at 5.56 terms/KB identified 20.8% of 22023 solid tumor pathology reports as low quality. Using this process, quality assessment of text-image data can increase efficiency and improve the caliber of clinical record abstraction.

127. **Shwe Yee Thinn**
Investigating the Effect of 2W1S Antigen Dosage as A Factor on Regulatory T Cell Formation in Mouse Model
Advisor: Alexa Weingarden
Mentor: Flannery Dahlberg
Sponsoring Program: LSSURP
Home Institution: Los Medanos College
Abstract: Celiac disease is a condition triggered by dietary gluten and affects 1% of the population. Consumption of gluten damages the small intestinal mucosa and leads to villous atrophy. Celiac disease is strongly associated with T cell activation caused by the gliadin peptide in gluten. Activation of gluten-specific $CD4^+$ T cells produces the pro-inflammatory cytokine interferon gamma (IFN-γ), and the resulting inflammatory response damages the intestinal lining. In healthy individuals, non-inflammatory, food-specific regulatory T cells are formed upon encountering dietary antigens. In this study, we aim to determine what factors influence the generation of food-specific regulatory T cells (Tregs) and whether regulatory T cell development depends on the amount of food antigen exposure in a mouse model. Mice were exposed to different doses of the 2W1S peptide. Regulatory T cell formation was evaluated in the spleen and secondary lymphoid organs using flow cytometry data analysis. 2W:I-A^b tetramers were used to identify 2W1S-specific $CD4^+$ T cells. The hypothesis is that higher antigen exposure will lead to a reduced presence of regulatory T cells. The results showed that there is an increase in regulatory T cells when mice are exposed to higher antigen doses.

128. **Molly Thompson**
Effects of Opioids on Motor Function in Mice
Advisor: Brady Atwood
Sponsoring Program: LSSURP
Home Institution: University of Minnesota Twin Cities
Abstract: Opioid use disorder has increased in recent years, including among pregnant individuals. This rise has led to more infants being born prenatally exposed to opioids. Studies in mice suggest that prenatal opioid exposure disrupts neurotransmitter signaling, myelination, and brain connectivity [2]. Using a mouse model, our research seeks to examine whether opioids produce deficits in motor coordination resulting from inflammation and cell death in brain regions that control movement, including the cerebellum, frontal cortex, and striatum. We predict that the anti-inflammatory, anxiolytic drug clonidine will alleviate these impairments. Clonidine is already used to treat neonatal opioid withdrawal, but its brain-protective effects require further study [1]. Mice underwent behavioral testing to assess locomotion, balance, and coordination. These effects will then be investigated by analyzing brain tissue through immunohistochemistry to detect activated caspase-3 (a marker of cell death) and GFAP (a marker of astrocyte activation). By combining behavioral testing with brain tissue analysis in a mouse model, this study will clarify the risks of opioid exposure and whether clonidine may mitigate these harmful effects.

129.	**Phoebe Thomas** *Title not finalized at time of submission* **Advisor:** Donald Simone **Sponsoring Program**: UMN Pain Consortium **Home Institution:** Macalester College **Abstract:** *Not finalized at time of submission*
130.	**Sofia Thompson** *Influence of food restriction on decision making in mice during two-armed restless bandit task* **Advisor:** Nicola Grissom **Mentor:** Nic Glewwe **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Cognitive and behavioral mechanisms of decision making are commonly assessed using mice to inform our understanding of genetic and sex-biased differences in learning and decision making strategies. Food restriction is standard practice to increase motivation to obtain food rewards during behavioral tasks. Protocols limit restriction level, however mice in the same cohort may vary by 5-20% bodyweight based on individual needs. Previous research has focused on how food restriction increases task engagement, but little is known about whether varying levels of restriction affect performance and strategy within a task. Here, I examine the relationship between performance, decision making strategy, restriction level, and sex in a two-armed restless bandit task, designed to study flexible decision making. While there was no significant effect of restriction level on performance, females consistently obtained more reward than males. Decision making strategy was assessed using the metrics win-stay (repeating rewarded choices) and lose-shift (switching after non-rewarded choices). Analyses are ongoing, but currently there are no clearly significant relationships between restriction level and strategy. However, females showed significantly higher win-stay strategy use than males. These results indicate that restriction level may not significantly impact performance or strategy, but sex significantly influences performance and sensitivity to rewards.
131.	**Trinity Thurman** *Tracking Ferret Movement while Imaging Visual Cortex Activity* **Advisor:** Gordon Smith **Mentor:** Evelyn Yatckoske **Sponsoring Program**: LSSURP **Home Institution:** Howard University **Abstract:** During brain development, spontaneous activity patterns occur across the visual cortex prior to eye opening. Early spontaneous activity is crucial for the formation of functional cortical pathways and neuronal circuits. However, the exact relationship between early spontaneous activity,environmental perception, and behavior remain open questions. Ferrets are an optimal subject for neurodevelopmental research, as they exhibit an immature birth and extended period of postnatal development relative to humans. To address this question, we are developing a head mounted miniature microscope that is capable of capturing calcium-based imaging of active neurons. In this study, we perform simultaneous imaging of wide-field neural activity in the visual cortex while tracking behavior in fifteen minute trials to categorize the types of behavior ferrets display under observation when placed in light and dark environments with stimuli. Data is categorized based on interaction with moving stimuli and level of neuronal response, and used to analyze ferrets' engagement with the environment. Our preliminary results suggest that ferrets, regardless of age, spend the most time looking at moving stimuli. Our findings will allow neuronal activity from awake freely moving juvenile ferrets to be analyzed, and will pave the way for future investigations into early spontaneous activity and behavior.

132. **Daisy Titus**

Metformin fails to replicate metabolic advantages seen in Compound 991 treatment of CAR T cells

Advisor: Craig Byersdorfer

Mentor: Elisabet Ampudia-Mesias

Sponsoring Program: LSSURP

Home Institution: University of Florida

Abstract: Chimeric Antigen Receptor (CAR) T cells, while life saving for patients with leukemia, have a 50% relapse rate, in part due to their short *in vivo* persistence (1). Previous data demonstrate that pre-infusion treatment of CAR T cells with Compound 991, an AMP-activated protein kinase (AMPK) agonist, increases their *in vivo* potency in murine models (2). However, the FDA approved AMPK agonist Metformin could offer a cost effective alternative. To determine whether metabolic priming with Metformin can produce the successes seen with Compound 991, human T cells were cultured with either DMSO (control), Metformin, or Compound 991 for 96 hours, then rested for 48 hours. To assess mitochondrial function, Seahorse Mitostress and glucose assays of culture media were conducted at multiple timepoints post-stimulation. Corresponding western blots detecting phosphorylation of Raptor, a downstream target of AMPK, were conducted to determine pathway activation. Although results varied across timepoints, Compound 991-treated T cells showed greater total spare respiratory capacity than those treated with Metformin. Analyses of Phospho-raptor and glucose utilization are ongoing. To evaluate differences *in vivo*, I will treat 4-1BB CAR T cells with metformin versus 991, then inject them into leukemia bearing mice to measure tumor clearance and overall survival.

133. **Julia Emilia Toledo**

RNA-binding and intrinsically disordered domains are necessary for Brat to regulate mRNAs

Advisor: Aaron Goldstrohm

Mentor: Robert Connacher

Sponsoring Program: UROP/URS

Home Institution: University of Minnesota Twin Cities

Abstract: Brain tumor (Brat) is a *D. melanogaster* RNA-binding protein which regulates genes at the mRNA level. Controlling gene expression in specific cell types, at specific times, is essential for proper development. This project aimed to determine how Brat regulates its target mRNAs. Previously, our lab used CRISPR to engineer a version of the *brat* gene that is incapable of binding RNA. We observed that larvae only expressing this mutant version proceeded through development at lower rates, similar to known *brat* mutants. Then, we overexpressed Brat in the entire fly or certain organs. Since overexpressed Brat produces obvious phenotypes, we can test whether engineered versions of Brat (like mutants or deletions of certain domains) also produce these phenotypes. If part of the protein is necessary for Brat's function, then its deletion will lead to a non-functional protein and no phenotype. We focused on intrinsically disordered domains (IDRs), since their function is unknown. We observed that overexpressing RNA-binding mutants or versions of Brat without IDRs produced the same phenotype as overexpressing nothing. These experiments demonstrated the importance of RNA-binding and IDRs to Brat's activity. Finally, we are attempting to generate a *Drosophila* cell line with these domains deleted using CRISPR.

134. **Abby Towle**

Assessing Cartilage and Bone Markers During Development on Brg1 Mutant Zebrafish

Advisor: Kristin Artinger

Mentors: Silvia Meyer Nava & Bryan Zepeda

Sponsoring Program: LSSURP

Home Institution: St. Olaf College

Abstract: Neural Crest Cells (NCCs) are multipotent stem cells originating from the neural tube during embryogenesis. NCCs in the cranial region give rise to chondrocytes, which develop the foundation for the craniofacial skeleton. The growth of this cartilaginous framework is determined by chondrocyte organization, which facilitates bony matrix deposition. Alterations to gene regulatory networks and signaling modules impact these structures, leading to craniofacial defects; temporal and spatial regulation via chromatin modification is critical for development. While many craniofacial signaling pathways are well known, the role of chromatin remodeler Brg1 is not. Brg1 KO mutations were studied using the Zebrafish model, revealing a strong craniofacial phenotype. RNA expression was amplified using hybridization chain reaction and observed via confocal microscopy. Individuals were genotyped by gel electrophoresis. RNA expression was quantified in ImageJ for intensity and area of individual markers. There are significant differences in RNA expression of various gene markers in mutants compared to WT ($p = .057$, $p = .0265$, $p = .0004$). Future studies should investigate the effects of the Brg1 KO mutation on other craniofacial gene markers, such as msx and snai1b. Mutations in Brg1 are associated with conditions such as cleft palate, highlighting the importance of understanding its regulatory pathways.

135.	**Annie Tran** *The Role of Ketone Utilization on Bone Remodeling in Intermittent Fasting* **Advisor:** Hai-Bin Ruan **Mentors:** Chenxin Gu & Zihao Wang **Sponsoring Program**: LSSURP **Home Institution:** Indiana University **Abstract:** *Redacted due to patentable data*
136.	**Tina Tran** *Differential Drug Responses in NSCLC Under Varying Fibroblast Co-Culture Conditions* **Advisor:** Stephanie Huang **Mentor:** Adam Lee **Sponsoring Program**: SCoPE **Home Institution:** Grinnell College **Abstract:** Lung cancer, particularly non-small cell lung cancer (NSCLC), remains the leading cause of cancer-related deaths worldwide, with limited treatment options. A major barrier to treatment success is the tumor microenvironment (TME), where cancer-associated fibroblasts (CAFs) contribute to immune suppression, metastasis, and therapy resistance. Utilizing our published spatial single-cell prediction pipeline, our research group has shown distinct predicted drug sensitivities for tumor cells in relation to fibroblast-density. To experimentally validate these predicted drug sensitivities and assess fibroblast impact on drug response, we longitudinally measured and compared the growth rates of NSCLC lines (A549 and CALU3) cultured alone or with fibroblasts (IMR-90) following treatment with three drugs: 5-fluorouracil, fexagratinib, and vemurafenib. Co-cultures were performed directly within 96-well culture plates or using transwell inserts with different media (DMEM or EMEM). Experimental results confirm that cancer cell line sensitivity is influenced by fibroblast presence. We observed a decrease in 5-fluorouracil sensitivity for cancer cells co-cultured with IMR-90 yet increased sensitivity for vemurafenib. These observations on differential drug sensitivity were impacted by both the selected cancer cell model as well as the media type. These findings suggest that fibroblast presence, cell model, and media type play an important role in NSCLC drug response.
137.	**Kayla Tucker** *Removal of Formaldehyde-Induced DNA-Protein Crosslinks in G1 and S Phase of Wild Type and Nucleotide Excision Repair Deficient Mammalian Cells* **Advisor:** Colin Campbell **Mentor:** Duha Alshareef **Sponsoring Program**: LSSURP **Home Institution:** University of Minnesota Twin Cities **Abstract:** DNA-protein crosslinks (DPCs) are a complex type of DNA damage and are subjected to multiple repair pathways. One of them is nucleotide excision repair (NER) which has two subpathways: transcription-coupled NER (TC-NER) and global genome NER (GG-NER). Recent work has shown the role of TC-NER in DPC removal. However, a role for GG-NER in the repair of DPCs has not been established. Increased understanding of how mammalian cells recognize and remove DNA damage could improve the efficacy of anti-cancer treatments by preventing or minimizing DNA damage to healthy cells. I examined repair of formaldehyde-induced DPCs in different NER-deficient cells. In these experiments agarose gel electrophoresis and scanning densitometry were employed to determine the kinetics of removal of formaldehyde-induced DPCs. My results show that formaldehyde treatment resulted in elevated levels of DPCs, compared to untreated controls. Analyses performed on cells allowed to recover in a formaldehyde-free environment revealed that there was no significant difference in DPC removal between wild type and NER-deficient cells at this specific time point, indicating that the GG-NER pathway does not contribute to DPC removal when measured over a five hour time course. Additional experiments over an extended timeframe are required to more fully test my hypothesis.

138. **Sam Tyhonas**

Brain-wide Measurement of Dopamine Receptor Densities in 16p11.2 Hemideletion

Advisor: Nicola Grissom

Mentors: Nic Glewwe & Erin Giglio

Sponsoring Program: LSSURP

Home Institution: Pennsylvania Western University

Abstract: Dopamine (DA) transmission is crucial to the expression of decision-making behaviors in the basal ganglia. The striatum—a key part of the basal ganglia–contains primarily medium-spiny neurons (MSNs) that express both D1 and D2 dopamine receptors, which modulate motivated and aversive behavior, respectively, in the striatum and cortex. While previous literature has shown that MSNs are involved in basic decision-making functions, it is unclear how other individual variations such as sex and genotype influence receptor distributions on these cells. The 16p11.2 gene deletion is associated with changes in reward-guided decisionmaking tasks, but its impact on receptor distributions is unknown. Since strong sex differences exist in reward-guided decision-making, we performed whole brain imaging on male and female mice of both wild-type (WT) and 16p11.2 (DEL) genotypes. After we obtained cell counts of various brain regions, we graphed the neuronal density of each MSN type within each group. We show that the orbital cortex has a consistent pattern of the 16p DEL male having higher neuronal density of D2 receptors, and that behavioral changes are not a result of altered DA production. This research demonstrates the breadth of changes in 16p11.2 deletion animals in dopaminergic signaling across many brain regions.

139. **Houytieng Ung**

Proteomic Analysis of Mitochondrial Activity in ARID1A-Deficient Clear Cell Carcinoma in Ovarian Cancer

Advisor: Martina Bazzaro

Mentors: Stefani Thomas & Mihir Shetty

Sponsoring Program: LSSURP

Home Institution: Florida International University

Abstract: ARID1A-mutated ovarian clear cell carcinoma (OCCC) is a rare and aggressive subtype of ovarian cancer, with a 5-year overall survival rate below 15%. Current treatments, including paclitaxel and carboplatin, are ineffective due to chemoresistance. Our previous work demonstrated that ARID1A-deficient cells develop increased reliance on mitochondrial respiration, suggesting a potential therapeutic vulnerability. While targeting mitochondria is promising in treating chemoresistant cancers, existing mitochondrial inhibitors cause severe side effects due to their broad activity against both cancerous and healthy cells. Moreover, development of FDA-approved mitochondrial inhibitors is hindered by limited data on how ARID1A loss influences specific components of the mitochondrial electron transport chain (ETC). To address this, our study focuses on identifying which ETC components ARID1A-mutant OCCC cells depend on for a more targeted therapeutics approach. Thus, we are conducting whole-cell proteomic analysis on ARID1A-knockout clones derived from the RMG1 OCCC cell line. Metabolic stresses are induced on these cells to shift energy production toward mitochondrial respiration. This strategy activates mitochondrial pathways, allowing us to assess mitochondrial respiration through global proteomic profiling using mass spectrometry. Findings from this study may uncover differences in ETC protein expression in ARID1A-deficient cells, offering more data toward a targeted mitochondrial approach treating ARID1A-mutated OCCC.

140. **Gaokalia Vang**
How Ploidy Shapes Phenotype: A Comparison of Tetraploid and Dihaploid Red Norland Potatoes
Advisor: Laura Shannon
Mentor: Timileyin Summonu
Sponsoring Program: SOAR-REEU
Home Institution: Concordia University, St. Paul
Abstract: The cultivated potato (*Solanum tuberosum*) is typically bred as a tetraploid clonal crop and propagated asexually. However, tetraploid breeding often results in low genetic gain due to high genetic load and heterozygosity. Diploid breeding offers a simpler genetic structure, higher genetic gain, and a faster response to emerging challenges in potato production. In this study, we compared two populations derived from the Red Norland potato variety: 200 selfed tetraploid progeny and 200 dihaploid progeny generated using the IVP101 dihaploid inducer. All plants were grown in a greenhouse for tuber multiplication prior to field evaluation. In total, 400 genotypes, 187 of which were replicated, were established in the field to assess phenotypic differences associated with changes in ploidy level. We are collecting data on key morphological and agronomic traits, including date of row closure, flowering time, flower color, leaf color, and chlorophyll content. By analyzing these traits, we aim to better understand how reducing ploidy from tetraploid to diploid affects plant development and phenotype. These findings will help inform breeding decisions, facilitate the use of diploid lines in potato improvement programs, and contribute to broader efforts to develop more efficient and genetically tractable potato cultivars.

141. **Aleena Varghese**
Role of p-bodies and RNA decay factors in Pumilio protein-mediated repression
Advisor: Aaron Goldstrohm
Mentor: Elise Dunshee
Sponsoring Program: LSSURP
Home Institution: University of Wisconsin–Madison
Abstract: Pumilio proteins (PUMs) are RNA-binding proteins that regulate genes post-transcriptionally in the cytoplasm by recruiting mRNA degradation factors. PUMs regulate several genes associated with neurodegenerative diseases and cancer. PUMs bind to mRNAs' 3' untranslated region and recruit the CNOT complex for 3' end degradation. This is followed by 5' decapping by the decapping complex, causing the target mRNA to be degraded from both ends. The CNOT and decapping complexes are also found in processing bodies (p-bodies), granules of decay factors and silenced RNAs in the cytoplasm. Since PUM's repressive activity and p-body assembly require similar factors, questions remain whether there is a relationship between p-bodies and PUMs. To test this, we created a HEK293T cell line that lacks p-bodies through the knockout (KO) of LSM14A, a necessary component of p-body formation. PUM's repressive activity will be compared between wild type (WT) and LSM14A KO cells using luciferase assays and northern blotting, which measure protein and RNA output. Additionally, PUM repression in LSM14A KO cells will be compared to the knockouts of RNA decay factors DDX6 and DCP2/XRN1. We expect that the LSM14A KO will have decreased PUM repression compared to WT, indicating that p-bodies are necessary for PUM function.

142. **Varsha Venkatesh**
Examining Associations Between Ethnic Homophily, Ethnic Identity, Perceived Discrimination and Well-Being Among Diverse College Students Using Structural Equation Modeling
Advisor: Alex Ajayi
Sponsoring Program: Pathways
Home Institution: University of Minnesota Twin Cities
Abstract: Ethnic homophily– or the tendency to make friends of the same ethnicity– is considered developmentally normative among college student populations. It is also closely linked with other social processes, including ethnic identity and perceived discrimination. However, the effects of ethnic homophily on well-being have been widely contested in past studies. Additionally, prior research has not examined undergraduate student populations. Given this, the present study examined the associations between ethnic homophily, ethnic identity exploration, perceived ethnic/racial denigration, and well-being indices through structural equation modeling. Participants were 1,530 first-year undergraduate students (M age = 18.11, 63.90% cisgender women, 73.90% White). Separate models were developed to describe pathways among White students and students of color. Although ethnic homophily was negatively associated with ethnic identity exploration among White students, the inverse effect was observed among students of color. Additionally, only in the White sample, ethnic homophily was negatively associated with perceived discrimination, which was in turn negatively associated with life satisfaction. The findings of this study provide needed context to previous studies of differently-aged populations, suggesting the unique roles of environment and developmental stage on the effects of racial homophily among diverse college students.

143.	**Patrick Vogel** *Early Autism Prediction using MRI-Based Machine Learning: Insights from a Case Study of Misclassification* **Advisor:** Meghan Swanson **Mentor:** Samantha Smalley **Sponsoring Program**: MIDB **Home Institution:** Augustana University **Abstract:** Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by impaired social-communication and restricted, repetitive behaviors that emerge in early childhood. Early detection is crucial to develop interventions that can improve long-term outcomes. Because structural brain changes precede core ASD features, recent diagnostic efforts have used machine learning to predict ASD diagnosis at 24 months based on structural magnetic resonance imaging (MRI) acquired at 6 months. A model developed by the Infant Brain Imaging Study (IBIS) predicted whether participants with high familial likelihood would receive an ASD diagnosis with 88% sensitivity and 95% specificity. While the model demonstrates high overall accuracy, understanding the clinical trajectory of misclassified participants is necessary for improving diagnostic outcomes. This case study investigates the development, characteristics, and diagnostic outcomes of six misclassified participants. False negatives exhibited diagnostic instability and subthreshold ASD features, indicating that individuals with dynamic presentations may not align well with binary classification models. In false positives, the presence of expressive language impairment suggests the model may over-rely on language-related features when assigning ASD classification. Altogether, these findings highlight limitations of binary classification models and the need for models sensitive to developmental nuance.
144.	**Keng Cha Vu** *Cholesterol Reduction Limits Obesity-Induced Bone Loss via Phlpp2* **Advisor:** Elizabeth Bradley **Mentor:** Ismael Karkache & Elizabeth Vu **Sponsoring Program**: LSSURP **Home Institution:** University of Minnesota Twin Cities **Abstract:** High dietary cholesterol decreases bone mass and increases the risk of osteoporosis. Osteoporosis is a disease that weakens bones and makes them more prone to fractures due to low bone mineral density. There is a continuous need for new treatment for osteoporosis. Phlpp2 is an understudied protein phosphatase that helps to suppress cell growth and promotes proliferation. Phlpp2 is a gene that has the potential to be used as a target to help treat osteoporosis.
145.	**Kachsia Vue** *Rising Language Shift in the Hmong Community: Perceptions of Hmong Community Members* **Advisor:** Zha Blong Xiong **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** The Hmong people are among many ethnic groups who are at risk of losing their heritage language as younger generations adopt the dominant language of their host country. Studies show that most second- and third-generation Hmong children are more likely to speak English, even at home. McLit (2020) predicts that the Hmong language could disappear entirely by the end of the 21st century. This study explores Hmong community members' perceptions of the language and factors contributing to its decline. Our sample size included 151 participants (87 males, 64 females; ages 18–79, M = 51.57, SD = 14.34) in 33 focus groups at a 2025 public event hosted by the Hmong RPA Writing System Project, as well as 13 interviews with Hmong teachers. The data collected also revealed that 71% of participants believed the Hmong language is threatened or endangered. Key factors cited for the shift included lack of exposure, limited access to Hmong library materials, and minimal research literature on the language. Future research recommendations are to be discussed.

146. **As'Shaunté Walker**
Repurposing Metformin as a Treatment for Cocaine Use Disorder (CUD) in Rats
Advisor: Sadé Spencer
Sponsoring Program: LSSURP
Home Institution: Tennessee State University
Abstract: Cocaine Use Disorder (CUD) affects over 1.5 million people in the U.S., yet no FDA-approved treatments currently exist. Metformin, an FDA-approved Type II diabetes medication, has shown potential in preclinical addiction models, possibly through indirect activation of AMPK, a key cellular energy sensor. Prior research suggests that microinjection of metformin into the nucleus accumbens (NAc) reduces cue-induced reinstatement of cocaine seeking. This study examined whether systemic administration of metformin alters cocaine or sucrose-seeking behavior in female Sprague Dawley rats (N = 16). Rats underwent acquisition, extinction, and cue-induced reinstatement using either cocaine or sucrose as rewards. During extinction and reinstatement, rats received systemic pretreatment with either vehicle (1 mg/ml) or metformin (175 mg/kg) 30 minutes before each session. Rats successfully acquired operant responding for cocaine and sucrose, discriminating between active and inactive levers. Preliminary findings showed no significant difference in extinction behavior following metformin treatment. Cue-induced reinstatement data were underpowered but suggested increased lever pressing following metformin, possibly indicating heightened cue reactivity. These early findings require caution due to small group sizes (n = 1–3) and procedural variability. Still, given the high relapse rates in CUD, Metformin may offer a promising target but requires deeper investigation.

147. **Jessica Wasson**
Catching Wild Wires: Discovery of a Current-Producing Geoanaerobacter *Species*
Advisor: Daniel Bond
Mentors: Chi Ho Chan & Julian Schwanbeck
Sponsoring Program: UROP/URS
Home Institution: University of Minnesota Twin Cities
Abstract: Electroactive bacteria such as *Geobacter* have the unique ability to use extracellular metals as electron acceptors, effectively producing electricity through respiration. To accomplish this, they use nanowires on their outer surface to transport electrons towards electron acceptors such as metal oxide particles or other conductive surfaces. Despite their role in electricity production, the distribution, diversity, and structures of nanowires across species remains poorly understood. This project aimed to isolate novel electricity producing organisms to investigate whether they possessed uncharacterized nanowires. Sediment samples were collected from Crosby Farm Regional Park and enriched in a Winogradsky column. Samples from putative iron-reducing zones were transferred to a reactor containing an electrode as the sole electron acceptor to select for electricity producing organisms. From this enrichment, a strain closely related to *Geoanaerobacter pelophilus* was isolated. This isolate produces up to ~660 $\mu A/cm^2$ of current, near the highest levels recorded for model strains like *G. sulfurreducens*. Whole-genome sequencing revealed a homolog of OmcE, a cytochrome nanowire in *Geobacter sulfurreducens*. Biofilms of *Geoanaerobacter pelophilus* are being submitted for Cryo-EM imaging to determine atomic-level structures of novel nanowires. These findings contribute to our understanding of how common nanowires are and if undiscovered nanowires exist with novel properties.

148. **Ty Watkins**
Allelic Variation of seed shattering genes in Northern Wild Rice (Zizania palustris)
Advisor: Jennifer Kimball
Mentors: Kat Schmidt, Lillian McGlip, & Maybell Banting
Sponsoring Program: SOAR-REEU
Home Institution: Virginia State University
Abstract: Northern Wild Rice (Zizania palustris) is a culturally significant aquatic crop native to North America. A major obstacle to its cultivation is seed shattering, where mature seeds prematurely detach from the plant, causing substantial yield losses during harvest. This project aims to identify allelic variants of genes potentially influencing seed shattering. Using molecular biology techniques DNA extraction, PCR amplification, and Sanger sequencing we analyzed five wild rice populations: NEBr, Franklin, Netum, K2, and Dawn-SR. To evaluate each population, 32 plants were grown under greenhouse conditions, arranged in a 4 by 4 planting design. We focused on two candidate genes that were selected based on comparative genomics, gene expression profiles, and prior genome-wide association. By contrasting individuals exhibiting strong seed retention with those that shatter early, we seek to discover genetic markers, such as single nucleotide polymorphisms (SNPs), that may be associated with seed shattering. These insights will facilitate targeted breeding approaches to enhance harvest efficiency and promote sustainable production of Northern Wild Rice.

149.	**Christian Wells** *Overcoming ER+ HER2- hormone therapy resistance (HTR) by fluorinated hexyl cuban-1-yl biguanide inhibitors of CYP3A4-mediated epoxyeicosatrienoic acid biosynthesis* **Advisor:** David Potter **Mentors:** Zhijun Guo & Jianxun Lei **Sponsoring Program**: LSSURP **Home Institution:** Northern State University **Abstract:** Patients with metastatic ER+ HER2- breast cancer (MBC) often suffer from HTR. The cyclin dependent kinase inhibitor (CDKi) palbociclib is often used in combination with the selective estrogen receptor degrader (SERD) fulvestrant in the front-line setting. We have discovered that CYP3A4-mediated biosynthesis of epoxyeicosatrienoic acids (EETs) can promote BC progression and HTR. Selection of HTR MCF-7 BC cells (clones MCF-7 AC1 LR/FR/PR-1 and -2) was associated with CYP3A4 over-expression and EET biosynthesis. Fulvestrant selection for HTR reproducibly co-selected for CYP3A4 over-expression. To overcome HTR due to CYP3A4 over-expression and associated EET biosynthesis, fluorinated hexyl-cuban-1-yl-biguanides (F-HCBs) were designed using a metformin/CYP3A4 co-crystal and synthesized. F-HCBs were tested for inhibition of CYP3A4-mediated EET biosynthesis in HRT BC cells. F-HCBs-inhibited proliferation of HTR MCF-7 clonal cell lines MCF7 AC1 LR/FR/PR-1 and -2 which were multiply resistant to letrozole, fulvestrant, and palbociclib. These findings support the hypothesis that fulvestrant resistance, a common clinical scenario for HTR BC can occur through over-expression of CYP3A4 and is reproducibly associated with concurrent CDKi resistance. These results support the hypothesis that CYP3A4 can contribute to the development of HTR and CDKi resistance and may be a target to overcome ER+HER2- HTR using F-HCBs.
150.	**Jennifer Wen** *Institutional Case Series of Telomere Biology Disorder Associated Myelodysplastic Syndrome and Acute Myeloid Leukemia* **Advisor:** Christen Ebens **Mentor:** Rebecca Tyron **Sponsoring Program**: CCRF **Home Institution:** Carleton College **Abstract:** Myelodysplastic syndrome (MDS) and acute myeloid leukemia (AML) are frequent forms of pre-malignant and malignant states, respectively, in patients with telomere biology disorders (TBD). TBDs result from defective telomere maintenance, leading to abnormally short telomeres that compromise chromosomal stability. Due to the intrinsic intolerance of cells to DNA damage from chemotherapy or radiation, MDS/AML treatments in TBD require careful considerations. Here, we review 6 patients with TBD-associated MDS (n=6) /AML (n=1), ages 12–71 years, seen at the University of Minnesota. Common initial therapy included hypomethylating agents (n=2) or chemotherapy (n=3), with 5 patients undergoing allogeneic hematopoietic cell transplant. All had prior cytopenias, with 1 experiencing progression of MDS to AML, and 2 relapsing. The median survival was not achieved with 3 of 6 alive at this time, and 1 lost to follow up. Together, these cases highlight the importance of individualized treatment for TBD patients with MDS/AML, and the need to carefully consider factors such as: age, surveillance for abnormal and/or clonal hematopoiesis, and treatment regimen (upfront and allogeneic hematopoietic cell transplantation approaches). Limited by the small patient population, further research is required to determine the optimal surveillance and treatment for MDS/AML in patients with TBD.

151. **Mikayla Whitehouse**
Streamlining expression for the investigation of protein structures in primordial life
Advisor: Burckhard Seelig
Mentor: Peter Winslow
Sponsoring Program: UROP/URS
Home Institution: University of Minnesota Twin Cities
Abstract: Modern life relies on proteins made from 20 different amino acids. However, the earliest proteins in life are hypothesized to have been made from fewer types of amino acids. Some proteins in early life thus may have needed to bind to ATP, life's main energy currency, using limited amino acid sets. Previously in the Seelig lab, researchers isolated ATP-binding proteins made from sets of the hypothesized earliest 5, 9, and 16 amino acids using mRNA display. They currently aim to characterize the structures of these proteins, which will increase our understanding of how proteins may have functioned to promote early life's development. To streamline that structural characterization process, this research aimed to optimize expression and purification conditions to increase the yield of primordial-like ATP-binding proteins expressed in EN2 cells, a modified *E. coli* BL21 strain. ATP binding assay sensitivity required the use of the *E. coli* EN2 cell strain, which lacks a specific chaperone protein, DnaK, which binds tightly to ATP. From this optimization, yields were increased by about 57%. This increase in yield is likely due to a larger fraction of inducible, living cells that can readily express our protein, and less time for protease-based protein degradation.

152. **Porshia Woods**
Examining the Relationship Between Alcohol's Aversive Properties and Consumption with Ethanol-Induced Conditioned Taste Aversion
Advisor: Jocelyn Richard
Mentor: Klaiten Kermoade
Sponsoring Program: LSSURP
Home Institution: The University of Michigan–Ann Arbor
Abstract: Individual differences in alcohol consumption suggest underlying variability in aversion sensitivity. This study aims to examine whether sensitivity to ethanol-induced aversion predicts voluntary ethanol consumption using a behavioral rat model. We hypothesized that a greater magnitude of ethanol aversion would be associated with lower voluntary ethanol intake, suggesting aversion sensitivity as a potential behavioral predictor of vulnerability to alcohol use disorder. Rats were placed on water restriction to support conditioned taste aversion (CTA) training. During CTA, rats received 10% sucrose paired with ethanol injections (1.25 g/kg), with alternating recovery days. Voluntary ethanol intake was measured using a two-bottle choice (2BC) paradigm, offering 16-hour access to 15% ethanol and water. Finally, aversion-resistant drinking was assessed using quinine-adulterated ethanol (45 and 90 mg/L). As expected, we found individual variability in aversion sensitivity as measured by CTA. Aversion sensitivity did not predict voluntary ethanol consumption, which was relatively high across most rats. We also did not observe any significant relationships between CTA and aversion-resistant drinking, though there was a trend towards a correlation between CTA and aversion-resistant drinking in female rats. In order to better assess the relationship between CTA and ethanol consumption, an increased sample size is needed.

153. **Antonia Wu**
Examining Non-Academic Indicators for a Prosperous Education and Career in STEM for Undergraduate Students in the Field
Advisor: Moin Syed
Sponsoring Program: UROP/URS
Home Institution: University of Minnesota Twin Cities
Abstract: This study aims to examine the predictive role of Big Five personality traits and scientific identity on career commitment and life satisfaction among STEM students. By exploring how traits like conscientiousness, openness, and extraversion correlate with students' commitment to their careers and their overall life satisfaction, the research seeks to uncover key psychological factors that contribute to success and well-being in STEM fields. Additionally, this study will explore whether demographic factors such as gender and ethnicity act as moderators in these relationships. We hypothesize that personality traits and scientific identity will significantly predict career commitment and life satisfaction, with potential variations across different demographic groups. Understanding these dynamics could provide valuable insights for improving retention and well-being among STEM students, informing future educational strategies and support systems. The expected outcomes of this study include identifying personality traits and factors that help predict career commitment and life satisfaction, as well as understanding how these factors may differ for students from various demographic backgrounds. Ultimately, the findings could guide interventions designed to support diverse groups of STEM students, fostering their academic and professional growth.

154. **Andy Yang**

Assessing the function of TBL1 and TBLR1 in the transcriptional regulation of hepatic metabolism with in vitro and in vivo models

Advisor: Amy Hauck

Mentor: Deborah Dickey

Sponsoring Program: BMBB Summer Undergraduate Internship

Home Institution: University of Minnesota Twin Cities

Abstract: Transducin β-like protein 1 (TBL1) and TBL1-related protein (TBLR1) are core subunits of the Nuclear Receptor Co-Repressor (NCOR) Complex, which regulates metabolic gene expression. Recent studies have shown that liver-specific knockout of complex members, NCOR1 and NCOR2, leads to hepatosteatosis but also, surprisingly, suppression of hepatic gluconeogenesis. TBL1 and TBLR1 are indispensable in the NCOR complex; however, their function within the complex and role in transcriptional regulation remain unclear. We hypothesize that TBL1 and TBLR1 are integral regulators of hepatic metabolism. To test this, we used siRNA-mediated knockdown (KD) of Tbl1x (encoding TBL1) and Tbl1xr1 (encoding TBLR1) to perform loss-of-function studies in cultured mouse hepatocytes. Following siRNA transfection, we used qRT-PCR to assess changes in mRNA expression of NCOR complex target genes between control and KD cells. Preliminary results show altered expression levels of genes in lipid and fatty acid metabolic pathways. As a complementary approach, we prepared and tested reagents to perform overexpression (OE) and KD of Tbl1x and Tbl1xr1 in vivo using Adeno-Associated Virus (AAV). Together, these findings provide valuable insights into the role of TBL1 and TBLR1 in hepatic metabolism and lay the groundwork for further studies in cancer, human TBL1/R1 mutations, and metabolic-related illnesses.

155. **Andy Yang**

Evaluating a Stakeholder and Equity Data-Driven Implementation (SEDDI) of HPV Self-Sampling Initiatives Across Primary Care Clinics

Advisor: Serena Xiong

Sponsoring Program: M-ASCEND

Home Institution: Carleton College

Abstract: Human Papillomavirus (HPV) self-sampling can increase cervical cancer screening rates by addressing barriers (e.g., mobility issues) that prevent equitable screening among women. Stakeholder and Equity Data-Driven Implementation (SEDDI) is a promising approach to adapting HPV self-sampling in clinics that serve populations experiencing disparities in cervical cancer screening. This study assesses the feasibility of implementing the SEDDI approach in HPV self-sampling initiatives in collaboration with healthcare professionals. SEDDI was implemented in four Minneapolis–St. Paul clinics (Bethesda, Phalen Village, Mill City, and Smiley's). Focus groups were held with implementation teams from two clinics in May-June 2025. Transcripts were cleaned, deidentified, and analyzed using rapid qualitative analysis, applying a priori domains to identify key themes and illustrative quotes. The SEDDI process helped implementation teams identify gaps in cervical cancer screening. Both clinics introduced HPV self-sampling for all patient populations. Teams found the implementation guide and the research team's technical support—particularly around workflow design and training—to be crucial to a successful rollout. Clinics plan to continue self-sampling and further educate patients moving forward. Healthcare professionals responded positively to the SEDDI approach, viewing it as an effective strategy for implementing new evidence-based interventions, especially in efforts to address health disparities.

156. **Bob Yang**

Orthographic Reform in the Hmong Romanized Popular Alphabet: Insights from Native Language Experts

Advisor: Zha Xiong

Sponsoring Program: McNair

Home Institution: University of Minnesota Twin Cities

Abstract: The Romanized Popular Alphabet (RPA) has been the primary writing system for the Hmong diaspora since the 1950s, but today native Hmong speakers and language experts in the United States increasingly question its suitability for the contemporary Hmong American community. Although there have been efforts to reform the RPA, little documentation exists of these initiatives or how Hmong perspectives have evolved over time. This study interviewed eight native Hmong language experts to reassess the RPA and whether changes are needed to better serve the community. Results found that a few preferred to preserve the original RPA, while the majority advocated for reform expressing a desire to simplify clusters, align consonants closer with English, use diacritics to mark tone, and unify dialects. These findings highlight the tension for the Hmong between preserving cultural identity as a stateless diasporic minority and adapting to changing linguistic environments to support language maintenance and transmission.

157. **Ashley Ynglada**
Social Expectations and Second-Language Speech Perception
Advisor: Benjamin Munson
Sponsoring Program: McNair
Home Institution: University of Minnesota Twin Cities
Abstract: Speech intelligibility refers to the accuracy with which a person's speech is reported by others. This ability can be heavily influenced by a listener's own perceptions and assumptions based on the speaker's identity. Previous studies have explored this phenomenon, although predominantly featuring native speakers of English. Our experiment builds on these studies while focusing on the impact racial identity perception may have on listeners who learned English later in life (L2 listeners) compared with native speakers (L1 listeners). The intention of this study is to determine whether the influence of talker's actual or assumed racial identity on speech intelligibility differs between L1 listeners and L2 listeners. In this experiment, six different individuals (two white, two Latina, and two Black) produced twenty sentences that were presented to two groups of listeners. Ten of these sentences were given with audio only, while the other ten included both audio and visual input. All sentences were presented with background noise, and listeners were tasked with transcribing what they heard. The findings of this study will help us understand the effects of racial identity in speech intelligibility, and help engage with the community of L2 listeners, which is typically underserved by speech-language pathologists and audiologists.

158. **Ledia Zewdu**
The Role of Cigarette Design in Racial Disparities of Mouth Level Toxicant Exposure
Advisor: Irina Stepanov
Mentor: Eleanore Hansen
Sponsoring Program: M-ASCEND
Home Institution: Macalester College
Abstract: African Americans have been historically discriminated and targeted upon by tobacco companies. Spanning decades, from commercial advertisements to intentional discounted cigarette prices, they've promoted specific cigarette brands that have contributed to intense smoking habits. The purpose of this study is to examine the racial difference in smoking habits as we analyze different cigarette brand designs, their sugar contents, and the smoking intensity levels. Using the Canadian Intense smoking regimen, we smoked cigarette buds to analyze mouth level toxicant exposures. In addition, we evaluated toxicity data through performing an industry document search analysis. As we examined documents, we paid attentive detail to keywords such as sugars and pyrolysis. Utilizing case study data, we also examined racial differences in exposure to smoke toxicants and their drivers such as smoking behavior, brand preferences, and design features. Results are incomplete, but information has shown brands targeting African Americans with more addictive cigarettes. Differences in smoke toxicant exposures are because of both behavioral patterns and product design factors. Targeted marketing against African Americans has contributed towards tobacco related harms, thus widening the health disparity gap.