Summer Undergraduate Research Experience (SURE) Poster Symposium

Morning Session

Thursday, August 6, 2026

Odd-Numbered Posters Will Present 9:30–10:30am
Even-Numbered Posters Will Present 10:30–11:30am

1.	**Abnazer Abadi** *Deletion of CD36 and How it Affects Bone Morphology* **Faculty Advisor:** Elizabeth Bradley **Mentors:** Elizabeth Vu & Ismael Karkache **Sponsoring Program**: LSSURP **Home Institution:** St. Olaf College **Abstract:** Cortical bone comprises approximately 80% of skeletal bone mass, and age-related cortical bone loss accounts for nearly 70% of total skeletal bone loss. Although bone anabolic agents increase cortical bone mass, their efficacy is substantially greater in the spine than the hip (+12.3% spine,+3.9% hip), highlighting the need for new strategies to enhance cortical bone. CD36, a membrane glycoprotein and scavenger receptor, has been implicated in bone remodeling, but its skeletal role remains unclear. To define its function, we generated mice with conditional deletion of Cd36 in cathepsin K (Ctsk)-expressing cells. Femora from 8-week-old male and female Cd36 conditional knockout (cKO) mice and control littermates were analyzed by micro-computed tomography. Female Cd36 cKO mice exhibited significantly increased cortical thickness, whereas trabecular bone parameters remained unchanged. Static histomorphometry of tartrate-resistant acid phosphatase (TRAP) stained sections revealed significantly fewer endosteal osteoclasts and increased cortical thickness in female Cd36 cKO mice compared with controls, consistent with the observed micro-computed tomography. These findings identify CD36 as a negative regulator of cortical bone remodeling in females and suggest that CD36 promotes endosteal osteoclast activity. Targeting CD36-dependent pathways may be a therapeutic strategy to improve cortical bone mass and reduce fracture risk.
2.	**Mariam Abdalla** *The Epigentic Effects of Vaping on Human Lungs* **Faculty Advisor:** Rodolfo Batres **Mentors:** Natalia Tretyakova & Abdur Rahim **Sponsoring Program**: M-ASCEND **Home Institution:** University of Minnesota Twin Cities **Abstract:** E-cigarette use, otherwise known as vaping, has been increasingly popular among young adults in the United States and the world. Vaping is widely considered a safe alternative to smoking, but its health effects are incompletely understood. Although e-cigarettes contain lower levels of tobacco carcinogens as compared to traditional tobacco products, they deliver other harmful substances such as heavy metals, aldehydes, and other volatile organic compounds etc. Thus, it is important to understand the biological consequences of vaping to clarify risks. In this study, we carried out e-cigarette exposure studies with primary human bronchial epithelial cell lines (BEAS-2B) cultured under air-liquid interface (ALI) conditions. Bronchial cells exposed to e-cigarette vapor showed decreased trans epithelial electrical resistance and increased secretion of cytokines into the basolateral media, suggesting that exposure to e-cigarette aerosol causes immune dysfunction. Furthermore, we have extracted DNA and RNA from the exposed cells for sequencing and quantification of epigenetic marks in DNA and RNA. Collectively, these findings indicate that exposure to e-cigarette vapor disrupts epithelial barrier function and triggers aberrant immune responses.
3.	**Nadira Abdulahi** *The Impact of Attending a Segregated Elementary School on Educational Outcomes in the Twin Cities Metro* **Faculty Advisor:** Andrew Zieffler **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities

	Abstract: Racially segregated schools in the Twin Cities potentially shape students' future educational outcomes. This research examines the effects of segregation in metropolitan elementary schools on educational outcomes. To evaluate this, schools were ranked using the local segregation index and averaged for six cohorts of students. Based on these averages, schools were divided into deciles. School-level proficiency rates in reading, mathematics, and science were compared across deciles. Using Statewide Longitudinal Education Data System (SLEDS) data, we identified every student who attended any grade 1–5 at any of the schools. We also collected information about high school and post-secondary outcomes (e.g. dropouts, graduation, post-secondary enrollment). These outcomes were compared across deciles. Results show reading, math, and science proficiency rates decline after for schools in decile 8–10. Students who attended a school in deciles 8–10 were less likely to graduate or graduate on time and had higher dropout rates. They were less likely to enroll in a post-secondary institution and those students who enrolled in a post-secondary institution were more likely to enroll in a two-year than a four-year post-secondary institution. They were also less likely to attend a selective and/or highly ranked institution.
4.	**Naomi Adler** *Synthesis and Testing of Novel C-C C7 Fluoroquinolone Antibiotics* **Faculty Advisor:** Adam Duerfeldt **Mentors:** Cole Friederichs **Sponsoring Program**: SCoPE **Home Institution:** Macalester College **Abstract:** Infections caused by antimicrobial resistant bacteria (AMR) were associated with 4.95M deaths in 2019 and are projected to reach 8.22M annually by 2050, underscoring the urgent need for new antibiotics. Fluoroquinolones represent a promising antibacterial class for structural modification due to their activity against both gram-positive and gram-negative bacteria. To date, most fluoroquinolone structure-activity relationship (SAR) studies have focused on C7-N functionalized derivatives (e.g., Ciprofloxacin, Levofloxacin, and Moxifloxacin), presumably because analogs can be readily accessed through nucleophilic-aromatic substitution. Interestingly very few studies have been reported on C7-C linked analogs, motivating us to investigate the chemistry and SAR associated with this mode of functionalization. This poster will report on our utilization of Suzuki cross-coupling chemistry to generate C7-C fluoroquinolone derivatives. Thus far, the isolation of C7-C organoboron derivatives has proven unsuccessful, limiting the SAR to compounds that can be accessed through fluoroquinolone electrophilic reaction partners (aryl halides). Nonetheless, an initial C7-C analog series was prepared, structurally characterized, and evaluated against Escherichia coli to determine minimum inhibitory concentrations (MICs). Preliminary results indicated that several analogs retain antibacterial activity, supporting further investigations of C7-C linked fluoroquinolones to reveal new SAR on this well-validated and clinically relevant antibacterial class.
5.	**Teju Akinola** *Investigating the Role of Bergmann Glial Calcium Signaling in Spinocerebellar Ataxia Type 1* **Faculty Advisor:** Marija Cvetanovic **Mentors:** Gourango Talukdar & Adri McCall **Sponsoring Program**: LSSURP **Home Institution:** Purdue University **Abstract:** Spinocerebellar Ataxia Type 1 (SCA1) is a fatal neurodegenerative disorder caused by a CAG repeat expansion in the *Ataxin1* (*ATXN1)* gene. SCA1 is characterized by progressive motor dysfunction, cerebellar degeneration, and Purkinje cell loss, with no disease-modifying treatment currently available. Recent studies suggest that increased calcium signaling in Bergmann glia, specialized cerebellar astrocytes, contributes to Purkinje cell dysfunction in SCA1. This study investigated whether reducing astrocyte calcium using IP3R2 genetic deletion could improve motor function and cerebellar pathology in a mouse model of SCA1. Experimental mice were assessed using the rotarod test and immunohistochemical analysis of cerebellar tissue. Additionally, confocal image analysis was performed to quantify SCA1 cerebellar pathology. Rotarod testing showed that reducing astrocyte calcium signaling resulted in partial to no improvement in motor coordination and balance. No statistically significant differences were observed in calbindin intensity, GFAP intensity, number of Iba1 cells/mm2, or molecular layer width among the experimental groups. These findings may reflect the study's small sample size (N=2 per group) and the relatively young age of the mice. Future

	studies using larger cohorts and later disease stages are needed to better evaluate the therapeutic potential of targeting astrocyte calcium signaling in SCA1.
6.	**Fred Anderson** *The Novel Sorbent ZO is an Effective Oral Gut Oxalate Binder: Therapeutic Implications for Hyperoxaluria, Hyperoxalemia, and Related Kidney Stones* **Faculty Advisor:** Hatim Hassan **Mentors:** Khalid Abdalla & Klein Wang **Sponsoring Program**: CLI-4394: Off-Campus Research **Home Institution:** University of Minnesota Rochester **Abstract:** There are currently no FDA-approved drugs that reduce plasma and urinary oxalate levels other than lumasiran and nedosiran, each of which decrease urinary oxalate excretion in primary hyperoxaluria type 1. Thus, broader oxalate-lowering therapies remain urgently needed. The gastrointestinal tract plays a major role in oxalate homeostasis as a site of both absorption and excretion. Thus, limiting gut oxalate absorption is a rational strategy to prevent and/or treat hyperoxaluria, hyperoxalemia, and related disorders. To this end, the Hassan Lab developed the novel sorbent ZO, a hydroxide-loaded anion exchanger, as an effective oral gut oxalate binder. A collaborator at HemoCleanse has demonstrated in rat studies that ZO is effective at binding phosphate in the gut, leading to reduced urinary and serum phosphate levels. We hypothesized ZO will also effectively bind oxalate in the gut and reduce urinary oxalate excretion. In vitro, ZO bound oxalate most effectively at pH 2 (simulating the stomach) when compared to pH 5.5 (simulating small intestine) and 7 (simulating colon). In vivo, ZO reduced 24-hour urinary oxalate excretion in mice. Relative to control mice, ZO (6 g/Kg body weight) reduced urinary oxalate excretion by 38.6%, 41.1%, and 39.1% after 1, 2, and 3 weeks, respectively.
7.	**Leslie Arredondo** *Pollen Viability in Wild potato relatives* (Solanum spp.) *reveals Reproductive Potential* **Faculty Advisor:** Laura Shannon **Mentors:** Logan Rodewald **Sponsoring Program**: SOAR-REEU **Home Institution:** Grinnell College **Abstract:** Potatoes *(Solanum tuberosum)* are a versatile global crop that feed billions, this diverse crop has hundreds of crop wild relatives, many of which are known to hybridize with potato. Unlike commercial potatoes in the US, which are tetraploid (4n), many wild potatoes are diploid (2n). Research investigations like Potato 2.0 aim to shift potato breeding towards a diploid inbred-hybrid system to simplify breeding by reducing chromosome number. Genetically understanding wild populations offers the potential to introduce valuable germplasm characteristics, like pollen viability, facilitating the selection of viable breeding candidates and addressing male and self fertility challenges in diploid breeding by introducing a viable wild relative. This study evaluates the pollen viability rate of 80 wild varieties, alongside a Genome-Wide Association Study (GWAS) identifying genomic regions associated with pollen viability. We quantified pollen viability with 2,3,5-triphenyltetrazolium chloride (TTC) staining and microscopic images, subsequently counting viable versus nonviable pollen cells to calculate the rate of pollen viability per wild. Linking phenotypic data with its respective genotype and analyzing with association tests reveals the genetic basis of male reproductive success in wild potatoes. The results of the investigation present a large distribution of viability rates across species.
8.	**Maya Aylward** *Quantifying Neural Activity UMAPs to Describe Economic Decision-Making Processes* **Faculty Advisor:** A. David Redish **Mentors:** Celia Gagliardi **Sponsoring Program**: LSSURP **Home Institution:** Emory University **Abstract:** Uniform Manifold Approximation and Projection (UMAP) is widely used to visualize high-dimensional neuroscience data, but its distance-warping properties have limited its use to qualitative visualization. We present a framework for quantifying UMAP embedding structure using pairwise distance regression against known task/behavioral variables, applied to a 60-minute session of neural ensembles recorded simultaneously from hippocampus (HC, 98 neurons), ventral orbital cortex (VO, 47 neurons), and lateral orbital cortex (LO, 156 neurons) during Restaurant Row, a neuroeconomic decision-making task in which rats choose whether to wait

	for food rewards of varying delays and values. For each region, we embedded the neural ensemble in a 2D UMAP, then computed pairwise Euclidean distances between embedding points and pairwise differences across eight task/behavioral variables (e.g., offer delay, value, decision), using linear regression to rank variables by R^2 and quantify how well each describes neural population geometry. In VO and LO, offer delay and value ranked highest, while the HC was best explained by wait-zone countdown. These regional differences suggest pairwise distance regression can transform UMAP from a qualitative visualization tool into a quantitative framework applicable across high-dimensional domains. We will extend this analysis to the full dataset of sessions to test whether these patterns generalize.
9.	**Elliot Ball-Dowling** *Causal Inference and Localization in Autism Spectrum Disorder* **Faculty Advisor:** Jean-Paul Noel **Mentors:** Tina Liu **Sponsoring Program**: LSSURP **Home Institution:** University of San Francisco **Abstract:** Sensory processing anomalies are well established in autism spectrum disorder (ASD). Here we hypothesize that these sensory anomalies are driven by altered causal inference: the process of attributing sensory signals to their underlying generative cause. To test this hypothesis, we used a multisensory localization task in which an auditory beep and a visual dot cloud were briefly presented simultaneously on a screen. In each trial, the auditory and visual stimuli were varied across four possible azimuths with varying disparities, creating thirty-two pairs of multisensory combinations. After each presentation, participants first indicated the perceived locations of the audio and then the visual stimuli, respectively. Behavioral, electroencephalography (EEG), and eye-tracking data were collected. The causal inference prediction was that auditory and visual cues attract one another at small disparities, thus biasing localization in a non-linear manner. Behavioral results were broadly consistent with Bayesian causal inference, with audiovisual disparity and visual reliability modulating multisensory integration. Across conditions, individuals with ASD showed reduced visual bias compared with TD participants.
10.	**Madeleine Bartlow-Sibley** *The Role of Medial Prefrontal Dopamine in Learning Under Uncertainty* **Faculty Advisor:** Nicola Grissom **Mentors:** Micaela Porod **Sponsoring Program**: LSSURP **Home Institution:** Wellesley College **Abstract:** Learning to associate cues or actions with rewards is critical for survival, with imbalances linked to neuropsychiatric conditions. Previous research indicates that dopamine broadly mediates associative learning. However, dopamine neurons do not broadcast a uniform signal but instead exhibit diverse, region-specific functions. Dopamine in the medial prefrontal cortex (mPFC) in particular has been difficult to study until recently, limiting understanding of its decision making role. With the advent of fiber photometry and fluorescent dopamine biosensors, dopamine fluctuations in mPFC can be measured and recorded in real-time. Here, mice (n=3) received injections of the viral sensor GRAB-DA3m and were implanted with optical fibers aimed at mPFC. Then, we recorded dopamine signals during probabilistic reversal learning and Pavlovian conditioning tasks. Previous work suggests a role for mPFC dopamine in adapting to change. Therefore, we hypothesize that mPFC dopamine is especially engaged during periods of reward uncertainty. If this is true, we expect enhanced dopamine release immediately following a reversal. In Pavlovian conditioning, we anticipate greater dopamine release during a probabilistic reward cue, compared to a certain reward cue. The results of our study will inform future research on the neurotransmitters involved in neuropsychiatric conditions characterized by maladaptive behaviors.
11.	**Jadlyn Bland** *UDP and Me: Increasing the Efficiency of UDP Event Analysis using a Novel Software Program* **Faculty Advisor:** Anthony Umpierre **Sponsoring Program**: LSSURP **Home Institution:** University of South Carolina

	Abstract: Epilepsy is a common neurological disease that is characterized by recurrent seizures. After injury, epilepsy has a gradual development period known as epileptogenesis. In past research, epileptogenesis has been associated with the release of uridine diphosphate (UDP), a pyrimidine that binds to P2Y6 receptors on microglial cells. This binding is linked to a neuroinflammatory effect that promotes epileptogenesis. Quantification of fluorescent UDP events has traditionally been done through manual analysis of video files; however, use of a new fluorescence tracking program, FluoroTracker, may improve the efficiency and objectivity of analysis. This study compares the efficiency and accuracy of manual and automatic UDP event tracking through analysis of program loading times and tracking times. Along with this, we compare the efficiency of three different sensitivity levels in the FluoroTrack program. We found that manual analysis was more efficient when ≥5 UDP events were present, but less efficient when <5 UDP events were present. We also found that the low and medium sensitivities were fairly comparable in efficiency, with the high sensitivity being the least efficient due to the number of false positives. These findings suggest that FluoroTrack is a valid analysis tool for quantifying fluorescent purine events.
12.	**Adrian Bosco** *Determining Persistence of Therapeutic Chimeric Antigen Receptor T cells in a Rhesus Macaque Model of HIV Infection* **Faculty Advisor:** Pamela Skinner **Mentors:** Mary Pampusch & Isabelle Finholm **Sponsoring Program**: Directed Research **Home Institution:** University of Minnesota Twin Cities **Abstract:** Although antiretroviral (ART) drug therapy suppresses viral loads, it fails to completely eliminate HIV reservoirs, and is not a cure for HIV/AIDS. One potential alternative is production of therapeutic T cells that express a chimeric antigen receptor (CAR), which allows them to better target and kill virus-producing cells, and a CXCR5 receptor to localize to where the virus is concentrated. The aim of this project was to determine CAR T cell persistence via qPCR, which provides a sensitive method of determining CAR presence. Six rhesus macaques were SIV-infected, treated with ART and released, then either treated with CAR T cells or left untreated. Blood and lymph nodes were collected over time. Genomic DNA was isolated, and quantitative PCR (qPCR) was used to examine levels of CAR/CXCR5 T cells from treated and control animals in order to determine length of persistence. We hypothesize that CAR T cell DNA will be present within the cells, and will be a better determination of CAR T cell persistence than flow cytometry. The information from this study will aid in the understanding of CAR/CXCR5 T cells and may aid in the development of a cure for HIV infections.
13.	**Madeline Bratvold** *The Growing Risk of Chronic Wasting Disease Spillover: Chronic Exposure of Wild Rodents to Environmental Prions* **Faculty Advisor:** Peter Larsen **Mentors:** Suzanne Stone **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** As Chronic Wasting Disease (CWD) continues to spread unimpeded across North America, there is increasing concern about the potential for CWD prions to cause prion diseases in a variety of species. CWD is a prion disease of cervids (e.g., white-tailed deer, mule deer, elk, etc.) and infected animals actively shed prions into the environment through their urine, feces, and carcasses. This observation, together with research indicating other non-cervid mammalian species are potentially susceptible to CWD prions, raises significant concerns about the potential for prion disease outbreaks in wildlife occurring in CWD endemic regions. The objective of this research project is to determine if CWD prions are circulating in wild rodents. Tissue samples were collected from wild rodents and tested for prion presence/absence using RT-QuIC technology following standard methods. White-tailed deer CWD-positive and- negative tissues were used as controls. Sixteen samples from the MNPRO biorepository were tested. Initial results reveal consistent prion seeding activity in at least four rodent samples from the Peromyscus genus and species Blarina brevicauda. Confirmation of rodent-borne prions will require additional research. Considering this pilot study, additional surveillance of wild rodents in CWD endemic areas is warranted.

14.	**Ian Brooks** *Motor Coordination and Gliosis in a Global Heterozygous Knockout of Wild-Type ATXN1 in Mice* **Faculty Advisor:** Marija Cvetanovic **Mentors:** Gavin Fuchs **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Spinocerebellar Ataxia Type 1 (SCA1) is a fatal, autosomal dominant neurodegenerative disease caused by a glutamine-encoding repeat expansion in the ATXN1 gene. Its most significant proximal cause is generally considered to be Purkinje cell death, but glial dysfunction has also been implicated. Recently, the Cvetanovic Lab has used a mouse model of the disease to show that knocking out the mutant allele in microglia and macrophages may improve disease phenotypes in behavior and cell pathology, suggesting that microglia may contribute to symptoms independent of Purkinje cell death or dysfunction. This interpretation assumes that changes are caused by knockout of the disease-causing mutation, and thus would not be caused by knocking out the wild-type ATXN1 allele. To test this, we raised mice with a global knockout of wild-type ATXN1, meaning they only carried one copy of the allele ($ATXN1^{2Q/-}$) compared to control mice ($ATXN1^{2Q/2Q}$). We performed behavioral testing and used immunohistochemistry to measure differences in motor coordination, cognition, and glial cell populations. Differences would suggest that knocking out wild-type ATXN1, as opposed to mutant ATXN1, can affect the response variables measured in our previous study. Therefore, we expect to observe no significant differences between $ATXN1^{2Q/-}$ and $ATXN1^{2Q/2Q}$ mice.
15.	**Corinne Byus** *Living Legacy: The Effect of Intercropping on Intermediate Wheatgrass* **Faculty Advisor:** Jacob Jungers **Mentors:** Grace Doyle **Sponsoring Program**: Forever Green Initiative URE **Home Institution:** Macalester College **Abstract:** Intermediate Wheatgrass *(Thinopyrum intermedium)* (IWG) is a crop that is growing in popularity on farms in the Midwest and in the Pacific Northwest. Its versatility allows farmers to harvest and sell it for both grain for human consumption and forage for livestock consumption. Additionally, as a perennial crop, it has the ability to continuously benefit farmers without it having to be replant annually after harvest. As this crop requires a period of vernalization before flowering it can only produce grain after its second year in the ground. For farmers using a mono-crop system, after the first year, all there is to harvest is forage. If not that, they are unable to this gain revenue for the crop that year as it continues to grow. This is where companion cropping can come into play. When Intermediate Wheatgrass is planted in an intercrop system with a annual companion crop such as Barley or Oats, farmers have the ability to harvest the annual while allowing the perennial to grow until it comes time for the harvest of the IWG. In addition to bringing in revenue, this cropping system bring additional benefits to the farmer like suppressing weeds.
16.	**Felipe Canaca** *Antidepressant-Like Effects of Angiotensin-Converting Enzyme Inhibition Following Chronic Social Defeat Stress* **Faculty Advisor:** Patrick Rothwell **Mentors:** Nicole Quintus & Ursula Girdwood **Sponsoring Program**: LSSURP **Home Institution:** University of Michigan **Abstract:** Approximately 8.3% of all US adults have experienced a major depressive episode, with a higher prevalence among females (10.2%) compared to males (6.2%), yet its etiology is not fully understood. Depression has been linked to down-regulation of the endogenous opioid system, leading to investigations of potential antidepressant medications that enhance endogenous opioid signaling without creating risk of abuse. Captopril is an angiotensin-converting enzyme (ACE) inhibitor used to treat hypertension. However, our lab has found that ACE cleaves enkephalins in the central nervous system, modulating endogenous opioid signaling. Thus, inhibiting ACE with captopril is a potential mechanism by which to counteract down-regulated opioid signaling in depression states. To study this, mice were exposed to ten days of chronic social defeat stress (CSDS). The mice were tested for social interaction before and after CSDS, showing reduced social interaction representative of depression-like behavior after CSDS. This phenotype was then rescued in male mice treated with captopril in the drinking water for 24 hours, but not in a control group receiving normal drinking water.

	However, this effect of captopril was not observed in female mice, necessitating further studies about the mechanism of CSDS and efficacy of ACE inhibition in female mice.
17.	**Dara Carneol** *Evaluating Yellowbud Hickory By-product as Mulch in Container Plantings* **Faculty Advisor:** Brandon Miller **Mentors:** Herika Pessoa **Sponsoring Program**: SOAR-REEU **Home Institution:** University of Wisconsin–Madison **Abstract:** The cultivation of yellowbud hickory [*Carya cordiformis (Wangenh.) K. Koch*] is gaining traction in the Upper Midwest not only as a resilient tree for landscape use, but also for newfound interest in development as a specialty oil crop. Similar to other specialty tree crops, their husks-a byproduct of processing for oil production-could be utilized as a locally sourced mulch for container nursery production. This study evaluated the effectiveness of yellowbud hickory husks as a mulch in container plant production compared to five other mulch treatments: control (no mulch), rice hulls, pine bark nuggets, sawdust, and hazelnut shells. Pots were filled with a commercial potting substrate, a petunia [Petunia ×hybrida Hook. (Regel)] transplant, and inoculated with rye grass (*Lolium spp. L*) and white clover (*Trifolium repens L.*). Over a 30-day period, internal temperature, moisture levels, weed seed germination, and plant growth were measured. Data were analyzed using analysis of variance and Tukey's honest significant difference for mean separation (α =0.05). Yellowbud hickory husks were as effective as, or superior to, the other mulches for retaining soil moisture and reducing white clover emergence. Comparable to other industry-standard mulch materials, yellowbud hickory husks may be a local and cost-effective option for nursery growers.
18.	**Evelyn Cegielski** *Development of Functional Assays to Characterize Pathogenicity of a Novel Caspase-8 Variant* **Faculty Advisor:** Beth Thielen **Mentors:** Sarah Wall **Sponsoring Program**: LSSURP **Home Institution:** Miami University **Abstract:** Whole genome sequencing (WGS) is increasingly used as a first-line diagnostic tool for children with unexplained developmental delay or undiagnosed disease. Per ACMG guidelines, novel pathogenic variants identified by WGS require confirmation through population, computational, and functional evidence. (Although population and computational data are readily accessible, functional validation demands rigorous mechanistic study. We identified a novel caspase-8 variant (R233W) in a patient presenting with hepatosplenomegaly and chronic lymphadenopathy. Caspase-8 initiates the extrinsic apoptotic pathway, which maintains lymphocyte homeostasis; its dysregulation causes lymphocyte accumulation characteristic of Autoimmune Lymphoproliferative Syndrome (ALPS). While ALPS is classically linked to FAS-ligand binding domain mutations, this patient's variant instead maps to the caspase-8 protein itself. A related variant, R248W, has previously been associated with ALPS-Caspase-8 Enzyme Deficiency, suggesting R233W may similarly impair caspase-8 activation and reduce apoptotic signaling. Rather than relying on primary patient lymphocytes, which are difficult to obtain and sustain, we generated a translational cell line via site-directed mutagenesis to model this variant. Western blot and flow cytometry assays are being developed to characterize caspase-8 activation and self-cleavage. These findings will provide functional evidence supporting pathogenicity classification of the R233W variant.
19.	**Jahdiel Cervantes-Guzman** *Literature Review: Moderator Role of Racial Socialization on the Relation Between Perceived Discrimination and Epigenetic Age Acceleration* **Faculty Advisor:** Juan Del Toro **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** Chronic stress can cause epigenetic age acceleration, which is a cellular indicator of premature biological aging, which is linked to poorer health and shorter lifespans. Due to interpersonal discrimination, defined as unfair treatment based on race or ethnicity, racial minorities face unique, persistent stressors that can trigger this premature aging. While parents frequently use ethnic-racial socialization by sharing cultural

	pride and preparing youth for systemic racial challenges to support their children, little research has explored whether these practices protect youth from these long-term biological harms. This study evaluates whether recollections of racial socialization in early buffer weaken the association between racial discrimination and biological age acceleration. We hypothesize that recollections of racial socialization significantly weaken the association between perceived discrimination and epigenetic age acceleration. Prior to testing our hypotheses, we conducted a literature review to synthesizes existing scholarship on discrimination, racial socialization, and biomarkers of aging. By aggregating current empirical findings, this review examines how early-life racial socialization is conceptualized as a moderator, thereby identifying critical research gaps and establishing a clearer framework for future study. This study aims to clarify the efficacy of parental racial socialization, and to empower minority communities with actionable psychosocial strategies against interpersonal stress.
20.	**Vincent Chen** *The Effect of mKate2 Gene on Arenavirus Replication* **Faculty Advisor:** Craig Bierle **Mentors:** Matt Pekarek & Hoang Nguyen **Sponsoring Program**: LSSURP **Home Institution:** Cornell University **Abstract:** Arenaviruses are a family of RNA viruses that include *Lassa virus*, which can cause high morbidity and mortality infections during pregnancy. Research has found that placental infection contributes to adverse fetal outcomes, yet the molecular mechanisms of arenavirus replication in the placenta remain poorly understood. *Pichinde virus* (PICV) is used as a surrogate arenavirus model because the virus is nonpathogenic to humans. Experiments in our lab have demonstrated that PICV P18 isolate infects human trophoblast stem cells and the guinea pig placenta. Reporter viruses expressing fluorescent proteins such as mKate2 enable visualization of infection, but the inserted gene may alter viral fitness and replication kinetics. Preliminary guinea pig infection studies suggest that the reporter virus is less virulent than wild-type PICV. In this study, Vero cells were infected with wild-type (WT) PICV P18 virus (n=3) or a recombinant virus expressing mKate2 (n=3). Viral titers were determined by plaque assay at 24, 48, 72, and 96 hours post-infection. Incorporation of the mKate2 gene decreased PICV plaque formation, suggesting that mKate2 insertion impairs P18 strain replication in vitro. These findings demonstrate that mKate2 incorporation has a deleterious effect on Pichinde virus replication, highlighting the importance of reporter gene insertion on viral pathogenesis.
21.	**Jiayi Chen** *Optimizing Winter Camelina Relay Cropping Through Planting Timing and Row Configuration* **Faculty Advisor:** Yusef Mohammed **Sponsoring Program**: Forever Green Initiative URE **Home Institution:** University of Minnesota Twin Cities **Abstract:** Relay cropping with winter camelina [*Camelina sativa (L.) Crantz*] has the potential to provide additional economic and environmental benefits in the Upper Midwest US. However, management practices such as soybean relay planting time and camelina row configuration may influence the camelina seed yield and its oil content. This study evaluated the effects of three soybean relay planting dates based on camelina growth stages following BBCH scale (BBCH35, BBCH60, and BBCH75) and camelina row configuration: two rows (CR2) and three rows (CR3) in a winter camelina–soybean relay cropping system. The experiment was conducted in randomized compete block design in three replications with the plot size of 7.62 m by 3.05 m at Rosemount, Minnesota. Camelina was planted on September 30/2025 and harvested on July 7/2026. Soil moisture was monitored weekly at six soil depths using PR2, and camelina seed yield and oil content were measured. This preliminary result showed that the effect of row spacing and soybean relaying date on seed yield and oil content were not significant. However, there was a trend of greater seed yield for CR3 (1192 kg ha-1) compared to CR2 (962 kg ha-1). Similarly, camelina seed yield was greater when soybean was relayed earlier.
22.	**Ethan Child** *Quantitative Analysis of Senescence Induction in Normal and Cancerous Breast Epithelial Cells* **Faculty Advisor:** Eric Batchelor **Mentors:** Ingrid Aragon **Sponsoring Program**: LSSURP **Home Institution:** Brigham Young University

	Abstract: TP53 plays an essential role in cellular stress responses, and its expression can be upregulated in response to DNA damage, among other stressors. This upregulation of TP53 temporarily triggers cell cycle arrest, but if the damage is too severe, the cell can proceed to apoptosis or senescence. Which outcome occurs is largely determined by TP53 levels and expression dynamics. We have shown that treatment with doxorubicin, followed by specific, scheduled treatments with Nutlin-3a results in a significantly higher rate of senescence induction among cancerous epithelial breast tissue than healthy epithelial breast tissue. An important aspect of these experiments is the use of the Cellular Senescence Assay, which uses the expression of beta-galactosidase as an indicator of cellular senescence. While this is useful, annotating these images by hand is time-consuming and subject to human error. To address these concerns, we developed an ImageJ macro script to help analyze these images. We demonstrate that this pipeline can closely replicate the results of manual annotations in less time and without variability from human bias. Taken together, these results provide for more efficacious dosing regimens for targeted treatment of cancerous tissue, allowing for better quantified and more effective use of existing chemotherapeutics.
23.	**Ellen Chinema** *Reviewing The Status of Microbial Contamination in Water Sources in the United States: A Minnesota Emphasis* **Faculty Advisor:** Claudia Munoz-Zanzi **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** The increased risk of exposure to waterborne illnesses through surface water systems remains a relevant public health issue in the United States. Aging water infrastructure, climate variability, agriculture, and recreational water use have led to the persistence of infectious pathogens in rural and urban water sources. This study's overall aim is to investigate the status of microbial contamination of water sources. A first objective is to summarize the research evidence of microbial contamination in the United States, with emphasis on Minnesota. I am applying systematic literature review methods to search the OVID Medline database using specific keywords. A total of 1,830 results were retrieved for screening, of which 81 met the eligibility criteria. A standardized data extraction process described study location, time, water sources investigated, and microbial contamination markers. For a second objective, preexisting Minnesota watershed data and land cover data to identify a correlation between surrounding environments and microbial contamination. The study will provide an update on the status of water quality research in Minnesota and describe the correlation with external factors. Results can be used for further research on water contamination catalysts, to improve and monitor water quality, and promote safer drinking and recreational water sources in Minnesota.
24.	**Elisa Chow** *Investigating the Effect of Plasma-Activated Water on the Functional and Baking Properties of Germinated Intermediate Wheatgrass Flour* **Faculty Advisor:** George Annor **Mentors:** Obed Aduama **Sponsoring Program**: Forever Green Initiative URE **Home Institution:** University of Minnesota Twin Cities **Abstract:** Intermediate wheatgrass *(Thinopyrum intermedium)*, also known commercially as Kernza®, is a perennial grain with growing attention due to its environmental, nutritional, and market potential. Plasma-activated water (PAW), treatment of water with cold plasma, is also an emerging technology in the food industry. In this study, the effects of PAW on the pasting properties, dough rheology, protein aggregation kinetics, and baking properties of germinated intermediate wheatgrass (IWG) flour were investigated. The ungerminated IWG flour (control) had a significantly higher maximum viscosity (181.5 BU), breakdown viscosity (61.5 BU), and setback viscosity (205 BU) than the maximum viscosity (37.5 BU), breakdown viscosity (26.5 BU), and setback viscosity (15.5 BU) of IWG germinated with PAW. The control also had significantly higher maximum torque (28.5 BU) and aggregation energy (751.59 GPE) compared to the maximum torque (19 BU) and aggregation energy (527.775 GPE) of IWG germinated with PAW. Active research is being done to examine the effect of PAW and germination on the baking properties of IWG flour.

25.	**Brianna Colborn** *Effects of GA_{4+7} and KNO_3 Seed Priming on Kentucky Bluegrass Germination and Establishment* **Faculty Advisor:** Dominic Petrella **Mentors:** Xin Xin **Sponsoring Program**: SOAR-REEU **Home Institution:** University of Wisconsin–Eau Claire **Abstract:** Kentucky bluegrass *(Poa pratensis L.; KBG)* is a widely used cool-season turfgrass for athletic fields, lawns, and parks. However, its slow germination and establishment can delay turf development and increase the risk of weed competition and soil erosion. Gibberellins are a group of plant hormones that promote plant germination, growth, and developmental processes. The objective of our study was to evaluate the effects of seed priming with gibberellic acid (GA_{4+7}) and 0.2% potassium nitrate (KNO_3) for KBG germination and establishment. Seeds from 15 KBG cultivars were primed with 100uM GA_{4+7} +0.2% KNO_3 and completely dried before being used in this study. Germination was evaluated in a growth chamber maintained at 25°C during the day and 20°C at night under a 12-hour photoperiod. Establishment was evaluated under greenhouse conditions. We also examined the correlation of 1,000 seed weights and their germination characteristics. Across the tested cultivars, seeds primed with GA_{4+7} and KNO_3 germinated and established more rapidly than untreated seeds. These results indicate that combined GA_{4+7} and KNO_3 seed priming may provide a practical approach for accelerating KBG germination and early establishment.
26.	**Kaycie Cowden** *Effects of $GABA_{B1}$ Receptor Deletion in Dopamine Neurons on Alcohol-Seeking* **Faculty Advisor:** Jocelyn Richard **Mentors:** Jonathan Aguirre **Sponsoring Program**: LSSURP **Home Institution:** Lycoming College **Abstract:** Not many alcohol use disorder (AUD) treatments exist despite the large number of people in the US with AUD. Activation of ventral tegmental area (VTA) GABAB receptors with baclofen is known to suppress alcohol-seeking behaviors, but the specific neuron population driving these effects remains unknown. We hypothesize that VTA dopamine (DA) neuron $GABA_{B1}$ receptors could be driving the effects of baclofen. Our goal was to study how the deletion of VTA DA neuron $GABA_{B1}$ receptors impacted alcohol-seeking. Following pre-exposure to and operant training with alcohol, rats underwent deletion of VTA DA $GABA_{B1}$ receptors using a Cre-dependent CRISPR-Cas9 viral approach. Rats were then tested during extinction learning and cued reinstatement. We found no general effect of VTA DA $GABA_{B1}$ deletion. This suggests that endogenous activation of $GABA_{B1}$ receptors does not alter alcohol-seeking. However, these receptors may still be important for the effects of baclofen in the VTA. Future research is needed to fully comprehend the role of VTA DA $GABA_{B1}$ receptors when intra-VTA baclofen is delivered during alcohol-seeking behaviors.
27.	**Mikey Davis** *Searching for the Beginning of the Universe: Analyzing LIGO/VIRGO O1-O4b Data For Evidence of Domain Walls* **Faculty Advisor:** Vuk Mandic **Mentors:** Tore Boybeyi **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** Recent improvements in gravitational wave (GW) detection technology have allowed the cosmological community to explore other, non-astrophysical sources of GWs, such as from domain walls (DWs). We explored this new frontier by examining two DW models, one from a prior paper and the other from our own research, with data from the recent LIGO O4 run. Our paper verifies and reproduces the results from past O1-O4a analyses, then examines how the two models compare against each other with recently released O4b observing run. We find that the addition of O4b data does not imply the presence of a domain wall in either model, but we do consider and examine potential options for third-generation terrestrial detectors like Cosmic Explorer or the Einstein Telescope for the detection of DWs in the future.

28.	**Thomas DeGeus** *Amygdala Acetylcholine is Necessary for Surprise-Induced Learning* **Faculty Advisor:** Kurt Fraser **Mentors:** Elle Russell & Serena Miller **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Basolateral amygdala acetylcholine is key in cue-reward learning, with cholinergic signaling changing in real time with salient reward-predicting events. How cholinergic signaling in the BLA impacts learning about unexpected cues and outcomes is still unknown. Here we trained rats in a blocking paradigm where one visual cue (A) is paired with high-value reward, and a separate visual cue (B) is paired with low-value reward. After training rats received intra-BLA infusions of saline, mecamylamine, or scopolamine before each of 4 compound conditioning sessions. In these sessions an auditory cue X was paired with A and associated with the same high-value reward as in training. An auditory cue Y was paired with B and indicated an upshift in value from low- to high-value reward. As a result, we expected learning to X to be blocked by the presence of A, but learning to Y to occur because of the change in value. When testing each cue alone, we found that saline and mecamylamine groups responded as expected, however, scopolamine treated rats had no responding to X or Y, instead responding to low-valued cue B, suggesting muscarinic ACh receptors have a role in giving attention to and learning about cues in our environment.
29.	**Clara Deneault** *High-Lysine Pennycress Seed Meal for Monogastric Livestock Feed* **Faculty Advisor:** Michael Smanski **Mentors:** Jane Swanberg & Sonja Swanson **Sponsoring Program**: Forever Green Initiative URE **Home Institution:** Elon University **Abstract:** Cover crops play an essential role in creating a sustainable system of agriculture, as they aid in the protection of soil, reduce erosion, and decrease nutrient runoff, while simultaneously providing farmers a new source of income. An emerging cover crop is pennycress, an oilseed crop that has the potential to produce useful products, such as jet fuel and animal feed, and can be integrated easily into existing crop rotations. These prospective products increase the economic value of pennycress for farmers, allowing them to produce sustainable products while concurrently protecting their soil. Pennycress seed meal, however, is deficient in an important amino acid called lysine, which aids in livestock growth and health and must currently be provided by external supplements that add an additional cost to farmers. For this meal to be a viable ingredient for monogastric livestock feed and an economically valuable cover crop, its lysine content must be improved. To address this issue, a modular cloning system was used to introduce more lysine into the DNA sequences of two abundant proteins found in pennycress seeds, cruciferin and napin.
30.	**Mai Dinh** *Histone Deacetylase 6 promotes Nrf2-mediated Antioxidant Response to Reduce Sickle Cell Disease Pathology* **Faculty Advisor:** Joan Beckman **Mentors:** Julia Nguyen **Sponsoring Program**: LSSURP **Home Institution:** Macalester College **Abstract:** Sickle cell disease (SCD) causes acute and chronic hemolysis that promotes painful vaso-occlusion (VO) and oxidant-mediated organ damage. Histone deacetylase 6 (HDAC6) controls oxidant response by deacetylating non-histone proteins such as Nrf2, which reduces VO and organ pathology in SCD. We hypothesize that HDAC6 loss increases Nrf2-mediated antioxidant activity to protect against SCD VO and organ damage. To investigate this, we used primary lung endothelial cells (ECs) isolated from wild-type (WT) and HDAC6 knockout (HDAC6KO) mice. ECs were treated with hemin or lipopolysaccharide (LPS) to stimulate SCD-related inflammation, and reactive oxygen species (ROS), P-selectin, and von Willebrand factor (vWF) were measured. Compared with LPS-treated WT ECs, LPS-treated HDAC6KO ECs had significantly reduced ROS, P-selectin, and vWF expression. We next created chimeras by transplanting control Townes AA or sickle cell model Townes SS bone marrow into WT and HDAC6KO recipients. Lung tissue staining showed HDAC6KO-SS mice had lower VO than WT-SS mice, with no significant differences in vWF or P-selectin expression between

	HDAC6KO-AA and HDAC6KO-SS chimeras. Together, these data suggest HDAC6KO reduces TLR-4-mediated activation and ROS. Future studies will evaluate chimeras for antioxidant pathway activation.
31.	**Miranda Dominguez** *Effects of Pharmacological Inhibition of Farnesyltransferase on Microglial Inflammation* **Faculty Advisor:** Ling Li **Mentors:** Kristina Fredriksen & Siddhi Shripad Joshi **Sponsoring Program**: SCoPE **Home Institution:** St. Olaf College **Abstract:** Alzheimer's disease (AD) is a major neurodegenerative disease characterized by amyloid-β plaques, tau tangles, and neuroinflammation. Recent studies indicate AD brains exhibit elevated levels of farnesyltransferase (FT) that catalyzes protein farnesylation, a post-translational modification of proteins facilitating membrane trafficking and downstream signaling. Microglia are immune cells in the brain responsible for neuroinflammation, protecting neurons by clearing protein aggregates, however chronic inflammation can lead to neurodegeneration and cognitive decline. The role of farnesylation in modulating microglial responses is poorly understood. This study aims to explore the effects of FT inhibition on inflammation in microglia using the FT inhibitor tipifarnib. Mouse microglial BV2 cells were treated with tipifarnib to assess dose dependent effects on protein farnesylation. To induce inflammation, cells were treated with a toll-like receptor 3 (TLR3) agonist polyinosinic:polycytidylic acid (Poly IC) and TLR4 agonist lipopolysaccharide (LPS). Microglial activation and protein farnesylation were assessed using immunofluorescence and western blotting. Results show that tipifarnib treatment at 1 μm for 24 hours is sufficient to robustly inhibit farnesylation in BV2 cells. Future experiments are expected to define the role of farnesylation in microglial inflammation in AD pathogenesis and the therapeutic potential of FT inhibition for AD.
32.	**Sharlyn Donoza** *Cholinergic Control of Cue-Driven Reward Seeking in the Amygdala* **Faculty Advisor:** Kurt Fraser **Mentors:** Elle Russell & Serena Miller **Sponsoring Program**: LSSURP **Home Institution:** University of California, Riverside **Abstract:** The basolateral amygdala (BLA) and central amygdala (CeA) contribute to distinct aspects of motivated behavior. The BLA supports specific outcome-mediated reward seeking, and the CeA supports more general motivational invigoration. Both structures receive cholinergic input from distinct sources. We sought to characterize how acetylcholine in the BLA and CeA contributed to cue-induced motivation. Seventeen Long-Evans rats (9 males, 8 females) first underwent Pavlovian conditioning in which one cue (CS+) predicted 20% sucrose and another (CS−) predicted nothing, then learned to lever-press for 20% sucrose. At test, rats receive intra-BLA or intra-CeA infusions (0.5 μL) of saline, the nicotinic antagonist mecamylamine, or the muscarinic antagonist scopolamine, and lever-pressing is assessed under extinction. At the same time, CS+ and CS− are presented to measure cue-energized reward seeking. We hypothesize that cholinergic signaling in the BLA and CeA contributes differently to cue-driven motivation. To assess general pavlovian-to-instrumental transfer, we do not predict that blocking ACh receptors in the BLA will alter cue-induced lever-pressing. In contrast, blocking ACh receptors in the CeA is expected to disrupt CS+ induced lever-pressing evidence for a loss of motivational invigoration. These data will open new directions to understanding cholinergic control of amygdala function in health and disease.
33.	**Alyssa Dosse** *"But I've Never Even Had Anal Sex Before!": Zonality of Anal High-Grade Dysplasia in Women Versus Gay Men* **Faculty Advisor:** Deanna Teoh **Sponsoring Program**: M-ASCEND **Home Institution:** University of Minnesota Twin Cities **Abstract:** The International Anal Neoplasia Society released anal cancer screening recommendations in 2023 for high-risk groups, including women with a history of gynecologic human papillomavirus (HPV)-associated disease. The misconception that anal sex is a prerequisite for disease alongside stigma against anal sex for women is a barrier to screening uptake. We hypothesize women are more likely to have perianal and distal anal lesions due to auto-innoculation from the gynecologic tract, while men who have sex with men (MSM) are more

	likely to have proximal anal lesions due to penetrative intercourse; however, literature on anal lesion distribution is scant. To analyze this, a retrospective cohort study was conducted using electronic health records of participants having undergone high resolution anoscopy at the University of Minnesota in the last 5 years. The primary endpoint is location of high-grade anal dysplastic lesions (AIN2 or 3) in women versus men, the majority of which are MSM or transgender women. These findings could help to reduce stigma and misconception that anoreceptive intercourse is a prerequisite for anal high-grade dysplasia, and potentially increase screening uptake among women who are at increased risk for anal cancer due to the presence of HPV-associated gynecologic disease.
34.	**Simon Duerst** *Nicotine Analysis in Spent Cigarette Filters from Relit and Continuously Smoked Whole Cigarettes* **Faculty Advisor:** Irina Stepanov **Mentors:** Irina Stepanov & Aleksandra Alcheva **Sponsoring Program**: M-ASCEND **Home Institution:** Bemidji State University **Abstract:** Cigarette relighting (extinguishing, saving, and later finishing a cigarette) is common, but its effect on exposures to smoke-toxicants remains understudied. To compare nicotine levels in spent cigarette filters from relit and continuously smoked whole-cigarettes, we analyzed 88 spent cigarette filters collected from 22 adults who completed two laboratory visits. At each visit, they smoked their usual-brand cigarettes ad libitum through a smoking topography device, smoking one whole-cigarette and one relit cigarette in randomized order. Nicotine was quantified from a 10-mm mouth-end filter section by LC-MS/MS using isotopically labeled internal standard. Nicotine levels were averaged within participants by condition across visits, and compared using a paired-samples t-test. We assessed associations between filter nicotine and participant demographics, cigarette characteristics and smoking topography. Nicotine levels were significantly higher in relit than in whole-cigarette filters ($p = 0.009$). Nicotine levels in spent filters were not associated with participant characteristics or smoking topography. Higher nicotine levels in spent filters from relit cigarettes suggest that relighting may affect tobacco smoke exposures. Ongoing analysis of filters collected during naturalistic smoking and analysis of smoke generated using participant-specific smoking topography will further characterize the differences in toxicants exposures associated with relighting.
35.	**Mia Dunlap** *Investigating the Effects of Early-Life Iron Deficiency and Insulin Treatment on Mitochondrial Quality Control Processes in the Hippocampus* **Faculty Advisor:** Thomas Bastian **Mentors:** Julie Bailard & Livia Reeves **Sponsoring Program**: LSSURP **Home Institution:** The University of Alabama **Abstract:** Developmental iron deficiency (ID) is one of the most common nutritional health issues worldwide. Cognitive and behavioral deficits that result from early-life ID often persist through adulthood despite iron repletion around 6 –24 months old. Developmental ID may disrupt mitochondrial morphology and function during critical periods of brain development. The hippocampus is particularly susceptible to ID, making it the critical area of study. We hypothesize that early-life ID induces long-term alterations in neuronal mitochondrial quality control. To model developmental ID, pregnant rat dams were fed an iron-sufficient or iron-deficient diet throughout gestation before restoring dietary iron beginning at postnatal day 7 (P7). Iron-deficient pups received either intranasal insulin or saline daily from P7 to P14. Hippocampal tissue was collected during peak hippocampal development at P14 and processed into whole-cell homogenates and mitochondrial samples for Western blotting. Hippocampal iron status was confirmed through transferrin receptor and ferritin protein expression. When evaluating mitochondrial quality control proteins, increased fission (Drp1) was observed in ID synaptic mitochondria. A similar trend was not observed for fission in nonsynaptic mitochondria or fusion (Opa1) in either sample. These findings suggest that quality control of mitochondria in developing hippocampus depends on iron availability, subcellular location, and metabolic regulation.

36.	**Callum Dvorak** *Assessing Impact of Xylazine Delivery to the Central Nervous System in the Presence or Absence of Perfusion* **Faculty Advisor:** Carolyn Fairbanks **Mentors:** Riddhi Vivek Kini **Sponsoring Program**: UMN Pain Consortium **Home Institution:** University of Minnesota Twin Cities **Abstract:** Xylazine, an α_{2A} adrenergic receptor agonist, has been escalatingly detected in samples of illicitly manufactured fentanyl. Despite concerns of increased opioid overdose from xylazine-fentanyl combinations, current understanding of xylazine and combination pharmacokinetics (PK) is limited. To inform PK experimental design, we compared xylazine concentrations in perfused and non-perfused mice. This was performed with liquid chromatography-mass spectrometry (LC/MS) analysis of plasma, brain, and spinal cord samples from subcutaneously injected male and female mice.
37.	**Kyla Elsbury** *Effect of NK1R Antagonist RP67580 on Alveolar Bone Loss in Ligature-Induced Periodontitis* **Faculty Advisor:** Drake Williams **Mentors:** Melanie Barksdale **Sponsoring Program**: LSSURP **Home Institution:** St. Olaf College **Abstract:** Periodontitis is a common chronic inflammatory disease that progressively destroys tooth-supporting tissues, including alveolar bone. Chronic inflammation in this tissue drives osteoclast activation and bone resorption through immune cell recruitment and cytokine-mediated signaling. Substance P (SP), a neuropeptide released at inflamed mucosal sites, signals through the neurokinin-1 receptor (NK1R) to amplify local immune responses, promoting leukocyte infiltration, proinflammatory cytokine production, and osteoclastogenesis in the periodontium. Prior work demonstrates that genetic ablation of SP or local NK1R blockade reduces alveolar bone loss in ligature-induced periodontitis, yet the effect of systemic NK1R antagonism remains poorly defined. We therefore examined whether blocking NK1R systemically could reduce periodontal disease severity and alveolar bone loss in a murine ligature-induced periodontitis model. Twenty-four mice were assigned to four groups (ligated or non-ligated treated with NK1R antagonist RP67580 or vehicle) and received daily intraperitoneal injections for eight days. Alveolar bone loss was quantified by micro-CT analysis. Our findings did not provide sufficient evidence to reject the null hypothesis that systemic NK1R antagonism has no effect on alveolar bone loss in this model. This suggests that local receptor engagement and dosing parameters warrant further optimization to clarify the therapeutic potential of NK1R blockade in periodontitis.
38.	**Jiaheng Fan** *Development of Second-Generation Retinoic Acid Receptor-Alpha Antagonists for Nonhormonal Male Contraception.* **Faculty Advisor:** Gunda Georg **Mentors:** Noha Taher & Ehfazul Haque **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Male contraceptive options remain limited, creating a need for safe, reversible, and non-hormonal alternatives. This project focuses on developing selective retinoic acid receptor alpha (RARα) antagonists because RARα signaling is essential for normal spermatogenesis. A potent RARα antagonist, SR230126A, was identified through a DNA-encoded library screen and provides a novel chemical scaffold for further optimization. New analogs will be designed using structure-activity relationship studies and induced-fit molecular docking to improve potency, selectivity, and drug-like properties. The compounds will be synthesized and characterized by 1H NMR and LC-MS to confirm structure and purity. Their antagonist activity, RAR isoform selectivity, agonist activity, and cellular toxicity will be evaluated using TR-FRET biochemical assays and β-lactamase cell-based assays. Promising compounds will undergo additional evaluation of solubility, permeability, metabolic stability, pharmacokinetics, and effects on sperm production. This research may advance selective RARα antagonists as reversible, non-hormonal male contraceptive candidates.

39.	**Zoey Foss** *Untangling Perennial Cereal Rye: History and Ploidy in the UMN Breeding Program* **Faculty Advisor:** James Anderson **Mentors:** Hannah Stoll **Sponsoring Program**: Forever Green Initiative URE **Home Institution:** University of Minnesota Twin Cities **Abstract:** As environmental concerns and agricultural challenges grow, perennial cover crops such as perennial cereal rye (PC-Rye; *Secale cereale x S. strictum*) have become a valuable tool for farmers. A dual-use grain and forage crop, PC-Rye is currently being developed at the University of Minnesota as part of the Forever Green Initiative with the goal of presenting another environmentally-friendly choice available in cropping systems. As a perennial, PC-Rye protects soil during the winter and requires less money and labor from farmers, who can harvest for several years after planting. PC-Rye is currently in its third breeding cycle, the first cycle having been planted with a mix of 400 diploid, 99 tetraploid, and 121 S. strictum (diploid) accessions and allowed to open pollinate. This project aims to determine the ploidies of C3 parent plants in order to achieve a streamlined breeding program with uniform ploidy and alleviate the risk of aneuploidy, failed pollination, and sterility in future generations. This work lays the foundation for future efforts to improve sustainability in agriculture in Minnesota and beyond.
40.	**Danielle Gao** *Dopamine Facilitates Hippocampal Synaptic Plasticity through Activation of Astrocyte Calcium Signaling* **Faculty Advisor:** Alfonso Araque **Mentors:** Rafael Falcon-Moya **Sponsoring Program**: LSSURP **Home Institution:** Smith College **Abstract:** Long-Term Potentiation (LTP) is a long-lasting activity-dependent enhancement of synaptic transmission. It is a cellular mechanism underlying learning and memory. Dopamine (DA) is a neuromodulator with key roles in brain function. In the hippocampus, DA regulates CA3-CA1 synaptic plasticity. The involvement of astrocytes in this process remains underexplored. Mice were injected in the hippocampus with AAV5-GfaABC1D-PI-LckGCaMP6.SV40 to image astrocyte Ca2+, AAV8-GFAP-hM3D(Gq)-mCherry for DREADD stimulation, and AAV8-GFAP-Melanopsin-mCherry for optogenetic stimulation. DAT-Cre mice were injected with AAV5-hSynFLEX-ChrimsonR-tdTomato into the VTA to optostimulate DA axons. Astrocyte Ca2+ was monitored using confocal microscopy and ImageJ and AQuA software. CA3-CA1 fEPSPs were recorded and LTP was evoked by theta burst stimulation (TBS). TBS paired with DA enhanced the LTP. Astrocytes responded with Ca2+ elevations to DA. Opto or chemogenetic stimulation of astrocytes enhanced the LTP. DA-induced LTP enhancement was impaired in IP3R2cKO, Calex, and aD1R-/- mice. Dopaminergic signaling enhances hippocampal LTP through activation of astrocytes.
41.	**Blake Geis** *Redefining Snowboarding: Olympians' Social Media Use* **Faculty Advisor:** Dunja Antunovic **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Academic research has extensively covered athletes' social media use, but often snowboarders are absent from the dataset. Research on elite snowboarders has mostly focused on institutionalization and Olympification, gendered embodiment, and snowboarding's relationship to environmentalism. This study seeks to bridge these two areas of research by asking how snowboarders use social media and what goals snowboarders hope to accomplish using social media. Semi-structured interviews were conducted with individuals who participated in the Winter Olympic Games between 2014-2026. Thematic analysis was carried out to find that participants view social media as a part of the gig and a means to an end that can create opportunities for sponsorship and influence their salary. The main platform used is Instagram, with TikTok and Youtube serving as auxiliary platforms; athletes post different content and use a different approach for each platform. Their goals are to make themselves known, displaying authenticity, increasing engagement, and peer approval. To achieve these goals, athletes run their own social media accounts without professional help, using

	a trial and error approach that focuses on behind the scenes and relatable content, occasionally utilizing controversial content to drive up comments.
42.	**Samantha Gilats** *Synthesizing Fluorescent Ligands for NanoBRET Competitive Binding Assay* **Faculty Advisor:** Swati More **Mentors:** Linh Tran **Sponsoring Program**: SCoPE **Home Institution:** Harvey Mudd College **Abstract:** Alpha-2 adrenergic receptors (α_2-ARs) are G-protein coupled receptors (GPCRs) that are important therapeutic targets for pain and hypertension. Subtype-selective ligands that target the α2B or α2C subtype of the receptor are preferred as analgesics due to fewer unwanted effects. Receptor subtype affinity is commonly assessed using radiolabeled ligands. However, assays using fluorescent ligands, such as NanoBioluminescence Resonance Energy Transfer (NanoBRET) assays, have emerged as safer, non-radioactive alternatives. NanoBRET assays require conjugating a fluorophore to a known ligand using an appropriate linker. This project aimed to determine the optimal linker length for conjugating known α_2-AR agonist guanabenz to the NanoBRET 590 fluorophore. After identifying the length that maximizes binding affinity and activity at the α_2 receptors, the ligand can be used in NanoBRET competitive binding assays to evaluate the subtype affinity of guanabenz analogs being developed as potential non-opioid analgesics. Ligands with no linker and the shortest linker length were synthesized to compare against previous analogs with varying linker lengths. The compounds were characterized using analytical techniques, then evaluated for receptor activity using the cAMP-Glo™ Assay. These studies provide a valuable tool for high-throughput characterization of α_2 receptor subtype selectivity and support the development of safer, more effective analgesics.
43.	**Callie Glawe** *Response of Dormancy-Capable Breast Cancer D2.0R Cells to Co-Culture with Macrophages* **Faculty Advisor:** Grace Bushnell **Mentors:** Furqan Mahdi **Sponsoring Program**: LSSURP **Home Institution:** University of Minnesota Morris **Abstract:** Estrogen receptor-positive breast cancer has a 20% recurrence rate in the 15 years following diagnosis. A potential contributor is the dissemination and metastasis of tumor cells to distant sites, such as the bone marrow, where the cells can remain dormant. The tumor microenvironment of breast cancer recruits monocytes that differentiate into macrophages of a primarily M2 phenotype. These macrophages increase tumor proliferation by promoting angiogenesis and physically aiding cell motility. Based on the behavior of macrophages at the primary tumor site, it was postulated that these cells may also be involved in reactivation of dormant cells in distant sites. Specifically, we hypothesized that the interaction between macrophages and dormancy-capable breast cancer D2.0R cells under semi-3D conditions could result in dormancy reversion. A seven-day co-culture of murine D2.0R cells and murine J774A.1 macrophages following the standard dormancy Matrigel-on-Top assay was performed, and the proliferation of the D2.0R cells was monitored with Cytation 5 imaging. The primary finding was that the D2.0R cells co-cultured with J774s had 6-fold higher proliferation compared to D2.0Rs cultured alone. Identifying macrophages as contributors to dormant tumor cell reactivation and metastasis may inform future studies on inflammation and therapy development.
44.	**Andre Glaze** *Quantifying Cerebellar Pathology in a Mouse Model of Spinocerebellar Ataxia Type 1* **Faculty Advisor:** Martha Streng **Mentors:** Alyssa Soles **Sponsoring Program**: LSSURP **Home Institution:** Morris Brown College **Abstract:** Spinocerebellar ataxia type 1 (SCA1) is a rare, dominantly inherited neurodegenerative disorder caused by a CAG trinucleotide repeat expansion in ATXN1. The disease features cerebellar pathology, including progressive Purkinje cell (PC) loss, leading to motor incoordination and fine motor skill deterioration. We investigated PC pathology and synaptic connections in the cerebellar molecular layer of f-ATXN1[146Q/2Q] mice. This model contains a humanized ATXN1 mutation flanked with lox sites, enabling cell-type specific gene deletion via Cre recombinase drivers like Nestin-Cre or Engrailed-1-Cre (Eng1-Cre). Cerebellar tissue from 25-

	week-old mice was processed using immunofluorescence histology for calbindin to label PCs and vesicular glutamate transporter 2 (VGLUT2) to label climbing fiber terminals onto PCs. Epifluorescent microscope images were quantified in ImageJ (FIJI) for molecular layer width, area, and mean intensities. Initial quantification showed a non-significant but trending reduction in calbindin intensity and molecular layer width in SCA1 mice (n=2) compared to WT littermates (n=3). In conclusion, 25-week mutant mice display trends of PC pathology, including altered climbing fiber inputs. Future work will expand sample sizes and assess the contribution of neural and cerebellar mutant ATXN1 expression with Nestin-Cre and Eng1-Cre lines respectively to evaluate gene deletion effects on PC structure and synaptic connections.
45.	**Matthew Goldenstein** *Central Nervous System Microenvironment Modulates T-Cell Function and Blinatumomab Activity in B-Call Acute Lymphoblastic Leukemia* **Faculty Advisor:** Peter Gordon **Mentors:** Maddi Gohman **Sponsoring Program**: LSSURP **Home Institution:** Cedarville University **Abstract:** Blinatumomab, a bispecific T-cell engager (BiTE), has significantly improved outcomes for patients with B-cell acute lymphoblastic leukemia (B-ALL). However, central nervous system (CNS) relapse remains a major clinical challenge due to limited drug penetration across the blood-brain barrier and potentially the unique microenvironment within cerebrospinal fluid (CSF). Since CSF is nutrient poor relative to plasma, we hypothesize that this microenvironment may alter T-cell activation, differentiation, and exhaustion, thereby reducing blinatumomab-mediated leukemia cytotoxicity. To test this hypothesis, primary human T-cells will be cocultured with GFP-expressing Nalm6 B-ALL cells in the presence or absence of blinatumomab using human plasma-like medium (HPLM) and donor-derived CSF to model systemic and CNS environments. T-cell killing of leukemia will be quantified via killing assay, and flow cytometry will be used to assess T-cell activation, exhaustion, and differentiation. We anticipate that T-cells cultured in CSF will demonstrate reduced activation, delayed differentiation into effector and memory phenotypes, and increased expression of exhaustion markers compared with HPLM-cultured T-cells, resulting in diminished blinatumomab-mediated leukemia cell killing. These studies will characterize how the CNS microenvironment influences T-cell biology and the efficacy of blinatumomab, providing a foundation for strategies to enhance immunotherapy for B-ALL involving the CNS.
46.	**Riley Graven** *Identifying the Immunopeptidome of Immortalized Schwann cells for NF1-MPNST Neoantigen Discovery* **Faculty Advisor:** David Largaespada **Mentors:** Kyle Richards **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Neurofibromatosis type 1 (NF1) syndrome is an autosomal dominant disorder associated with a predisposition to certain forms of cancer like malignant peripheral nerve sheath tumors (MPNST). Currently, the treatment for NF1 associated MPNSTs is resection followed by chemoradiation; despite this aggressive treatment, ~5 year survival rates for MPNSTs are ~50%. There are currently no targeted therapies. Immunotherapy relies on differentiating healthy and cancerous cells using Human Leukocyte Antigens (HLA). One avenue used to identify targets for immunotherapy is in the identification and comparison of different cell line immunopeptidomes. A cell's immunopeptidome consists of all peptides within the cell that have the potential to be presented by the cell's HLA. Here we determined and analyzed the HLA class I immunopeptidome of TERT immortalized human Schwann cells (iHSCs). We found over two thousand peptides that are presented by iHSCs on HLA class I. These peptides are either found in healthy cells, known to be tumor associated antigens, or do not match the normal proteome. Future comparison between the iHSC and NF1-MPNST cell lines will determine neoantigens and tumor associated antigens specific to NF1-MPNSTs. These neoantigens can be used in the future as potential immunotherapy targets for patients with NF1 null MPNSTs.

47.	**Gavin Halvorson** *Investigating the Role of Endocytosis on Vasoactive Intestinal Peptide Receptor 1 Signaling in Triple Negative Breast Cancer* **Faculty Advisor:** Emily Blythe **Mentors:** Chantel Mastos **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** The vasoactive intestinal peptide receptor 1 (VIPR1) is a G-protein-coupled receptor (GPCR) that couples to stimulatory G-proteins to increase cyclic adenosine monophosphate (cAMP) concentration and protein kinase A (PKA) activity. Dysregulation of VIPR1 signaling has been implicated in the progression of certain cancers, including triple-negative breast cancer (TNBC), through cAMP-dependent activation of oncogenes. TNBC is the most aggressive breast cancer subtype and carries the worst prognosis for patients, as its treatments lack the targeted molecular therapies applicable to other subtypes. In TNBC cells, VIPR1 traffics from the plasma membrane to the nucleus, but the effects of this intracellular localization on sculpting the signaling response remain poorly understood. In this project, I used cAMP and PKA biosensors in a TNBC cell line and blocked endocytosis to monitor the spatially encoded regulation of second messenger activity upon agonist stimulation. These data provide quantitative insight into the role of receptor trafficking in prolonging and enhancing the VIPR1 signaling response in TNBC. In focusing on the aberrant signaling of intracellular VIPR1, this research may help to inform the development of novel targeted therapies for TNBC.
48.	**Jiaxuan Han** *Identification of atRA-like Ligands that Selectively Target CRABP1 for Neuroprotective Therapy* **Faculty Advisor:** Li-Na Wei **Mentors:** Jennifer Nhieu **Sponsoring Program**: Independent Research **Home Institution:** University of Minnesota Twin Cities **Abstract:** All-trans retinoic acid (atRA) has therapeutic potential for neurological disorders, but its clinical use is limited by retinoic acid receptor (RAR)-mediated toxicity resulting from off-targeting in gene transcription. Cellular retinoic acid binding protein 1 (CRABP1) mediates non-canonical, RAR-independent signaling through distinct signalosome complexes involved in neuronal homeostasis, including CaMKII, ErK, and eIF2a pathways. We hypothesized that CRABP1-selective, RAR-independent ligands could modulate these neuroprotective signaling pathways while avoiding RAR-associated toxicity. Candidate compounds were evaluated using thermal shift assays to confirm CRABP1 binding, RAR induction assays to assess RAR activation, and Western blot analysis to examine activity through phosphorylation of CaMKII, ErK, and eIF2a in MN1 cells. Three compounds (C60, C66, C67) bound CRABP1 without activating RAR and exhibited distinct signaling profiles to each signalosome. C60 modulated pCaMKII and peIF2a, C66 selectively modulated pCaMKII, and C67 modulated pCaMKII, pErK, and peIF2a. These findings demonstrate that CRABP1-selective ligands can differentially regulate CRABP1 signalosomes associated with neuronal excitability, mitochondrial stress responses, and neuronal survival. In conclusion, CRABP1-selective, RAR-independent ligands represent a potential therapeutic strategy through signalosomes-specific modulation for neurodegenerative diseases while avoiding toxicity associated with RAR activation.
49.	**Emily Hannon** *Effects Of Semaglutide On Body Composition And Visceral Adipose Tissue In Children And Adolescents* **Faculty Advisor:** Donald Dengel **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** Childhood obesity is an increasing health risk around the world. The treatment method that is most recommended for children and adolescents is to initiate lifestyle modifications (i.e., increased physical activity and/or changes in dietary intake), however these have been proven to be difficult to institute for this population. The purpose of this study is to look at the effects of semaglutide (i.e. Ozempic) on body composition and visceral adipose tissue (VAT) in adolescents. Participants were randomized to either 56 weeks of intensive behavioral counseling (BC: 52 contact hrs) or 56 weeks of low-intensity behavioral counseling (12 contact hrs) combined with 2.4 mg semaglutide (SEM). Participants underwent measures of body composition using dual X-ray absorptiometry (DXA) at baseline, 52 and 56 weeks. An analysis of variance (ANOVA) was used

	to examine body composition change over time. All statistical analyses were completed using R Studio with a statistical significance of $p>0.05$. At baseline there were no differences between the BC and SEM groups in regards to body fat percentages or visceral adipose tissue. At 52 and 26 weeks there were significant differences in percent fat and VAT between the BC and SEM groups.
50.	**Devan Hanson** *Varying Fall Dormancy Levels and Life Stage Harvesting Method Effects in Alfalfa Dry Matter Yield* **Faculty Advisor:** Jo Heuschele **Sponsoring Program**: Forever Green Initiative URE **Home Institution:** University of Minnesota Twin Cities **Abstract:** The perennial plant alfalfa is an important high yielding crop in the United States. With its high biomass production and nutrition, alfalfa is heavily used as dry matter feed especially in the dairy cattle industry. This research aims to correlate effects of dormancy levels and harvesting stage in various alfalfa varieties to the dry matter yield. Six different dormancy varieties were grown being rain-fed in Becker, Minnesota as well as being harvested at various life stages including earlybud, full-flower and a variable cycle of cutting. It was hypothesized that the alfalfa dry matter yield would be highest in the variety that is native to the Minnesota region and that each harvest was cut at the full-flower stage. The preliminary data trends found that the hypothesis was not supported. The native region variety of alfalfa was not the highest yielding in this research experiment.
51.	**Ophira Harpster** *Beneath the Turf: Water Storage and Dry-Down in Native and USGA Rootzones* **Faculty Advisor:** Bryan Runck **Mentors:** Ann Piotrowski **Sponsoring Program**: SOAR-REEU **Home Institution:** Oregon State University **Abstract:** Water management in turfgrass is essential for turf health and environmental quality; engineered soils have high infiltration rates with high sand content, while native soils have lower infiltration rates with typically higher clay content. Understanding how native and engineered rootzones store and release water supports irrigation, drought, and drainage decisions. This study compared volumetric water content (VWC) dry-down patterns in creeping bentgrass *(Agrostis stolonifera)* plots with native-soil and United States Golf Association (USGA) sand rootzones at the University of Minnesota. Sensors measured VWC at depths of 1.3, 7.6, and 15.2 cm. Rain and atmospheric sensors supplied weather context. Python was used to compare variability, dry-down rate, and time to 50% dry-down. Across 13 wetting events, the USGA rootzone dried faster near the surface, reaching 50% dry-down sooner than native soil in 11 events. At 1.3 cm depth, mean time to 50% dry-down was 6.9 hours in USGA and 15.2 hours in native soil. At 7.6 and 15.2 cm depths, native-soil VWC averaged 12.8 and 21.9 percentage points higher, respectively. The drainage and moisture-retention patterns show that rootzone construction should be selected according to local climate, irrigation capacity, and the risks of either excess water or rapid dry-down.
52.	**Karly Hermanson** *Extremotolerant Protein Lipid Nanoparticles Protect Pulmonary Cells from Genotoxic DNA Damage* **Faculty Advisor:** Ameya Kirtane **Mentors:** Nilesh Ambhore **Sponsoring Program**: SCoPE **Home Institution:** St. Olaf College **Abstract:** Pulmonary fibrosis is a major complication in many cancer patients who are treated with genotoxic agents, including chemotherapy and radiation. DNA damage from these agents triggers cell death and the release of inflammatory mediators, driving pulmonary fibrosis. Methods to reduce this DNA damage could be helpful, and it is known that the extremotolerant organisms, such as tardigrades, withstand DNA damage caused by genotoxic agents. Therefore, we hypothesized that the use of proteins from tardigrades will reduce DNA damage and protect pulmonary cells. To deliver these proteins, we encapsulated mRNA encoding tardigrade proteins in lipid nanoparticles (LNPs) and transfected pulmonary cells, observing robust protein expression. Using the COMET assay, we found that expression of tardigrade proteins TDR1 and dsup significantly reduced DNA damage following chemotherapy treatment. We also used colony formation assays

	to show increased cell survival and proliferative capacity in radiation-treated cells. Colony formation was increased with TDR1, dsup, and LEA4 proteins, indicating successful protection. Together, these results support the hypothesis that tardigrade protein-encoding mRNA-LNPs can protect pulmonary cells from genotoxic DNA damage. Future studies will investigate the efficacy of these nanoparticles in vivo and assess their ability to prevent pulmonary fibrosis in mouse models of genotoxic lung injury.
53.	**Katherine Hilleren-Policy** *ERVMER34-1/HEMO A Potential Target for Treatment Against Malignant Peripheral Nerve Sheath Tumors* **Faculty Advisor:** David Largaespada **Mentors:** Liangjun Wang **Sponsoring Program**: LSSURP **Home Institution:** University of Minnesota Twin Cities **Abstract:** Malignant peripheral nerve sheath tumors (MPNSTs) are aggressive soft tissue sarcomas with limited therapeutic options, underscoring the need for targeted therapies. Using cell surface biotinylation and mass spectrometry, we identified the endogenous retroviral envelope protein ERVMER34-1 (HEMO) on MPNST cell line S462TY. Western blot confirmed robust HEMO expression across most MPNST cell lines. Plasma from MPNST patients showed significantly elevated HEMO levels, suggesting potential as a tumor biomarker. To investigate HEMO function, recombinant HEMO pulldown/mass spectrometry identified macrophage migration inhibitory factor (MIF) as its top interactor. This interaction was validated by reciprocal co-immunoprecipitation and in vitro binding assays. Notably, HEMO-knockout cells secreted significantly higher levels of MIF into the culture medium and displayed increased cell surface-associated MIF compared with wild-type cells, suggesting that HEMO regulates MIF localization and/or availability, thereby influencing tumor progression and immune modulation. To explore the therapeutic potential of HEMO, we are developing a HEMO-specific chimeric antigen receptor (CAR) T-cell and evaluating its antigen recognition and cytotoxic activity against HEMO-positive MPNST cells. Collectively, these studies identify HEMO as a novel MPNST-associated cell surface protein and reveal a previously unrecognized interaction between HEMO and MIF, supporting HEMO as a promising biomarker and immunotherapeutic target for MPNST.
54.	**Ethan Ho** *Effects of Different Growth Mediums on the Biofilm Growth Capacity of* Enterococcus faecalis **Faculty Advisor:** Julia Willett **Mentors:** Erna Karic **Sponsoring Program**: LSSURP **Home Institution:** Louisiana State University **Abstract:** *Enterococcus faecalis* is a Gram-positive commensal bacterium that exists at low levels in the gastrointestinal tract. It is also an opportunistic pathogen capable of causing biofilm-associated infections across the body, including persistent oral infections and catheter-associated urinary tract infections in hospitals. Though E. faecalis generally remains at low levels in the oral microbiome, it has often been associated with infected root canals and failed root canal treatments. E. faecalis can form biofilms on many surfaces, which contributes to its ability to resist various antibiotic treatments and makes infections difficult to treat. Because relatively little is known about Enterococcus carriage in the oral cavity, we collected oral rinse samples from 2025 Minnesota State Fair participants to isolate enterococci. We performed in vitro biofilm and growth curve assays to investigate the effects of different growth media, including with and without sucrose, on each of the isolates. In doing so, we characterized differences in planktonic cell growth and biofilm formation across the isolates. Overall, our work highlights variability in biofilm formation of oral Enterococcus isolates, which will be helpful for future studies on determining how these bacteria persist in the oral cavity and contribute to endodontic infections.
55.	**Ellington Hughes** *Exploring the Antifungal Resistance Mechanisms of* Candida parapsilosis **Faculty Advisor:** Anna Selmecki **Mentors:** Christopher Zajac **Sponsoring Program**: LSSURP **Home Institution:** Morehouse College **Abstract:** *Candida parapsilosis* is an opportunistic fungal pathogen and commensal of human skin. It spreads horizontally in healthcare settings, exploiting weakened immune systems and indwelling medical devices.

	C.parapsilosis' ability to form biofilms enables it to adhere to medical devices and resist antifungal treatment. Antifungal resistance is especially concerning because there are few antifungal options available for the treatment of *C.parapsilosis* infections, resulting in an increased likelihood of treatment failure. To better understand the genetic implications behind this resistance, we performed whole-genome sequencing on 8 bloodstream isolates from an individual patient. We found one isolate had aneuploidy and increased resistance to fluconazole. The gene ERG11, a known fluconazole target, was located in the aneuploid region, and amplification of ERG11 may explain the isolate's drug resistance. Whole-genome analysis of all 8 isolates identified only a few unique mutations, suggesting genetic relatedness among isolates. We will prioritize engineering mutations in these amplified chromosomal regions to identify the mechanism of resistance. Future work examining these isolates in oral-like environments may also help determine how genomic changes influence biofilm formation and surface adhesion, providing more context for disease progression and its potential relationship to the oral cavity.
56.	**Andi Huselid** *Racial Disparities in the Impact of Childhood Adversities on Brain Development* **Faculty Advisor:** Mark Fiecas **Mentors:** William Asinger & Ellery Island **Sponsoring Program**: Equitable Data Science **Home Institution:** St. Olaf College **Co-Presenter(s):** Justice Wilbourn, Elon University **Abstract:** Multiracial individuals are one of the fastest-growing populations in the United States, yet we know little about their development compared to monoracial individuals. Early life adversity (ELA) has been linked to brain development and an increased risk of adverse mental health outcomes, but whether these effects differ across mono- and multiracial adolescents remains unclear. This study used data from the Adolescent Brain Cognitive Development (ABCD) Study, to determine whether threat- and deprivation-related ELA dimensions differentially relate to longitudinal changes in amygdala and hippocampal volume among Black, White, and White + Black multiracial youth. Linear mixed effects models tested associations between ELA, race, and age while adjusting for whole subcortical volume, sex, and within-participant repeated measures. Findings show threat was associated with reduced amygdala and hippocampal volumes across racial groups, with smaller negative associations among White + Black multiracial adolescents than among monoracial adolescents. In contrast, deprivation showed positive associations in White + Black multiracial youth that more closely resembled those observed in Black adolescents than in White adolescents. Overall, these findings highlight how ELA differentially impacts neurodevelopment in mono- and multiracial youth.
57.	**Allan Jeandron, Jr.** *Developing a Quantitative Foliage Color Classification System for* Weigela florida Thunb. **Faculty Advisor:** Seth Wannemuehler **Sponsoring Program**: SOAR-REEU **Home Institution:** Louisiana State University **Abstract:** *Weigela florida Thunb.* is a cold-hardy, deciduous ornamental shrub introduced to gardens in the 1800s that is experiencing a resurgence in garden popularity. While it is valued for its spring flower display, for the remainder of the growing season its landscape value relies entirely on its foliage. Despite industry demand for unique foliage aesthetics, breeding progress remains hindered by subjective, visual color-rating systems that lack reproducibility. To establish a standardized selection index, this study aims to develop and validate a quantitative foliage color classification system for W. florida breeding populations. This approach uses a Nix handheld colorimeter to capture color parameters and evaluate color characteristics across a set of representative foliar color classes. A composite foliage color index integrating CIELAB measurements and anthocyanin estimates is expected to classify foliage color variations more consistently than visual ratings alone. Ultimately, establishing this protocol provides a standardized foliage color classification system for Weigela breeding and provides baseline data to understand genes affecting foliage color which will accelerate selection efficiency for ornamental plant breeding.

58.	**Haleiana Jones** *Investigating AMPK-Dependent Phosphorylation of ARHGEF2 in Human T-cells* **Faculty Advisor:** Craig Byersdorfer **Sponsoring Program**: LSSURP **Home Institution:** Florida State University **Abstract:** Chimeric antigen receptor (CAR) T cell therapy has improved outcomes for patients with leukemia, but limited CAR T cell persistence and metabolic dysfunction can reduce long-term efficacy. Previous work demonstrated that treatment of CAR T cells with Compound 991, a direct activator of AMP-activated protein kinase (AMPK), improved survival in leukemia-bearing mice and increased phosphorylation of ARHGEF2, a regulator of cell motility and proliferation, at a predicted AMPK-specific phosphorylation site. The current study investigated whether ARHGEF2 phosphorylation increased in human T cells after Compound 991 treatment and whether these changes were dependent upon AMPK signaling. Human T cells were expanded and treated with Compound 991 or dimethyl sulfoxide (DMSO) as vehicle control on days 5 and 7 of a nine-day culture period. Proteins were collected by trichloroacetic acid precipitation, and analyzed using a Mn2+- Phos-tag Mobility Shift Assay (PTMSA), followed by Western blotting for ARHGEF2. PTMSA analysis demonstrated greater abundance of slower migrating ARHGEF2 bands in Compound 991-treated samples, consistent with increased phosphorylation. Future studies comparing ARHGEF2 migration in AMPK-sufficient and -deficient T cells, both human and murine, to help determine whether AMPK is required for ARHGEF2 phosphorylation and clarify its potential role in T cell persistence and antitumor activity.
59.	**Aleen Jude** *Developing Polyneural Risk Scores to Predict Adolescent Psychopathology* **Faculty Advisor:** Mark Fiecas **Mentors:** Ellery Island **Sponsoring Program**: Equitable Data Science **Home Institution:** University of Minnesota Twin Cities **Co-Presenter(s):** Kevin Ndayishimiye, Howard University **Abstract:** Accelerated cortical thinning in adolescence is associated with youth psychopathology, but individual brain region associations have limited clinical significance. By aggregating cortical thickness across all brain regions to create a stronger signal, this project develops polyneural risk score (PNRS) models that predict psychopathology in youth. Utilizing data from the Adolescent Brain Cognitive Development Study, we used Generalized Linear Models (GLMs) and Mixed-Effect Models to generate unique PNRS models for nine psychopathology outcomes. We then used GLMs to assess the significance of each PNRS. Although PNRS was a significant predictor for all outcomes, when compared to the covariate-only model, PNRS only significantly improved predictive accuracy for select outcomes and demographics. Most promisingly, PNRS significantly improved predictive accuracy for suicide attempts in both sexes, all age groups, and White individuals, but could not be evaluated for other racial groups due to low sample sizes. Additionally, PNRS models showed no significant disparities in predictive accuracy across race, sex, and age demographics. These findings suggest that PNRS provides meaningful information for predicting psychopathology that is not captured by demographic characteristics. Future steps should aim to improve the predictive utility of PNRS models in order to ensure benefits for all populations instead of specific sub-groups.
60.	**Jae Hoon Kahler** *Synthesis of FIRE Standards for Quantitative Determination of Hemoglobin Adducts* **Faculty Advisor:** Natalia Tretyakova **Mentors:** Qi Zhang & Erik Moran **Sponsoring Program**: SCoPE **Home Institution:** University of Minnesota Twin Cities **Abstract:** Lung cancer risk is naturally present when smoking, however a method to determine individuals at elevated risk among smokers has not yet been established. Failure to metabolize electrophiles produced from both smoking or one's environment would put them at an elevated risk of lung cancer. Therefore, a methodology to quantify risk is imperative for early detection. The same electrophiles that would damage DNA also form stable adducts to the N-terminal ends of valine in hemoglobin. Quantifying these hemoglobin adducts using LC-MS/MS allows for a direct and simple method for the detection of elevated cancer risk, and is what the FIRE project aims to achieve for various relevant adducts. Ethylene oxide is one such carcinogenic

	compound that produces adducts, and is generated by smoking and chemical manufacturing. The method requires a labeled (deuterated) internal standard for adduct quantification and an unlabeled standard for method validation. Therefore, the goal of the research conducted was to synthesize ethylene oxide's labeled and unlabeled standards.
61.	**Bhavya Kanagala** *Identifying the Role of ARHGEF2 in CAR T Cell Metabolic Improvements Associated with Compound 991 Treatment* **Faculty Advisor:** Craig Byersdorfer **Mentors:** Elisabet Ampudia-Mesias **Sponsoring Program**: SUPER **Home Institution:** University of Minnesota Twin Cities **Abstract:** Treatment with Compound 991, an AMPK agonist, has shown promise by improving in the persistence and leukemia-clearing abilities of Chimeric Antigen Receptor (CAR) T cells in vivo, likely associated with AMPK's role in metabolic regulation. A phosphoproteomic analysis performed to identify potential downstream candidates of AMPK detected a 3-fold increase in ARHGEF2 at an AMPK targeted site. I hypothesize that AMPK activation by 991 upregulates cellular metabolism, in part through the phosphorylation of ARHGEF2. To determine ARHGEF2's role, I will perform a CRISPR knock-out of the ARHGEF2 gene in human T cells, which will then be treated with 991. By comparing efficacy ex cyto, I selected several promising gRNAs to test in cells. Of the tested gRNAs, two stood out as potential options to continue pursuing, with 50.8% and 42.9% decreases in protein levels in the preliminary trial. These gRNAs will be further tested through multiplex CRISPR to determine whether a combination of gRNAs will produce more consistent protein deletions. Upon identifying efficient gRNA combinations, I will proceed to knock-out ARHGEF2 in 991-treated T cells and compare their behavior to the mock-treated T cells to verify the gene's importance in the AMPK pathway.
62.	**Erica Kazin** *Development of Tyrosine-Reactive Targeted Covalent Inhibitors for the Cat Eye Syndrome Chromosome Region, Candidate 2 (CECR2) Protein* **Faculty Advisor:** William Pomerantz **Mentors:** Richard Ede & Ana Katrina Tiu **Sponsoring Program**: LSSURP **Home Institution:** Michigan Technological University **Abstract:** The Cat Eye Syndrome Chromosome Region Candidate 2 (CECR2) protein is an epigenetic acetyl-lysine reader implicated in breast cancer by upregulating immunosuppressive genes critical for metastasis. CECR2 features a highly druggable bromodomain (BRD) with a unique tyrosine residue, making it a potential therapeutic target. This project explores the design and synthesis of targeted covalent inhibitors (TCIs) for the CECR2 BRD by installing tyrosine-reactive electrophiles onto BZ1, a reversible binder of the CECR2 BRD. A focused library of inhibitors was synthesized, and covalent labeling between these TCIs and the CECR2 BRD was assessed using intact protein mass spectrometry and differential scanning fluorimetry. Preliminary results demonstrate covalent labeling and protein stabilization. Further analysis of the TCIs, including chymotrypsin digestion of the TCI-protein adduct and site-directed mutagenesis, will be performed to verify selective covalent labeling of the nonconserved tyrosine residue. These TCIs have the potential for further expansion as potent inhibitors and as useful reference points for other heterobifunctional molecule development.
63.	**Eleanor Kelman** *Synthesis of HINT1-Targeting PROTACs to Probe Active-Site and Surface-Mediated Interactions* **Faculty Advisor:** Carston Wagner **Mentors:** Kostana Ligori **Sponsoring Program**: SCoPE **Home Institution:** Carleton College **Abstract:** Human histidine triad nucleotide-binding protein 1 (HINT1) is a protein involved in several central nervous system processes, including neuroplasticity, and has been implicated in multiple neuropsychiatric disorders. Additionally, HINT1 mediates cross-talk between the mu-opioid receptor and N-methyl-D-aspartate receptor (NMDAR), making it a potential therapeutic target. Although small-molecule inhibitors have demonstrated that HINT1 active-site inhibition significantly alters this cross-regulatory relationship, HINT1 also interacts with partner proteins through surface-mediated protein-protein interactions. Consequently, active-site inhibition alone cannot fully distinguish the relative contributions of these two interaction mechanisms.

	Proteolysis-targeting chimeras (PROTACs) provide an alternative approach by selectively degrading a target protein rather than simply inhibiting its activity. These bifunctional molecules recruit an E3 ubiquitin ligase to the protein of interest, promoting polyubiquitination and subsequent degradation by the 26S proteasome. In this work, HINT1-targeting PROTACs were designed and synthesized by coupling nucleoside-based HINT1 ligands to an ubiquitin-recruiting ligand using copper-catalyzed azide–alkyne cycloaddition. These compounds provide chemical tools to investigate the consequences of complete HINT1 degradation and to distinguish the roles of active-site inhibition and surface-mediated protein interactions in HINT1 signaling. This work establishes a foundation for elucidating HINT1 function and developing targeted therapeutic strategies for HINT1-associated neurological disorders.
64.	**Mitchelle Kennedy** *Dose-Dependent Effects of Doxorubicin on THP-1 Immune Cells* **Faculty Advisor:** Beshay Zordoky **Mentors:** Muneera Al-Hajri & Marianne Grant **Sponsoring Program**: M-ASCEND **Home Institution:** University of Minnesota Twin Cities **Abstract:** Doxorubicin (DOX) is a powerful chemotherapeutic agent, but its clinical use is limited by off-target toxicities, particularly in innate immune cells. While high doses of DOX are known to induce cell death, its effects on THP-1 cells, including senescence and apoptosis, remain poorly understood. This study characterized the dose-dependent effects of DOX on THP-1 cellular fate using SA-β-Gal staining, Western blotting, and MTT assay. THP-1 cells were exposed to 0.025, 0.05, or 1 μM DOX for 24 hours, then cultured in fresh medium for 4 days before analysis. DOX induced both apoptosis and senescence, with cells showing pronounced sensitivity at concentrations as low as 0.025 μM. Apoptosis was demonstrated by increased cleaved caspase-3 and cleaved PARP, accompanied by reduced cell viability in the MTT assay. Higher DOX concentrations caused greater reductions in viability. Senescence was supported by dose-dependent increases in p21 expression and elevated SA-β-Gal activity compared with controls, indicating enhanced lysosomal activity associated with senescence. These findings demonstrate that even low-dose DOX promotes senescence and apoptosis in THP-1 immune cells, highlighting the sensitivity of innate immune cells to chemotherapeutic exposure.
65.	**Hassan Khan** *Evaluation of KPC Tumor Cell Line Susceptibility to Tumor-Specific CD8 T Cells Using a Titration Killing Assay* **Faculty Advisor:** Ingunn Stromnes **Mentors:** Audrey Hilk **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Pancreatic ductal adenocarcinoma (PDAC), the most common and aggressive form of pancreatic cancer, is difficult to treat due to the specific peptide-MHC complex which is not well understood. CD8+ T cells induce tumor cell death when their TCR recognizes MHC class 1 peptide complex on cancer cells. To test this, we investigated the influence of cytokine IFNy, which upregulates MHC class 1, in a co-culture with CD8+ T cells: 6.1, 8.1, and OT-1 on cancer cell line KPC2a, KPC451, and KPC4662. Luminescence was used to quantify readout of cancer cell viability. We hypothesized that IFNy would enhance tumor killing by increasing MHC class 1 expression. Among co-culture, groups that received IFNy had a lower luminescence reading indicating that an increase in cytokine IFNy leads to an increase in cell death. These results are consistent with IFNy mediated upregulation of MHC class 1, which enhances T cell recognition. These findings are consistent with enhanced antigen presentation. This work highlights how cytokine signaling can regulate antigen presentation in PDAC.
66.	**Anastasiya Khotko** *Effects of Monocarboxylate Transporter-1 Inhibition in 4-NQO Oral Carcinogenesis Model* **Faculty Advisor:** Rajaram Gopalakrishnan **Mentors:** Olanrewaju Ajeigbe **Sponsoring Program**: LSSURP **Home Institution:** Bemidji State University **Abstract:** Oral Squamous Cell Carcinoma (OSCC) is the most common form of Head and Neck cancer with high metastatic capabilities that result in a survival rate of 50-70% and over 450,000 deaths annually. Our previous studies showed that OSCC progression is associated with overexpression of Monocarboxylate Transporter-1

	(MCT-1) and deleting/inhibiting MCT1 blocked cancer invasion in an OSCC organotypic 3D culture system. MCT-1 is a cellular lactate transporter linked to metabolic symbiosis, gene regulation, and maintenance of a glycolytic tumor microenvironment, often leading to chemoresistance. This study utilizes MCT-1 inhibitor AZD3965 in a 4-nitroquinoline 1-oxide (4-NQO) oral carcinogenesis model to characterize OSCC progression and inhibition. By evaluating incidence and severity of dysplastic (precancerous) and cancerous lesions across four study groups (untreated, 4-NQO alone, AZD3965 alone, and 4-NQO + AZD3965), we observed fewer and smaller cancerous lesions in AZD3965 + 4-NQO treated mice compared to 4-NQO treated mice. Our preliminary results further demonstrated that the cancers found in AZD3965 treated mice were predominantly exophytic rather than invasive, and the invasive lesions showed lesser depth of invasion compared to 4-NQO treated mice. Following completion of our analysis, we hope to conclude that AZD3965 will be an effective therapeutic agent and prevent progression of OSCC.
67.	**Ava Kirr** *Synthesis of ATP-Biotin Used to Assay Kinases for Cancer Drug Development* **Faculty Advisor:** Laurie Parker **Mentors:** Jason Heier **Sponsoring Program**: LSSURP **Home Institution:** Dartmouth College **Abstract:** Kinases influence cell growth and proliferation by catalyzing the transfer of an ATP γ-phosphate to serine, threonine, or tyrosine residues on protein substrates. As dysregulated kinases contribute to several diseases, including many types of cancer, identification of kinase-specific substrate sequences is imperative for targeted cancer drug development. To date, the methods used to enrich and identify substrates, including antiphosphoantibodies and metal-based phosphoenrichment, are limited by biases, background noise, and high costs. To overcome these limitations, we synthesized ATP-biotin as a chemical probe that exploits the kinase's native catalytic mechanism. When ATP-biotin is applied, a biotin-γ-phosphate unit is transferred to the target protein, functionalizing it for capture by streptavidin and enabling identification. Synthesis of ATP biotin is achieved with two coupling steps: attachment of ATP's γ-phosphate to a flexible diamine linker to preserve kinase affinity, followed by coupling to biotin. Following this successful synthesis, our next aim is to quantify ATP-biotin's kinetic efficiency relative to ATP. A reliable probe would enable investigation of specific kinase-substrate interactions in a complex cellular environment, including those underlying oncogenic kinase signaling, leading to more selective and effective cancer therapies.
68.	**Brittney Kiyeny** *Investigating the Effects of Repeated Cocaine on Kinases CaMKK2 and TAK1 Upstream of AMPK* **Faculty Advisor:** Sade Spencer **Mentors:** Abbey Brewer & Kaitlin Beel **Sponsoring Program**: LSSURP **Home Institution:** University of Minnesota Twin Cities **Abstract:** Cocaine use is a major public health problem as chronic use creates lasting effects on the brain. This can be studied using repeated cocaine exposure in animal models called sensitization. The signaling pathways involved in cocaine sensitization are not fully understood, but one protein that has been implicated is AMPK. My project aims to measure the upstream kinases CaMKK2 and TAK1 that directly impact the downstream activation of AMPK. I am assessing whether repeated cocaine exposure alters their activity, measured by changes in phosphorylation state. The amount of total and phosphorylated protein is analyzed using a Western blot protocol. We set out to examine brain regions involved with reward, such as the nucleus accumbens shell (NASH), nucleus accumbens (NACC), ventral tegmental area (VTA), and infralimbic cortex (IL). I hypothesize that repeated cocaine exposure will increase phosphorylated CaMKK2 and TAK1, promoting activated phosphorylation of AMPK. However, total protein expression is expected to stay constant. This would suggest that cocaine exposure influences their activity levels rather than how much protein is being expressed. This research highlights the importance of signaling mechanisms associated with cocaine sensitization, which can ultimately help future studies address cocaine's lasting effects.

69.	**Lorenzo Knop** *Role of White Matter Astrocytes in the Regulation of Huntington's Disease (HD) Neuropathology* **Faculty Advisor:** Rocio Gomez-Pastor **Mentors:** Abbygail Michel **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** The poster I plan to present will encompass my work involved in investigating how the removal of white matter astrocytes expressing glial fibrillary acidic protein (GFAP) in the striatum of Huntington's disease (HD) mice impacts neuropathology associated with HD, which includes mHTT protein aggregation, white matter atrophy, and neuroinflammation. Previous work in the lab shows that it is unclear what role these white matter astrocytes are playing, and whether they are providing protective or damaging functions.
70.	**Elizabeth Koa** *Combined CYP3A4, PI3Kα, and CDK4/6 Inhibition Overcomes Hormone Therapy Resistance in Mutant PI3Kα ER+/HER2− Breast Cancer* **Faculty Advisor:** David Potter **Mentors:** Zhijun Guo **Sponsoring Program**: LSSURP **Home Institution:** Amherst College **Abstract:** About 40% of patients with estrogen receptor-positive, human epidermal growth factor receptor 2-negative (ER+ HER2-) metastatic breast cancer (MBC) exhibit hormone therapy resistance (HTR) driven by mutant PI3Kα, limiting the effectiveness of endocrine therapies such as the selective estrogen receptor degrader (SERD) fulvestrant (F). HTR is associated with dysregulation of signaling pathways that promote tumor growth and survival, including upregulation of the cytochrome P450 enzyme CYP3A4. The clonal frequency of CYP3A4 upregulation after F selection is unknown, but is estimated from our preliminary data to be greater than 20%. Fulvestrant-selected MCF-7AC1 clonal cell lines, resistant to letrozole (LR), fulvestrant (FR), and the cyclin-dependent kinase inhibitor (CDKi) palbociclib (PR), were screened to measure the rate of CYP3A4 upregulation. We hypothesized that these cell lines would be sensitive to C5-difluorohexyl-cuban-1-yl biguanide (C5F2-HCB), a novel monooxygenase inhibitor that blocks CYP3A4-mediated biosynthesis of cancer-promoting epoxy polyunsaturated fatty acids (EpFAs). C5F2-HCB was found to synergize with a combination of the mutant PI3Kα inhibitor tersolisib, the CDKi abemaciclib, and F (isobologram combination index=0.27). This finding identifies a promising combination strategy for overcoming HTR and supports further evaluation in preclinical models.
71.	**Al Kolman** *Methylation Mechanism of* Eastern Equine Encephalitis Virus *(EEEV) nsP1* **Faculty Advisor:** Robert Geraghty **Mentors:** Jake Mahoney **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** *Eastern Equine Encephalitis Virus* (EEEV) is an alphavirus primarily spread by mosquitos that has a mortality rate of 30% with no known treatments. Symptoms include brain swelling, coma, and seizures. Several viruses, including EEEV, require viral RNA methylation to evade the immune system. For EEEV, non-structural protein 1 (nsP1) is the enzyme responsible for the generation of this “methyl cap”. Understanding the function of nsP1 is necessary to find a route for nsP1 inhibition to prevent the virus from using the methyl cap to evade the immune system. However, the process for how nsP1 produces its methyl cap is unknown. This project is dedicated to purifying EEEV nsP1 to conduct enzyme assays to determine if nsP1 follows similar steps, including GTP methylation and formation of a covalent bond to methylguanosine, that related viruses use to generate a methyl cap. Successful purification of nsP1 was done using an ALFA tag along with Foscholine-12 as a detergent to solubilize nsP1. An activity assay using western blotting to measure formation of the methylguanosine-nsP1 intermediate was inconclusive. Next steps include directly examining GTP methylation using a methyltransferase assay and further investigating covalent intermediate formation through optimization of western blotting.

72.	**Gavin Larson** *Do Even N2 Fixing Bacteria Cheat Alfalfa with Rhizopine?* **Faculty Advisor:** Robert Denison **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Through a deeper understanding of bacteria and plant symbiosis, nitrogen fixation by legumes is a sustainable way to increase crop yield. Studying changes in nodule mass and nitrogen fixation (via hydrogen evolution assays) informs us about the impact on each organism when one's behavior changes. In this experiment, we studied the impacts of rhizopine producing rhizobia. Though results were largely inconclusive, this research still highlights a knowledge gap for how this species interaction could have evolved.
73.	**Ocean Lee** *Assessing Decision-Making Behavior for Different Rewards Using FED3 Devices* **Faculty Advisor:** Nicola Grissom **Mentors:** Anika Paulson **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** Assessing decision-making behavior is a valuable way to study how animals learn from experience. Decision-making with mice often involves moving the mouse from their cage to a testing chamber which can introduce variables that lower ecological validity such as handler stress and being in an unfamiliar environment. The FED3 (Feeding Experimentation Device ver.3), an alternative for measuring operant behavior and food intake, is a device that fits within the mouse's home cage and allows 24 hour testing. We're observing whether decision-making with FED3 devices differs when the reward is a pellet as it's standard for FED3, versus milkshake, which is standard for testing chambers. Pellets are more filling than liquid rewards, which can affect the mouse's motivation. Twelve mice (6 male, 6 female) are individually homed with a FED3 device, either receiving pellets or milkshake to determine the metabolic effects of each reinforcer. To measure decision-making, mice nosepoke one of two sensors with different reward probabilities. Reward probabilities on each sensor change, so the mice must choose between testing a new sensor or exploiting the one they know works best. We predict that animals will do more trials with a liquid reinforcer, but both reinforcers will use similar strategies.
74.	**Trent Lewis** *Evaluating Mechanisms to Improve Trispecific Killer Engagers in Natural Killer Cells to Treat Hormone-Resistant Prostate Cancer* **Faculty Advisor:** Nicholas Zorko **Mentors:** Jacob Rugloski & Cassandra Butterbaugh **Sponsoring Program**: LSSURP **Home Institution:** East Tennessee State University **Abstract:** Prostate cancer (PCa) is the most common non-cutaneous malignancy and the second leading cause of cancer death in men globally. Although hormone therapy is initially effective, resistance develops quickly, highlighting the need for novel immunotherapies. Trispecific Killer Engagers (TriKEs) are immune engager molecules that activate natural killer (NK) cells through CD16 and interleukin-15 (IL-15) stimulation while linking to tumor cells. This project sought to evaluate possible mechanisms to enhance TriKE anti-tumor activity in hormone-resistant PCa. First, we analyzed the effect of concurrent CD16 and IL-15 binding on NK activity. Functional and proliferation assays were performed using isolated CD16-binding and IL-15 domains, as well as a TriKE with a binder-dead anti-B7-H3 arm, compared to active TriKE. Concurrent CD16 and IL-15 administration had no significant effect on NK activity, indicating the physical link between the two elements in TriKEs is critical. Second, we analyzed the significance of androgen receptor (AR) activity on NK immune suppression. To test this, we are engineering AR knockout NK cells with the intent of investigating the interaction between AR signaling and TriKE-mediated activation. We successfully validated AR-targeting constructs using C4-2 cells and will proceed with additional experiments to evaluate how AR activity impacts NK cell function.

75.	**Quinn Logan** *Engineering Selective Protein Ligands for Tumor Cell Targeting* **Faculty Advisor:** Ben Hackel **Mentors:** Anna Steele **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** Folate receptor alpha (FolR1) is overexpressed in several cancers, making it a promising target for selective therapeutic delivery. Multivalent ligand designs can improve targeting specificity through avidity, but the effect of linker length on FolR1-targeted constructs remains unexplored. This study examines how linker length affects the balance between avidity and selectivity in a bivalent FolR1-binding construct, aiming to identify architectures that best discriminate between high- and low-expressing cells. Results are also compared with linker length trends previously reported for CEA-targeted constructs. Using an existing bivalent construct (F1N11K, ~250 nM affinity) as a control and estimated FolR1 spacing on IGROV-1 cells (~50 nm), new linker variants shorter (~2 nm) and longer (~19 nm) than the current ~6 nm linker were designed and tested. Findings are expected to inform how linker length influences multivalent binding and expression-dependent targeting, guiding future design of FolR1-targeted cancer therapeutics.
76.	**Liam Luepker** *Targeting Mitochondrial and Cytosolic Calcium Handling Dysregulation in DMD Cardiomyopathy* **Faculty Advisor:** Forum Kamdar **Mentors:** Patrick Ernst **Sponsoring Program**: LSSURP **Home Institution:** Grinnell College **Abstract:** Cardiomyopathy is the leading cause of mortality in Duchenne Muscular Dystrophy (DMD). Although emerging molecular therapies have shown promise, their clinical application is limited by cost, immune responses, and mutation-specific mechanisms of action. Dysregulated calcium handling is a hallmark of DMD cardiomyopathy and represents a promising therapeutic target. This study evaluated the effects of the small-molecule drug istaroxime on sarcoplasmic reticulum and mitochondrial calcium handling in DMD patient-derived cardiomyocytes. Human-induced pluripotent stem cell-derived cardiomyocytes (hiPSC-CMs) generated from patients with DMD were used to assess the effects of istaroxime on intracellular calcium dynamics. Cytosolic and mitochondrial calcium imaging were performed using fluorescent calcium indicators. Compared with control CMs, DMD hiPSC-CMs exhibited elevated baseline calcium levels, reduced calcium transient amplitude, prolonged time to peak, and impaired calcium decay, consistent with disrupted calcium cycling. Treatment with 100 nM istaroxime significantly reduced baseline calcium, increased transient amplitude, shortened time to peak, and improved calcium decay kinetics. Mitochondrial calcium imaging further revealed reduced calcium influx amplitude and prolonged time to peak in DMD cardiomyocytes relative to controls. Low-dose istaroxime improves both cytosolic and mitochondrial calcium handling in DMD hiPSC-derived cardiomyocytes. Istaroxime may represent a mutation-independent therapeutic strategy for DMD-associated cardiomyopathy.
77.	**Emma Mach** *EWS/FLI1 Binding In Ewing Sarcoma is Governed by Optimal GGAAr Characteristics That Could Contribute to Incidence Heterogeneity Across Ancestries* **Faculty Advisor:** Logan Spector **Sponsoring Program**: Children's Cancer Research Fund **Home Institution:** St. Olaf College **Abstract:** Ewing sarcoma (ES) is the second most common pediatric bone cancer. It is caused by a chromosomal translocation that fuses a FUS protein family member and an ETS binding protein, resulting in an aberrant transcription factor that binds 5'-GGAA motifs-3' in the genome. When bound by EWS/FLI1, the most common fusion protein in ES, GGAAr act as a cis-regulatory elements by reorganizing chromatin to an open conformation and activating downstream gene expression. GGAAr characteristics have high heterogeneity between individuals and cell lines. Additionally, ES incidence rates vary greatly between ancestries. Our hypothesis is that variation in GGAAr characteristics genome-wide underlie ES risk and could explain ancestry-related differences in incidence, mediated by EWS/FLI1 cooperative binding to increase binding affinity at GGAAr and optimal local concentration at GGAAr for ES oncogenesis. To test this, we plan to conduct a case-

	control study for ES using blood and saliva samples obtained from Children's Oncology Group. We will extract DNA, perform long-read whole genome sequencing, and analyze GGAAr characteristics and fusion protein localization genome-wide in ancestry groups previously defined. Currently, we are analyzing publicly available lrWGS data to gather information about GGAAr variation in a control population.
78.	**Ryan Magwaro** *Explaining the Decline in Youth Incarceration: Structural Drivers of Juvenile Decarceration in the United States* **Faculty Advisor:** Chris Uggen **Mentors:** Ryan Larson & Anna Dalcortivo **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** Youth incarceration in the United States has declined by more than seventy percent since the early 2000s, marking one of the most significant shifts in the juvenile justice system. Despite this decline, racial disparities persist, and scholars note that the underlying causes are more complex than crime trends alone. Although many attribute the decline to policy reforms, emerging evidence suggests that structural, demographic, and institutional forces may play a larger role. This study identifies the structural, political, and socioeconomic conditions that help explain why youth incarceration has declined across states over the past two decades by updating and extending a 2000 to 2018 dataset through 2024. This analysis uses state-level data including youth incarceration rates, policy indicators, demographic characteristics, and socioeconomic conditions, with the dependent variable being the state-level youth incarceration rate. Key independent variables capture demographic composition, state policy environments, measures of socioeconomic disadvantage, and system-level practices such as the availability of community-based alternatives. Preliminary research suggests that states with stronger community alternatives experience larger declines, while socioeconomic disadvantage slows decarceration. These findings highlight the importance of structural conditions in shaping youth justice outcomes and can guide policies that reduce harm and support positive developmental trajectories for justice-involved youth.
79.	**Jaylynn Maijala** *Rising Together: A Strategy for Addressing Mental Health Disparities Among Rural Youth* **Faculty Advisor:** Mimi Choy-Brown **Mentors:** Cheng Jin **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** In the United States, rural youth experience higher rates of depression, anxiety, and suicide than urban youth. When young people and their families seek help, there is often a delay in services due to a shortage of available mental health care in nearly all rural communities. A way to bridge this gap is to train mentors on how to support young people through evidence-based practices, like Interpersonal Psychotherapy – Adolescent Skills Training (IPT-AST). The IPT-AST model is designed to develop and strengthen young people's interpersonal skills. The goal of the study is to figure out the best way to make a package of techniques available to support the evolving mental health needs of youth in rural settings. A mixed-method approach will be used to evaluate the acceptability of the developed training. Data will be collected using surveys and focus groups made up of mentors and clinical supervisors. By the end of this project a potential tool/training will be developed so that eventually, youth in rural communities have access to consistent and reliable mental health support that will provide them much deserved relief.
80.	**Samanvita Mangalampalli** *Socioeconomic Status and Stress Response in Children* **Faculty Advisor:** Kathleen Thomas **Mentors:** Annie Colomer **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** The purpose of this study was to understand what effect, if any, family socioeconomic status might have on the hormonal stress response of 11- to 16-year-old youth. This project analyzed data from multiple studies of children and adolescents using variations of the Trier Social Stress Test for Children (TSST-C). We defined SES as a composite of relative household income and parental education levels. Stress response was measured through salivary cortisol, salivary alpha-amylase, and self-reported stress measures. Data was

	analyzed using correlation and linear regression analyses on SPSS. Results show that there is no significant general correlation between SES and stress response. However, split-file analyses T-test and correlations show significant relationships between relative income and sAA levels ($p = 0.043$), and for females of this age group, lower relative income may increase salivary alpha-amylase activity during acute lab stressors. A major constraint of our study was a population of participants who did not accurately represent the socioeconomic range that our project could have benefitted from. Given such constraints, our results show that SES has the potential to affect stress response, if the participants represented a population with greater socioeconomic diversity. We aim to replicate this with such participants in the future.
81.	**Melissa Martinez** *The Effects of Growing Zinnia* (Zinnia elegans) *and Snapdragon* (Antirrhinum majus) *in an Agrivoltaic East West fixed solar panel array.* **Faculty Advisor:** Nathan Eylands **Mentors:** Ameila Johnson **Sponsoring Program**: SOAR-REEU **Home Institution:** CSU Monterey Bay **Abstract:** Agricultural land has been shrinking due to urban developments, such as housing. However, the human population is growing at the same time. Agricultural products need to be produced to meet community needs, despite less farmland available. Agrivoltaics, the practice of producing agricultural commodities between solar panels, provides a possible solution to this by putting both agriculture and solar energy on the same land. Another benefit is that the panels can provide extra shade to crops that benefit from shade. We tested two cut flower species Zinnia *(Zinnia elegans L.)* and Snapdragon *(Antirrhinum majus L.)* varieties in an agrivoltaic system located in Minneapolis, MN. This is to measure if being grown in between fixed panels, being placed in shady and sunny sections makes changes morphology, and physiology. Flowers were directly seeded in capillary plug trays and transplanted to the field site, planted 0.3m apart from each other. Marketability data was based on stem length, stem diameter flower quality, and mature leaf count . Physiological traits were based on leaf readings from chlorophyll concentration and stomatal density. This data was analyzed, using statistical software, to make cut flower recommendations to farmers so they can be better informed on growing in agrivoltaics systems.
82.	**Isaac McCollum** *Pharmacokinetics of the Novel Antiepileptic Z944 in Rats* **Faculty Advisor:** Lisa Coles **Sponsoring Program**: SCoPE **Home Institution:** Grinnell College **Abstract:** Post-traumatic epilepsy (PTE) resulting from traumatic brain injury (TBI) is often resistant to currently available anticonvulsants, which target seizures themselves rather than modifying the mechanism or progression of epilepsy. Z944 is a first-in-class calcium channel antagonist that has demonstrated antiseizure and antiepileptogenic properties in rats and offers a promising treatment route for PTE. To inform dosing and establish target drug concentrations in future studies, this investigation seeks to establish the pharmacokinetic (PK) parameters of Z944 in the lateral fluid percussion injury (LFPI) model of PTE. Sprague-Dawley rats were subjected to either LFPI or sham treatments and given a bolus injection followed by subcutaneous infusion for 7 days. Blood samples were collected at various time points via lateral tail vein puncture, and the Z944 concentration of these samples was determined using high-performance liquid chromatography-tandem mass spectrometry (HPLC-MS). Results from the concentration-time profile were analyzed by noncompartmental and compartmental analysis. The results of these analyses, including Z944's PK parameters within this model, will be presented at the Summer Undergraduate Research Expo (SURE).
83.	**Madeline McDowell** *The Relationship between Functional Brain Network Topography and Sleep Duration in Adolescents.* **Faculty Advisor:** Damien Fair **Mentors:** Sanju Koirala & Erendiz Tarakci **Sponsoring Program**: MIDB **Home Institution:** Augustana University

	Abstract: Recently, a Science paper by Marek et al. (2026) examined the relationship between external environmental factors and brain-wide associations in functional network maps, using functional connectivity and cortical thickness measures from the Adolescent Brain Cognitive Development (ABCD) study. Their findings indicated that socioeconomic status had the strongest influence on brain-wide associations; however, sleep was the second strongest predictor. Prior research has focused on functional connectivity; however, recent work has shown that individual variation in topography relates to cognition and psychopathology and is influenced by environmental factors. In this work, we specifically aimed to examine how sleep relates to brain network topography. Using the ABCD database (baseline: N = 7439; ages 9-10; Year 2: N = 5701; ages 11-12), we quantified individual differences in network size during early adolescence and comprehensively examined associations with sleep duration from the parent-reported SDS scale. There was no significant difference between brain network topography and sleep duration; however, the somato-cognitive action network had the largest effect size and replicated across timepoints. Moving forward, we will examine longitudinal associations between brain topography and sleep measures to determine the direction of sleep quantity and network topography variability.
84.	**Sydney McIntosh** *AATC-1 Effects on Behavioral Aspects of Cocaine Use Disorder* **Faculty Advisor:** Paul Mermelstein **Mentors:** Hannah McMullan & Sidney Kuo **Sponsoring Program**: LSSURP **Home Institution:** Iowa State University **Abstract:** Cocaine use is a growing concern in America. There are currently no FDA-approved pharmacological treatments for cocaine use disorder. In this study, we investigated whether an endogenously occurring chemical called AATC-1 has potential as a treatment for cocaine use disorder. We tested the effect of AATC-1 on the behavioral response to cocaine in two non-contingent cocaine treatment paradigms. We assayed locomotor responses following chronic cocaine exposure to test whether AATC-1 can reduce cocaine locomotor sensitization. We also used conditioned place preference tests to determine if AATC-1 prevents reinstatement of cocaine conditioned placed preference. AATC-1, whether given chronically during the abstinence period, or acutely before a cocaine challenge dose, did not decrease cocaine locomotor sensitization. Conditioned place preference tests are currently in progress. Our results thus far suggest AATC-1 may not affect the behavioral response to cocaine. However, it will be interesting to determine whether our ongoing conditioned place preference experiments reveal an effect of AATC-1 on cocaine place preference.
85.	**Teaghan McNeill** *Combining Two Natural Killer Cell Therapies Improves Tumor Control in 3D Models of Glioblastoma* **Faculty Advisor:** Pippa Kennedy **Mentors:** Riley Lyons & Young Vue **Sponsoring Program**: LSSURP **Home Institution:** Randolph-Macon College **Abstract:** Glioblastoma is an aggressive malignant brain tumor that strongly resists standard care with a 5-year survival rate below 10%. Here we compared the killing ability of natural killer (NK) cell therapies against two glioblastoma lines: LN229 and MGG8. Expanded NK cells and induced pluripotent stem cell-derived NK cells (iNKs) with and without a chimeric antigen receptor (CAR) were tested against glioblastoma cells in spheroid killing assays used to achieve a more physiological representation of a tumor. Tri-specific killer engager (TriKE) drugs that dually bind NK cells and tumor cells were added, which typically increase NK cytotoxicity against tumors. iNK cells without CAR have been previously shown to have moderate cytotoxicity against MGG8 cells, which was confirmed here; however, they showed minimal change in cytotoxicity with TriKE treatment. CAR-expressing iNK cells alone had significant cytotoxicity against both cell lines, with an even greater effect on LN229 cells when combined with TriKE. Both therapies killed better than expanded NK cells. The experiments suggest there is value in adding TriKE to CAR-containing iNK cell therapies that are approaching clinical trial for glioblastoma treatment. The next steps include establishing fluorescent glioblastoma lines to dissect the single cell killing dynamics of CAR-containing NK cells.

86.	**Ella Millo** *Investigating the Effects of E-Cadherin Loss on Mitochondrial Function in Invasive Lobular Carcinoma* **Faculty Advisor:** Julie Ostrander **Mentors:** Chinasa Ufondu **Sponsoring Program**: LSSURP **Home Institution:** Michigan State University **Abstract:** Invasive Lobular Carcinoma (ILC) is the most common special histologic subtype of breast cancer, with 40,000 new cases diagnosed annually. Loss of E-cadherin, encoded by the CDH1 gene, is an early hallmark of ILC and occurs in nearly 95% of cases. Previous work in our laboratory demonstrated that CDH1 loss promotes metabolic reprogramming, specifically a shift towards oxidative phosphorylation (OXPHOS). The goal of this project is to determine how E-cadherin loss alters mitochondrial membrane potential and sensitivity to OXPHOS inhibitors. Using a CRISPR-Cas9 gene editing system, two independent models of CDH1 KO were tested. Western blot analysis was performed to confirm E-cadherin loss. Mitochondrial membrane potential was assessed using the fluorescent dye TMRM following treatment with the mitochondrial uncoupler FCCP and ATP synthase inhibitor, oligomycin. AlamarBlue assays were performed to assess the effect of OXPHOS inhibitors on cell viability. Knockout of CDH1 was confirmed using Western blotting. Validation of the TMRM assay demonstrated depolarization following FCCP treatment, while oligomycin suggests differential effects. We anticipate that CDH1 KO cells will exhibit altered mitochondrial membrane potential and increased sensitivity to OXPHOS inhibitors compared to control cells. Understanding these differences may reveal metabolic adaptations that contribute to ILC progression.
87.	**Madison Misterek** *Cascading Effects of Pumpkinseed Sunfish Colonization on Host-Parasite Dynamics in a Small Kettle Lake* **Faculty Advisor:** Brian Wisenden **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Pumpkinseed sunfish *(Lepomis gibbosus)* are mollusk-eating predators that recolonized Deming Lake at Itasca State Park around 2015 and reached a 20-year population high in 2025. Since snails are the intermediate host for the brain parasite *Ornithodiplostomum ptychocheilus* (Op), sunfish predation on snails may suppress Op transmission to fathead minnows. Comparing Op intensity in fathead minnows from Deming Lake 2026 (post-colonization) to 2010 (pre-colonization), with sunfish-free Budd Lake as a control, showed a six-fold drop in Op intensity in Deming Lake ($p < 0.0001$), supporting a sunfish-driven disruption of parasite transmission.
88.	**Sophia Mitchell** *Predicting Developmental Timing of Peak Tic Severity in Tic Disorders* **Faculty Advisor:** Christine Conelea **Mentors:** Brianna Wellen & Sarah Kretsch **Sponsoring Program**: MIDB **Home Institution:** Carleton College **Abstract:** Tourette Syndrome and chronic tic disorders typically reach peak severity in late childhood, yet significant individual variability exists in developmental timing. Although demographic and clinical factors influence overall symptom presentation, less is known about how these variables relate to the age at which individuals reach peak tic severity. This observational study examines whether age of tic onset, sex, and psychiatric comorbidity status (ADHD and/or OCD) predict self-reported age at peak tic severity. Self-report data will be drawn from the Minnesota Tic and Compulsivity Lab's Tic Clips Adult survey and MnTiC Registry. Multiple linear regression will be conducted to evaluate the predictive strength of onset age, sex, and comorbid diagnoses on the continuous outcome of peak severity age. It is hypothesized that earlier onset, sex, and the presence of comorbidities will be significantly associated with peak timing. As a non-experimental, cross-sectional design, this study aims to characterize observational patterns in tic progression, identifying key clinical predictors to guide future longitudinal research and refine trajectory modeling.

89.	**Jordan Moudry** *Soil Fertility Beyond the Harvest: Potentially Mineralizable Nitrogen as a Means to Explore Long-Term Impact of Cover Crop Cycles within High Tunnels* **Faculty Advisor:** Julie Grossman **Mentors:** Benjamin Tanner **Sponsoring Program**: SOAR-REEU **Home Institution:** Smith College **Abstract:** High tunnel systems protect from volatile shoulder seasons and limit nutrient leaching, while increasing yields and lengthening growing seasons. However, intense nutrient cycling within these systems often demands heavier fertilizer inputs, risking harmful runoff. Legume cover crops present a promising alternative to typical organic fertilizers as they can provide mineral nitrogen through fixation and biomass decomposition without causing excessive phosphorus levels. This project explores the long-term impact of various legume cover crops (Austrian Winter Pea, Hairy Vetch, Crimson Clover, Cowpea, and Field Pea) on potentially mineralizable nitrogen (PMN) following cover crop implementation between 2024 and 2026. Soil samples were collected at sites in Grand Rapids and St. Paul, Minnesota, as well as replicate plots on regional farms, and processed by anaerobic incubation. Colorimetric ammonium measurements determined the amount of mineral nitrogen that could become available in ideal conditions. Initial results from the fall of 2024 show clear variation in PMN by farm location and not by cover crop treatment. Specifically, plots at Grand Rapids had significantly lower PMN values, possibly due to inconsistent use and lack of organic matter. These results highlight the impact of imported soils, site establishment history, and past crop rotations on PMN values within high tunnels.
90.	**Delaney Nickles** *Assessment of Genetic Interactions Between prdm3, prdm16, and brg1 in the Regulation of Cranial Neural Crest-Derived Skeletal Development* **Faculty Advisor:** Kristen Artinger **Mentors:** Julaine Roffers-Agarwal **Sponsoring Program**: LSSURP **Home Institution:** Missouri State University **Abstract:** Neural crest is a multipotent cell type that forms several cranial derivatives including bone and cartilage. Mutations affecting the development or migration of these cells can lead to abnormalities including cleft lip/palate. Previous research found prdm3 and prdm16 function as transcription factors and chromatin modifiers and also regulate neural crest derivative formation. Another chromatin modifier, brg1 is a BAF complex component and regulates differentiation. Previous findings in the lab showed that loss of prdm16 and prdm3 have opposite effects regarding a group of differentially expressed genes, including brg1. We hypothesize that prdm3 and prdm16 work with brg1 to regulate neural crest derivative formation. To do so, we examined craniofacial skeletal progenitors in zebrafish by alcian blue/alizarin red-stained skeletal staining and Hybridization Chain Reaction (HCR) with three separate bone (runx2b) and cartilage (col2a1a, sox9a) markers. Analysis of alcian blue-stained samples demonstrated a difference in craniofacial skeletal element shape of brg1 single alongside prdm3;brg1 and prdm16;brg1 double mutants. Preliminary interpretations of HCR imaging demonstrate a decrease in intensity and shape changes of stained bone and craniofacial cartilage elements. Collectively, these preliminary results suggest that prdm3 and prdm16 function with brg1 to regulate cranial neural crest-derived skeletal development.
91.	**Sophia Nocho-Iverson** *Effects of CRABP1 on Protein Glycosylation* **Faculty Advisor:** Li-Na Wei **Mentors:** Fatimah Najjar **Sponsoring Program**: LSSURP **Home Institution:** University of Minnesota Twin Cities **Abstract:** Glycosylation is a common post-translational modification, involving the addition of carbohydrate units to proteins, influencing folding and function. Proper glycosylation is important in secretory cells, where proteins undergo processing in the endoplasmic reticulum and Golgi apparatus prior to secretion. CRABP1 is a cytosolic protein abundantly expressed in secretory cells, where previous work from the Wei Lab has demonstrated that loss of CRABP1 increases protein misfolding in secretory cells. Given CRABP1's expression in

	secretory cells, lung tissues were selected to assess the potential role of CRABP1 in glycosylation through evaluation of highly glycosylated mucins. Lung tissues from CRABP1 total knockout (CKO) and WT mice were evaluated to assess glycosylated mucin. Protein lysates were treated with Endo H and PNGase F, which cleave glycans generated during ER and Golgi respectively, to assess alterations in glycoproteins between genotypes. Total glycosylated mucin demonstrated reduced glycosylated mucin signal intensity in CKO lungs relative to WT controls, suggesting altered mucin glycosylation in the absence of CRABP1. Furthermore, glycoproteins from CKO lungs exhibited increased resistance to PNGase F digestion, indicating potential defects in glycans during Golgi processing. Together, these findings support a role for CRABP1 in regulating glycoprotein processing and its potential of maintaining secretory cell function.
92.	**Reuben Ockman** *BioID Reveals Dimerization-Dependent Recruitment of CCR4-NOT by Drosophila Brat and Develops an Approach for Identifying Protein Interactions in Human Cells* **Faculty Advisor:** Aaron Goldstrohm **Mentors:** Robert Connacher **Sponsoring Program**: LSSURP **Home Institution:** University of California, Berkeley **Abstract:** The CCR4-NOT complex, the master regulator of eukaryotic mRNA stability, is recruited to specific mRNAs by RNA-binding proteins (RBPs). We mapped these interactions via BioID. First, in Drosophila, the RBP Brat destabilizes mRNAs, but its connection to CCR4-NOT remains unclear. As the C-terminus of Brat is necessary for RNA regulation, we used BioID to test whether the C-terminus interacts with CCR4-NOT. These assays compared the promiscusous biotin ligase 'ultraID' fused to the full H-NHL domains and a longer, dimerized form. We found that Brat C-terminus interacts with the CCR4-NOT deadenylase but only as a dimer. Second, in human cells, we used BioID to identify proteins interacting with CNOT1. The N-terminus of CNOT1 contains de novo missense mutations linked to developmental disorders. We fused the N-terminus of CNOT1 to ultraID for transient expression in cultured human cells, to test whether protein-protein interactions differ between the wild-type and mutant forms. We optimized BioID conditions ahead of a full-scale experiment. This project establishes a connection between Brat and CCR4-NOT in Drosophila, and in parallel develops a BioID approach for identifying RBPs that interact with the human CCR4-NOT complex.
93.	**Chukwubunkem Okezie** *Investigating How Resilience Reduces Internalizing Symptoms of Multicultural vs. Monocultural Adolescents Facing Early Life Adversity* **Faculty Advisor:** Mark Fiecas **Mentors:** Kelly Duffy & William Asinger **Sponsoring Program**: Equitable Data Science **Home Institution:** Macalester College **Co-Presenter(s):** Dorothy Fulcher, Macalester College **Abstract:** Early life adversity (ELA) is a well-established predictor of negative mental health outcomes. This relationship is specifically important amongst adolescents, as their developmental period sets trajectories for long-term health outcomes. Additionally, this relationship is often even more important for marginalized populations who have experienced disproportionate rates of adversity. Using data from the Adolescent Brain Cognitive Development Study, the largest longitudinal study on adolescent development, we used causal mediation analysis and regression analysis to examine the role of resilience as a mediator for ELA and mental health symptoms. We compared effects between monocultural and multicultural adolescents. Our findings indicate that as ELA among adolescents increases, internalizing symptoms increase at a faster rate among multicultural adolescents compared to monocultural adolescents. Within our casual mediation analysis we found that resilience, specifically among multicultural adolescents, helps slow the increase in internalizing symptoms. Further analysis showed environmental contributors to resilience to be the most protective domain amongst multicultural youth's increasing internalizing symptoms. With this, we advocate for increased access for multicultural adolescents to protective factors like safe green spaces and community-based art and sports organizations to mitigate the mental health impacts of ELA.

94.	**Thalia Oliveros** *PARP Inhibitor and Cisplatin Cross-Resistance in a BRCA2-Mutant High-Grade Serous Ovarian Cancer Cell Line* **Faculty Advisor:** Stefani Thomas **Mentors:** Trudy Philips & Carly Twigg **Sponsoring Program**: LSSURP **Home Institution:** Florida International University **Abstract:** High-grade serous ovarian cancer (HGSOC) is the most aggressive ovarian cancer subtype. Standard treatment includes cytoreduction and platinum-based chemotherapy (cisplatin), followed by PARP inhibitor (PARPi) treatment. However, acquired resistance to PARPi is common, with some tumors exhibiting cross-resistance to cisplatin. Understanding the molecular mechanisms of cross-resistance can improve personalized treatment by avoiding ineffective therapies and toxicity. This study aims to assess the cross-resistance of PARPi-resistant HGSOC cells to cisplatin. BRCA2-mut PEO1 parental HGSOC cells (P1-S) were exposed to increasing concentrations of the PARPi olaparib to develop acquired resistance (P1-OR). To evaluate response to olaparib and cisplatin, drug sensitivity was measured using Sulforhodamine B and clonogenic assays. DNA damage response was analyzed by measuring γ-H2AX (DNA damage marker), RAD51 (DNA damage repair marker), and cleaved PARP (apoptotic marker) expression through Western blot analysis. P1-S showed increased sensitivity to olaparib and cisplatin (IC50 = 3.94 μM and 5.57 μM). P1-OR had decreased sensitivity to olaparib (IC50 > 50 μM). P1-OR and P1-S cells exhibited comparable cisplatin sensitivity. γ-H2AX expression was increased and RAD51 expression was decreased in P1-S cells resulting in increased cell death, whereas P1-OR cells showed the opposite pattern. Future studies will assess cross-resistance between cisplatin and other PARPi.
95.	**Sofia Olmedo** *Effects of Location and Domesticated Pennycress Lines on Pennycress Seed Yield, Oil Content, and Oil Yield* **Faculty Advisor:** Yesuf Mohammed **Sponsoring Program**: Forever Green Initiative URE **Home Institution:** University of St. Thomas **Abstract:** Domesticated pennycress (*Thlaspi arvense L.*) can provide raw material for biofuel and bioproducts. However, variation may exist among pennycress lines and locations. We evaluated seven domesticated pennycress lines (PC_1 to PC_7) at Rosemount and Waseca, Minnesota, to determine the effects of location and line on seed yield, oil content, and oil yield. The lines were seeded in a randomized complete block design with four replications and a plot size of 7.62 m by 3.05 m. The Rosemount study was sown on September 29, 2025, and the Waseca study on October 1, 2025. Both sites were harvested on June 16, 2026. A near-infrared analyzer (Perten model DA 7250, PerkinElmer, Shelton, CT, USA) was used to determine seed oil content. Results showed significant differences among locations and lines in seed yield, oil content, and oil yield. Seed yield was greater at Rosemount (1,082 kg ha^{-1}) than at Waseca (755 kg ha^{-1}). PC_5 had the highest mean seed yield (1,223 kg ha^{-1}) and oil yield (432 kg ha^{-1}), while PC_6 had the highest mean oil content (38.88%). No significant location by pennycress line interactions occurred, indicating that line performance was generally consistent across both locations.
96.	**Kendyl Olson** *Barriers and Facilitators of Tobacco Cessation Resources Among Somali Americans* **Faculty Advisor:** April Wilhelm **Sponsoring Program**: M-ASCEND **Home Institution:** College of Saint Benedict **Abstract:** Although cigarette smoking has declined in the United States, tobacco use continues to disproportionately affect some racial, ethnic, and immigrant populations, including Somali Americans. While evidence-based tobacco cessation resources are available, little is known about Somali parents' perceptions of these resources. This study explored Somali parents' perceived barriers and facilitators to using tobacco cessation medications, Quitline services, and text messaging programs. We conducted 10 individual interviews and seven focus groups (40 participants) with Somali American parents exposed to smoking between September 2025 and March 2026. Transcripts were analyzed thematically. Across cessation resources, Somali American parents described access barriers, including limited awareness, financial constraints, and literacy, language, and technology barriers. While these barriers were largely similar across cessation resources, hesitancy about safety was a barrier unique to medications, while privacy concerns and limited engagement were primarily discussed in relation to text messaging programs. Cross-cutting facilitators included culturally

	and linguistically appropriate education, trusted healthcare provider support, and ongoing reminders and motivational messaging. Participants emphasized these strategies would improve awareness, engagement, and smoking cessation among Somali parents. These findings highlight the importance of culturally tailored tobacco cessation interventions improving access to and usability of cessation resources for Somali parents.
97.	**Zane Orion** *Investigating the Impacts of Accumbal Inhibition of Angiotensin-Converting Enzyme on Fentanyl Reinforcement* **Faculty Advisor:** Patrick Rothwell **Mentors:** Ciarra Whindleton **Sponsoring Program**: Independent Research **Home Institution:** University of Minnesota Twin Cities **Abstract:** Opioid use disorders (OUDs) are brain conditions perpetuated by high relapse percentages, which in turn causes high mortality rates. Psychiatric conditions like OUD and depression are highly linked to the nucleus accumbens (NAc), a key part of the brain reward circuit.. Importantly, the NAc contains high levels of angiotensin-converting enzyme (ACE) expression. Interestingly, inhibition of ACE selectively decreases activity of a specific neuron that normally promotes drug responses. We hypothesize this effect of ACE inhibition offers potential in therapeutic treatments for OUD. To test a potential role of accumbal ACE inhibition on opioid-seeking behaviors, a genetic knockout (KO) approach was used, where floxed ACE transgenic mice received bilateral injections of an AAV expressing Cre. However, these mice struggled to distinguish between active and inactive levers during behavioral acquisition. Histological evidence of viral toxicity was identified in the first group, so we tested a separate group of mice injected with the same virus diluted to a lower titration. Our initial results using the lower titer suggest normal acquisition, however a larger sample is needed to solidify this finding. Additional next steps would be testing whether the conditional KO of ACE affects other reward-seeking, such as sucrose.
98.	**Haley Orvik** *Mitochondrial Dysfunction as a Biomarker and Therapeutic Target in Pompe Disease* **Faculty Advisor:** Reena Kartha **Mentors:** Marcia Terluk **Sponsoring Program**: SCoPE **Home Institution:** University of Minnesota Twin Cities **Abstract:** Pompe disease (PD) is a lysosomal storage disease caused by mutations in the GAA gene, which encodes the enzyme acid-α-glucosidase that catalyzes the conversion of glycogen into α-glucose in lysosomes. Early-onset PD (IOPD) occurs in infancy and early adolescence, typically represented as 1% GAA enzyme function. Late-onset patients (LOPD) present with symptoms later in life and typically have higher enzymatic function and milder symptoms. Enzyme replacement therapy (ERT) is the standard of care and begins as soon as clinical symptoms present; however, the disease may be progressing subclinically, and the current biomarkers cannot identify symptom onset early on. Inadequate substrate clearance increases reactive oxygen species production, which in turn affects mitochondrial function. This organelle crosstalk may explain why patients with PD continue to experience fatigue even with ERT. Thus, our objective is to develop a validated protocol for monitoring mitochondrial health in patients with PD. Using cell viability, fluorescence microscopy, and Seahorse ATP Rate Assays with patient-derived PD cells, we will characterize and compare the secondary mitochondrial dysfunction in IOPD and LOPD cells, and we will use this platform to test antioxidants. Results from these experiments will inform us on the potential for assessing mitochondrial function to make treatment decisions.
99.	**Theodora Osborne** *Effect of Timing and Technique of Allergen Introduction on Specific CD4+ T Cell Response* **Faculty Advisor:** Ryan Nelson **Mentors:** Joe Butterfield **Sponsoring Program**: LSSURP **Home Institution:** Evangel University **Abstract:** In 2015, the clinical LEAP trials found that early exposure to peanuts led to significantly decreased likelihood of developing peanut allergy. T cell tolerance is critical in prevention of allergic disease, but there are few in depth studies characterizing the effect of early or late introduction of dietary antigens on CD4+ T cell tolerance in mice. To address this gap, we performed experiments exposing adult mice to model food antigens

	OVA and 2W peptide via different routes—oral gavage, ad lib in drinking water, or sweetened condensed milk feedings. We hypothesized that drinking water would create the greatest tolerance because of smaller doses as opposed to bolus dosing. After completing their feeding schedules, we harvested spleen and lymph nodes and performed flow cytometry to determine CD4+ T cell subsets present, and performed ELISA to quantify the food antigen specific antibody responses present in serum. We did not observe significant variance in the tolerogenic T cell responses across these methods of short-term feedings, however, we observed that sweetened condensed milk was viable for delivery of food antigens to both young and old mice. This paved the way for ongoing.
100.	**Aisha Osman** *The Influence of Social Determinants of Health On Physical Activity In Cancer and Non-Cancer Survivors* **Faculty Advisor:** Brianna Leitzelar **Sponsoring Program**: M-ASCEND **Home Institution:** University of Minnesota Twin Cities **Abstract:** Physical activity is recommended for cancer survivors (CS), but social determinants of health (SDoH) affect one's ability to do so. Objectives: (1) Determine differences in PA between CS and non-cancer survivors (NCS). (2) Determine if the relationship between cancer status and PA differ depending on access (geographic location), education, and/or social and community context (age, gender, marital status). This was a secondary, cross-sectional analysis using data collected at the Minnesota State Fair (n=488 NCS, n=68 CS). Participants completed sociodemographic (SDoH) and cancer status questions; and the International PA Questionnaire to assess PA (mins/week). T-tests and ANOVAs were used to determine significant differences. PA didn't significantly differ between CS and NCS (p=0.71). There was a significant interaction effect for education (p=0.048). Post-hoc testing revealed CS had significantly higher PA than NCS (mean difference = 353.62, p=0.017) for those with lower education, whereas there were no significant differences for those with a higher education (p=0.724). The results show education as the only SDoH affecting PA depending on cancer status. The results were surprising and didn't correspond with current literature, however, SDoH remains important to consider in research.
101.	**Sarah Ouachani** *Investigating the Effects of Hyaluronic Acid on* Enterococcus faecalis *Aggregate Formation* **Faculty Advisor:** Julia Willett **Mentors:** Amanda Haeberle **Sponsoring Program**: Independent Research **Home Institution:** University of Minnesota Twin Cities **Abstract:** *Enterococcus faecalis* is a Gram-positive gut commensal bacterium that causes biofilm associated infections including root canals, endocarditis, and prosthetic joint infections (PJIs). We previously demonstrated that E. faecalis forms biofilms and liquid-phase aggregates when grown in a simulated synovial fluid model (SSF) and hyaluronic acid (HA), the primary glycosaminoglycan in SSF, is sufficient to promote liquid aggregate formation. Since the effect of HA in a damaged joint cavity during a PJI is understudied, I tested how different molecular weights of HA impact aggregation. I quantified liquid aggregate formation in different concentrations of low molecular weight (MW) HA, which mimics the HA in damaged joints, and found that higher concentrations of low MW HA were sufficient to promote liquid aggregate formation. Furthermore, I treated HA aggregates with exogenous hyaluronidases and found that upon degradation of HA, E. faecalis no longer aggregates. These results demonstrate that HA is necessary and sufficient for liquid aggregate formation. Lastly, I quantified aggregate formation for biofilm deficient strains and found that HA promotes liquid aggregate formation in the absence of canonical biofilm mechanisms. With these results, there are broader implications for how E. faecalis and HA interact during infections throughout the body.
102.	**Janelle Pabona** *Th17 Cell Differentiation to Investigate Tenofovir Uptake* **Faculty Advisor:** Melanie Nicol **Mentors:** Lindsey Collins **Sponsoring Program**: SCoPE **Home Institution:** University of Illinois Urbana-Champaign

	Abstract: Tenofovir is an antiretroviral medication used to prevent HIV transmission, known as Pre-Exposure Prophylaxis or PrEP. While PrEP is highly effective at reducing HIV transmission, variable efficacy in preventing vaginal transmission highlights the need to better understand the factors influencing tenofovir drug distribution and efficacy in the female genital tract. T-helper17 (Th17) cells have been found to be especially susceptible to HIV infection, and levels of TFVdp, the active form of tenofovir, have been positively correlated with IL-17, a cytokine produced by Th17 cells. To determine the relationship between Th17 cells and TFVdp, we will first isolate CD4+ cells from PBMCs and induce differentiation into Th17 cells. By testing various antibody combinations, we aim to establish a reliable protocol for generating Th17 cells. Then, CD4 and IL-17 ELISAs will be performed to verify the presence of Th17 cells and quantify IL-17 levels. Finally, the Th17 cells will be incubated with tenofovir, and TFVdp concentrations will be compared between Th17 cells vs. non-Th17 cells. We hypothesize that Th17 cells metabolize more tenofovir than CD4+ IL-17-negative cells. These findings can inform future therapeutic development and guide dosing regimens for PrEP across sex and gender spectrums.
103.	**Hawon Park** *Evaluating the Ability of Patient Satisfaction Surveys to Capture Discriminatory Experiences: A Systematic Review* **Faculty Advisor:** Ebiere Okah **Sponsoring Program**: M-ASCEND **Home Institution:** Cornell University **Abstract:** Black patients report higher rates of racial mistreatment than White patients in surveys evaluating discrimination but commonly report similar or better care experiences in patient satisfaction surveys. We conducted a systematic review to identify whether domains in the Discrimination in Medical Settings (DMS) scale were captured in patient satisfaction surveys to explore this disconnect. Studies examining racial differences in patient satisfaction over the past 10 years were extracted from Scopus, CINAHL, APA PsycINFO, Web of Science, and MEDLINE. We identified the presence of DMS domains in satisfaction surveys. 815 articles were identified with 27 included studies. Four of the seven DMS domains were represented in satisfaction surveys (respect, courtesy, poorer service, and listening). Compared to White patients, Black patients consistently reported being treated with less courtesy and respect (9 of 9 studies) and reported worse overall care experiences (9 of 16 studies). Listening was examined in isolation in one study and found to be the same. Disrespect (and courtesy) is an item of the DMS reflected in the patient satisfaction surveys that consistently reveal racial differences in care. It may be an important signal in patient satisfaction surveys that captures patients' experience of racial mistreatment.
104.	**Eshaan Parnerkar** *Evaluating How Microglial ATXN1 Knockout Alters Phagocytic Function and Motor Symptoms in Spinocerebellar Ataxia Type 1* **Faculty Advisor:** Marija Cvetanovic **Mentors:** Gavin Fuchs **Sponsoring Program**: Independent Research **Home Institution:** University of Minnesota Twin Cities **Abstract:** Spinocerebellar Ataxia Type 1 (SCA1) is a fatal autosomal dominant neurodegenerative disease caused by a CAG repeat expansion in the ATXN1 gene, resulting in progressive Purkinje cell degeneration and motor dysfunction. Chronically activated microglia are a hallmark of SCA1 pathology and are believed to contribute to neurodegeneration through impaired phagocytic ability. Previous work from the Cvetanovic lab showed that removing mutant ATXN1 from both macrophages and microglia via LYVE1-cre partially rescued disease symptoms, but the specific contribution of only microglia was not known. To address this, f-ATXN1^{146}Q/2Q × TMEM119-creER^T2 mice were used to selectively delete mutant ATXN1 from microglia compared to f-ATXN1^{146}Q/2Q (Disease) and wildtype controls. Motor coordination was assessed via accelerating rotarod at 14, 24, and 30 weeks. Brain tissue was immunofluorescently stained with IBA1 and Calbindin to quantify microglial and Purkinje cell density across cerebellar regions. Microglial phagocytic function was found through analysis of neuronal markers within microglial volume. Results suggest microglial-specific ATXN1 deletion is insufficient to rescue motor symptoms or phagocytic function, implicating non-cell-autonomous mechanisms as primary drivers of microglial dysfunction in SCA1.

105.	**Brooklynn Rait** *System-Wide Profiling of Potential Lysyl Oxidase Targets with In Vitro Enzymatic Assays and Quantitative Chemical Proteomics* **Faculty Advisor:** Yue Chen **Mentors:** Haiping Ouyang & Ang Luo **Sponsoring Program**: LSSURP **Home Institution:** University of Wisconsin–Green Bay **Abstract:** Lysyl oxidase (LOX) is a family of copper-dependent metalloenzymes that oxidizes the amino group on lysine side chains in proteins into an aldehyde, forming a posttranslational modification known as allysine. Previous studies show that LOX-dependent allysine generation plays critical roles in collagen crosslinking in the extracellular matrix and is generated on nuclear transcription factors and histones to regulate gene expression. Allysine modifications can be produced through LOX enzymes, or non-enzymatically via reaction oxygen species. This raises a question of what fraction of allysine sites are regulated by LOX enzymes versus produced non-enzymatically. The Chen lab has recently developed a capture-and-release chemical proteomics workflow for system-wide profiling of allysine targets. This study combines the workflow with label free quantitative proteomics for system-wide enrichment and site-specific identification of LOX-dependent allysine. We developed a fluorescent-based detection and quantification assay for carbonylated proteins using Rhodamine B-hydrazide. Then, we established an in vitro enzymatic assay with a specific LOX family enzyme, LOXL2, then used it to perform chemical proteomics enrichment and LCMS analysis to identify allysine targets. Analysis revealed proteins enriched and targeted upon LOXL2 treatment, generating further hypotheses regarding how and what LOXL2 is regulating within cells.
106.	**Koda Ramos** *Assessing Pest Infestation Rates on Collard Greens in Relation to Plant Phenotypic Traits* **Faculty Advisor:** Mary Rogers **Mentors:** William Pradel **Sponsoring Program**: SOAR-REEU **Home Institution:** University of Texas Rio Grande Valley **Abstract:** Collards *(Brassica oleracea var. viridis)* are valued for their cultural significance and phenotypic diversity, yet they are increasingly threatened by insect pests. The invasive swede midge *(Contarinia nasturtii)* is an emerging pest of brassica crops in northern regions of the United States; while systemic pesticides can manage swede midge in conventional large-scale agriculture, organic and small-scale growers lack effective alternatives. This study evaluated 10 heirloom collard varieties to determine their susceptibility and tolerance to the swede midge, alongside other cosmopolitan pests, including the imported cabbageworm *(Pieris rapae),* diamondback moth *(Plutella xylostella)*, cabbage looper *(Trichoplusia ni)*, and flea beetles *(Phyllotreta cruciferae, P. striolata)*. Since herbivorous insects rely on visual and chemical cues for host plant selection, this research investigated the role of phenotypic traits—leaf color and epicuticular waxes—that may be associated with plant defense. We hypothesized that foliage coloration and glaucosity influence infestation levels of various pests. During the trial, we recorded plant morphological characteristics such as leaf/ stem color, and glaucosity. Each plant was regularly scouted for various insect pests and their life stages. The swede midge population was monitored and tracked using pheromone-baited sticky card traps. These findings provide critical insights for growers seeking sustainable pest management strategies.
107.	**Berary Ramos** *Characterizing Mechanisms of Ferroptosis Resistance in YUMM 1.7 Melanoma Cells* **Faculty Advisor:** Carla Rothlin **Mentors:** Brandon Burbach **Sponsoring Program**: LSSURP **Home Institution:** University of Minnesota Twin Cities **Abstract:** Ferroptosis is an iron-dependent form of regulated cell death driven by the accumulation of lipid peroxides. During this process, reactive oxygen species oxidize polyunsaturated fatty acids (PUFAs) within membrane phospholipids, initiating a chain reaction that generates lipid peroxides. Ferroptosis has emerged as a promising therapeutic strategy for melanomas because many tumor cells evade other forms of cell death but remain susceptible to ferroptosis. However, tumor cells can acquire resistance to ferroptosis following prolonged exposure to ferroptosis-inducing agents, reducing the effectiveness of these therapies. The

	molecular mechanisms underlying acquired ferroptosis resistance remain incompletely known. My project aims to characterize ferroptosis-resistant (FR) derivatives of the YUMM 1.7 murine melanoma cell line by comparing their responses to a ferroptosis-inducing molecule (RSL3) with those of the parental cell line. Using flow cytometry, lipid peroxidation and cell viability were assessed across increasing RSL3 doses, with BODIPY and Ghost Dye staining, respectively. Characterizing the phenotypic differences between ferroptosis-resistant and non-ferroptosis-resistant melanoma cells will provide insight into the mechanisms that enable resistance and may identify pathways that can be targeted to restore ferroptosis sensitivity in cancer.
108.	**Yazmin Rangel Tellez** *Examining the Reproductive Success of* Gryllus pennsylvanicus *Exposed to Sublethal Neonicotinoids* **Faculty Advisor:** Mingzi Xu **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** Pesticide use is widespread. Although designed for specific target species, they often spread beyond their intended areas, posing a risk of low-dose exposure to non-target organisms. Insects provide vital ecosystem services, including nutrient cycling, pollination, seed dispersal, and serving as a major food source. Sublethal exposure can be ecologically significant, altering reproductive biology, population dynamics, and community structure. There is limited data on how pesticides affect reproductive tissue development and mating behavior in non-target organisms. Most existing data comes from honey bees and other hymenopterans, which have specialized reproductive biology distinct from most insects. To address this gap, this project asks how sublethal ingestion of imidacloprid affects reproductive tissues and mating behaviors. Imidacloprid is one of the most widely used insecticides, making it a key compound for assessing sublethal impacts. We use the cricket *Gryllus pennsylvanicus* as a model in a controlled exposure experiment, assigning individuals to imidacloprid-treated or untreated diets. Effects are analyzed using song recordings and gonad mass. Imidacloprid has demonstrated environmental impacts that led to its ban in the EU, and high-quality risk assessment data is crucial to informing US pesticide policy. This study helps close a major gap by providing data on a non-target insect species.
109.	**Tina Raunaqe** *The SPP1 Alveolar Macrophage Cluster Is Associated with FEV1 Decline in HIV-Associated COPD* **Faculty Advisor:** Monica Campo **Sponsoring Program**: LSSURP **Home Institution:** University of California, Los Angeles **Abstract:** Chronic obstructive pulmonary disease (COPD) is the third leading cause of death worldwide. HIV increases the risk of developing COPD. However, the underlying mechanisms remain incompletely understood. We aimed to characterize clusters of alveolar macrophages (AM) associated with COPD in individuals with HIV. We performed computational analysis of a proteomic dataset generated from bronchoalveolar lavage fluid from HIV positive individuals with (26) and without (26) COPD using a SomaScan assay. We matched 3872 proteins to gene names and mapped them to major cell types then to alveolar macrophage clusters previously identified with single-cell transcriptomics. 53.9% of total genes that were matched into AMs matched into AM clusters. We performed proteome-wide association testing and found that the most significant AM cluster associated with COPD (defined by low FEV1pp) was the SPP1 cluster. This cluster has been described as comprising transitional/intermediate AMs with recruited features and consists of several known genes associated with emphysema. The SPP1 cluster contains twenty three potential biomarkers significantly associated with lower FEV1pp. Future in vitro studies will evaluate the role of this cluster in the pathophysiology of HIV-associated COPD. These findings will help identify patients at-risk of frequent COPD exacerbations and be potential therapeutic targets.
110.	**Franziska Rinkleff** *Effects of In Vitro Aging on the Physicochemical, Mechanical, and Thermal Properties of Direct Printed Clear Aligner Materials* **Faculty Advisor:** Jae Sung Lee **Mentors:** Mayuri Parappullil Vellayappan **Sponsoring Program**: LSSURP **Home Institution:** University of Minnesota Rochester

	Abstract: Clear aligner therapy is a rapidly expanding area of orthodontics, yet conventional thermoformed aligners are associated with material waste, prolonged manufacturing times, and progressive force degradation during clinical use. Direct 3D printing has emerged as a promising alternative capable of improving manufacturing efficiency while enabling customized aligner fabrication. This study evaluated the effects of in vitro aging on the physicochemical, mechanical, thermal, and optical properties of two direct-printed clear aligner resins fabricated at three print orientations (0°, 45°, and 90°). Specimens were aged in artificial saliva at 37°C for 1, 7, and 14 days under continuous rotation to simulate the oral environment. Material properties were characterized using tensile testing, scanning electron microscopy, differential scanning calorimetry, thermogravimetric analysis, and UV-visible spectrophotometry and compared with conventional thermoformed aligner materials (Essix ACE, Zendura). Preliminary findings indicate that print orientation significantly influences baseline mechanical performance, with 45° specimens exhibiting greater Young's modulus (0.75 ± 0.03 GPa) and yield stress (17.74 ± 0.75 MPa), while 90° specimens demonstrated higher ultimate tensile strength (31.51 ± 2.57). Direct-printed resins also exhibited greater UV-visible absorbance than thermoformed controls. These findings provide insight into the performance of direct-printed aligner materials and support continued investigation of their long-term clinical durability.
111.	**Arabelle Rohs** *Evaluating Germination Protocols for Strawberry* (Fragaria x ananassa) **Faculty Advisor:** Matthew Clark **Mentors:** Gabriel Olson-Jensen **Sponsoring Program**: SOAR-REEU **Home Institution:** Grinnell College **Abstract:** The development of strawberry *(Fragaraia x ananassa)* cultivars via breeding requires the ability to propagate new seedling populations by sexual reproduction. Currently, the University of Minnesota fruit breeding program lacks such a protocol. This study sought to develop a standardized, efficient strawberry seed germination protocol. Germination protocols were evaluated on open pollinated seeds of 'Brunswick' in a full factorial design of 25 seeds per replicate with 5 replicates per treatment and 6 treatment groups. The factors were growth medium (full-strength Murashige and Skoog growth media in vitro or blotting paper) and GA3 treatment of 0, 500, and 1000 ppm. Seeds were placed under 16-hour day T8 Fluorescent light and ambient room temperature. Germination counts were recorded three times per week and seedling transplant survival recorded at the end of the experiment. A linear mixed effects model was used to understand the effects of the treatments on both germination and survivability of transplants. Preliminary analysis found no statistically significant difference between GA3 treatment (P-value of 0.392), although analysis is ongoing. The germination rate on blotting paper averaged 10%. These results demonstrate the feasibility of developing an effective protocol, although work is ongoing to make the protocol more efficient.
112.	**Rosalia Romero Rosales** *Using AI to Generate Culturally Tailored Messages to Increase Breast Cancer Screening Among African American Women* **Faculty Advisor:** David Haynes **Sponsoring Program**: M-ASCEND **Home Institution:** University of Minnesota Rochester **Abstract:** Breast cancer remains a leading cause of cancer mortality, accounting for over 685,000 deaths globally in 2020. Black women, however, experience higher mortality rates than women from other ethnic backgrounds (Rauch et al., 2023). This qualitative study focuses specifically on African American women, exploring how fatalism, stigma, mistrust, and access barriers shape their perceptions of breast cancer screening. African American women community members will attend a community engagement event. Community members are encouraged to share their experiences through PhotoThreads, a photovoice-based platform capturing audio, photo, text, or speech input, with an incentive upon completion. Responses will undergo directed content analysis and be mapped onto predefined knowledge graph nodes (e.g., concern, community), feeding into a retrieval-augmented generation (RAG) process that generates personalized breast cancer screening messages. We anticipate that responses will reveal how fatalism, stigma, medical mistrust, access barriers, and community influence shape screening decisions. These findings will inform a knowledge graph and RAG process that produces culturally tailored, personalized screening messages. These findings will

	inform the development of culturally tailored, AI-generated messaging tools, grounded in the expertise and knowledge of African American women, to address barriers to breast cancer screening.
113.	**Julia Sagstetter** *Establishing a Historical Control Cohort for Comparative Effectiveness Studies of* Cytomegalovirus *Prophylaxis with Letermovir in Pediatric Hematopoietic Cell Transplantation* **Faculty Advisor:** Alex Hoover **Sponsoring Program**: Children's Cancer Research Fund **Home Institution:** Carleton College **Abstract:** *Cytomegalovirus* (CMV) remains a major cause of morbidity in pediatric allogeneic hematopoietic cell transplants (HCT). While letermovir was recently approved in August 2024 for CMV prophylaxis in pediatric HCT recipients and has demonstrated safety and efficacy in adult transplant populations, there is limited pediatric data for effectiveness, creating a need for studies evaluating its use in children. For future assessment of CMV prevention strategies, we are developing a synthetic control arm from a cohort of pediatric allogeneic HCT recipients using retrospective medical record review. Eligible patients are identified through an institutional bone marrow transplant database, and chart abstraction is performed to procure and record data in a secure REDCap multi-institutional database. Data collected include patient demographics, transplant characteristics, CMV monitoring, antiviral prophylaxis and treatment, graft-versus-host disease, engraftment, chimerism, and clinical outcomes. Data collection is ongoing, but preliminary work demonstrates that it is feasible to systematically identify eligible pediatric HCT patients and capture robust transplant and CMV-related data. This historical cohort will provide information for future comparative effectiveness studies evaluating letermovir prophylaxis and other CMV prevention strategies in pediatric HCT recipients.
114.	**Cam Sharpe** *Is It a Bird? Is It a Plane?: Flying Squirrel Nesting Behaviors in Itasca State Park* **Faculty Advisor:** Joseph Whittaker **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Forest succession in Itasca State Park has been pushing populations of Southern Flying *Squirrels (Glaucomys volans)* that typically nest in deciduous trees north, into the historical range of Northern Flying Squirrels *(Glaucomys sabrinus)* which typically inhabit conifers. *G. volans* has become the most commonly seen squirrel in the park, bringing concerns about the state of its native counterpart's populations. In this study, I trapped a total of 6 flying squirrels (1 Northern, 5 Southern) over the course of 5 weeks in the park, and used radio telemetry to track their daytime roosting sites. I collected data from different nest sites and compared it to past years' data. The lack of *G. sabrinus* caught across the park in the past years suggests a decline in population, and I observed a *G. volans* displacing a *G. sabrinus* from her nest site during the study. More nest site data is needed on *G. sabrinus* to determine differences in nesting behaviors, but early evidence shows that they may be choosing less ideal nests due to displacement and an increase in *G. volans* in the park.
115.	**Reghan Sikorski** *Food Parenting Practices Across Income Groups: A Comparison of Four Parenting Domains* **Faculty Advisor:** Katie Loth **Sponsoring Program**: M-ASCEND **Home Institution:** Southeastern University **Abstract:** Food parenting practices have a profound influence on children's dietary habits and their relationship with food. Early nutrition is essential for healthy development, making it important to understand how the four food parenting practices (autonomy support, structure, coercive control, indulgence) influence child health. This study examines the association between family income and specific food parenting practices. A quantitative analysis was conducted using baseline survey data from the Preschool Plates Cohort Study (N=252). The relationship between income and the four food parenting practices was examined using pairwise t-tests. Statistical significance was established at $p < 0.05$. Statistically significant differences across income brackets were observed for coercive control ($p<0.001$) and indulgence ($p<0.001$), with families earning 100k+ reporting lower mean engagement in indulgence practices. Families earning 0-25k reported higher mean engagement in coercive practices than families of other income groups. In contrast, endorsement of autonomy support and structure remained constant across income levels, showing no significant differences ($p>0.05$). Income disparities influence how parents navigate feeding within the home. Addressing these differences

	requires expanding resources to support lower-income families, empowering them to adopt positive food parenting practices that promote long-term child health.
116.	**Ajay Singh** *Koji Fermentation of Canola and Pennycress Meal* **Faculty Advisor:** Bo Hu **Mentors:** Xiao Sun **Sponsoring Program**: Forever Green Initiative URE **Home Institution:** University of Minnesota Twin Cities **Abstract:** Koji, a food grade fungus, can increase the nutritional value of seed meals for animal feed. Canola meal (CM) and Pennycress meal (PM) contain anti-nutritional factors that negatively impact livestock, but fermentation with koji reduces these compounds. Koji strains, *Aspergillus oryzae* (AO) and *Aspergillus oryzae* commercialized (AOc), were fermented with CM and PM. Every other day for eight days, two flasks were withdrawn and frozen stored to compare fermentation times. Analysis of glucosinolates (sinigrin in PM) and phenolic compounds (sinapine and sinapic acid in CM) was performed to evaluate the effects of fermentation on CM and PM. Results show Koji efficiently reduces anti-nutritional factors in both CM and PM. In CM, sinapine content was reduced from 5.487to 1.332mg/g by AO, and from 4.848 to 2.116mg/g by AOc. Sinapic acid content was reduced from 0.484 to 0.133mg/g by AO, while from 0.499 to 0.089mg/g by AOc. In PM, sinigrin content was reduced from 86.52 to 6.61umol/g by AO, while from 84.26 to 6.36umol/g by AOc. This study shows Koji's impact on seed meals by reducing anti-nutritional factors giving farmers more nutritious feed.
117.	**Sneha Singh** *Identification of 52 Age-Related Macular Degeneration (AMD) Risk Alleles and Cumulative Polygenic Risk Scores (PRS) Across a Series of Commonly Used Cell Lines* **Faculty Advisor:** John Hulleman **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Age-related macular degeneration (AMD) affects the region of the retina responsible for central vision. Previously, AMD risk has been defined by high-risk single nucleotide polymorphisms (SNPs) in two genes: CFH and/or ARMS2/HTRA1. However, polygenic risk scores (PRS), which combine risk assessments across multiple genes, have received increased attention due to their more comprehensive nature for disease risk. While PRS are typically imputed for patients, similar genetic information could be useful for cell lines used in research, providing context for biological observations and providing testing grounds for future targeted therapies. We used next-generation sequencing to profile six immortalized cell lines and one induced pluripotent cell (iPSC) line commonly used in vision research. Missing callouts were verified by standard PCR and Sanger sequencing. Inferred races and sexes included European (MIO-M1 [male], ARPE-19 [male], TM-1 [female], 293T [female], 293A [female]), Latino (IMR90-4 [female]), and Asian (THP-1 [male]) ancestry. Cell line PRS scores (in order of decreasing risk) were: MIO-M1 > ARPE-19 > TM-1 > 293T > IMR90-4 > 293A > THP-1. MIO-M1 cells were homozygous for the ARMS2/HTRA1 effect allele (rs36212733) while ARPE-19 cells were heterozygous for this effect allele. MIO-M1, ARPE-19, TM-1 and IMR90-4 harbored major heterozygous risk variants in CFH (rs485632).
118.	**Charuvi Singh** *Effects of LAT1 Inhibition on Proliferation and Metastatic Behavior in Genetically Distinct Colorectal Cancer Cell Lines* **Faculty Advisor:** Subree Subramanian **Mentors:** Shubhashri Ambhore & Luis Ramirez **Sponsoring Program**: LSSURP **Home Institution:** University of Massachusetts Amherst **Abstract:** Colorectal cancer (CRC) remains a major cause of cancer-related mortality worldwide. Many tumors, including CRC, exhibit dependence on L-type amino acid transporter 1 (LAT1) to sustain proliferative and metastatic capacity through enhanced uptake of essential amino acids and activation of downstream metabolic signaling pathways. JPH203 is a selective LAT1 inhibitor that blocks amino acid transport and may thereby attenuate tumor cell growth and migration. However, its effects across genetically heterogeneous CRC models have not been fully defined. To address this, CRC cell lines harboring distinct alterations in key driver genes including APC, KRAS, TP53, and SMAD4 were treated with increasing concentrations of JPH203. Cell proliferation

	and migration were subsequently evaluated using complementary in vitro assays. JPH203 suppressed both proliferative and migratory phenotypes across different CRC lines, although the magnitude of the response varied among models. These findings suggest that LAT1 inhibition exerts anti-tumor activity across diverse CRC contexts. Further studies will determine whether sensitivity to JPH203 is influenced by genomic background and whether these determinants can be leveraged to identify the CRC subtype most likely to benefit from LAT1-targeted therapy.
119.	**Victoria Soderholm** *Targeting of Interneurons via GAD Cre Mouse Model In the Medial Prefrontal Cortex* **Faculty Advisor:** Patrick Rothwell **Mentors:** Lydia Cunitz **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Roughly 90% interneurons in the medial prefrontal cortex (mPFC) contain receptors known as N-methyl-D-aspartate receptors (NMDAR), which help regulate neuronal excitability, synaptic plasticity, and cognitive functions. Our lab aims to investigate whether blocking these receptors causes schizophrenia-like symptoms through disinhibition of the mPFC. Tools to target interneuronal populations are necessary to test this hypothesis. One method of targeting interneurons is by using mDlx enhancers which can target a virus to interneurons, but when used with Cre recombinase targeting becomes less accurate. We predict that a more precise method to target interneurons uses GAD-Cre mice to localize a non-interneuronal specific NMDAR-ablating virus to interneurons. Mice were injected with either a control virus or a Grin1 virus into the mPFC. Immunohistochemistry was then performed and slices were analyzed using the HALO image software. We found that there was greater specificity when analyzing the % infected cells compared to using the mDlx enhancer. This work demonstrates a method of analysis that has higher specificity and allows for better targeting of interneurons for future studies of the role of NMDARs in interneurons.
120.	**Ari Starr** *Characterization of* Enterococcus faecalis *Biofilm Production on Relevant Prosthetic Joint Materials.* **Faculty Advisor:** Julia Willett **Mentors:** Amanda Haeberle **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** *Enterococcus faecalis* is a Gram positive opportunistic pathogen responsible for 11% of periprosthetic joint infections (PJI). A PJI is an infection of the joint cavity on implanted prosthetic joints and is typically biofilm associated. Our lab has previously shown a panel of *E. faecalis* PJI clinical isolates form biofilms on Aclar, a thermoplastic film, in rich media, however, very little is known about how *E. faecalis* forms biofilms on common prosthetic materials like ceramic, polyethylene, steel, or titanium in synovial fluid. To address this, I used a submerged substrate biofilm assay to quantify the biofilm production of *E. faecalis* PJI clinical isolates on ceramic, polyethylene, steel, and titanium in rich media. I found no significant difference in biofilm formation on ceramic, steel, and Aclar in BHI among this panel of *E. faecalis* PJI isolates. I next developed an in vitro simulated synovial fluid (SSF) condition and used a submerged substrate assay in SSF to quantify biofilm formation of *E. faecalis* on different prosthetic joint materials. I found no significant difference between biofilm formation on different substrates. Understanding the affinity of *E. faecalis* biofilm production on different prosthetic materials may guide future anti-biofilm therapeutics on these prosthetic materials.
121.	**Amanda Stein** *Extramedullary Hematopoiesis and Myeloid LOX-1 Expression in the Liver Pre-Metastatic Niche in Triple Negative Breast Cancer* **Faculty Advisor:** Kaylee Schwertfeger **Mentors:** Lyndsay Reese **Sponsoring Program**: LSSURP **Home Institution:** Smith College **Abstract:** Triple negative breast cancer (TNBC) is an aggressive subset of breast cancer that lacks targetable receptors, causing treatment difficulties especially after distal metastasis. The tumor microenvironment and pre-metastatic niche yield promising possibilities for therapeutic treatment. Despite being a frequent site of metastasis in human breast cancer, the liver is an understudied metastatic site. Using mouse models of breast

	cancer, preliminary work from our lab has demonstrated that the liver pre-metastatic niche contains extramedullary hematopoiesis (EMH). EMH consists partially of immunosuppressive macrophages that highly express LOX-1, a receptor protein for oxidized LDL associated with poor patient prognosis and likely mediated by a tumor-derived factor. Treating bone marrow derived macrophages (BMDMs) with tumor cell-conditioned media elucidates how LOX-1 expression is impacted by primary tumor signaling. Results from this project show that LOX-1 expression in BMDMs is partially NF-κB and JAK/STAT signaling dependent, but the responsible tumor cell-derived factor is not dependent on tumor FGFR signaling. Additionally, metastatic tumor cell-derived factors induce higher myeloid LOX-1 expression than nonmetastatic tumor cell-derived factors, indicating that LOX-1 may play a role in metastasis. Future research can further investigate the mechanism and functional effects of myeloid LOX-1 expression, uncovering a targetable pathway for metastatic TNBC treatment.
122.	**Zoe Swanson** *Pilot Optimization of an Experimental Avian Pathogenic* Escherichia coli *(APEC) Challenge Dose in Turkeys* **Faculty Advisor:** Sunantha Kosonsiriluk **Sponsoring Program**: RISE **Home Institution:** University of Minnesota Twin Cities **Abstract:** Colibacillosis, caused by avian pathogenic *Escherichia coli* (APEC), is a major bacterial disease affecting commercial turkeys. This pilot study aimed to identify an appropriate APEC challenge dose for future studies evaluating immune priming as a strategy to mitigate colibacillosis. Twenty 4-week-old commercial turkey hens were assigned to one of four groups (n = 5/group): an unchallenged control or challenged subcutaneously with 10^7, 10^8, or 3.8×10^9 CFU of APEC. Clinical scores were assessed daily using a 0–4 scale, and body weight and mortality were monitored for seven days. Clinical scores differed among challenge groups over time, with birds receiving 3.8×10^9 CFU developing clinical signs earlier and reaching the greatest severity. The 10^8 CFU group showed a delayed increase in clinical scores, whereas the 10^7 CFU group remained similar to controls. Mortality occurred only in the 3.8×10^9 CFU group (2/5 birds). Although body weight did not differ significantly among groups, birds challenged with 3.8×10^9 CFU were approximately 259.6 g (19.6%) lighter than controls by day 7. Overall, the 3.8×10^9 CFU dose produced the most consistent clinical disease with limited mortality, supporting its selection for subsequent immune priming studies.
123.	**Caitlyn Taylor** *A Fight of Blight: Varying Irrigation Regime Impacts on Early Blight,* Alternaria solani*, Incidence in Dakota Russet and Russet Burbank Potato Varieties* **Faculty Advisor:** Megan McCaghey **Mentors:** Jasper Tao **Sponsoring Program**: SOAR-REEU **Home Institution:** Whitman College **Abstract:** Early blight, a disease caused by the fungal pathogen *Alternaria solani*, has been reported to cause up 50% of potato yield losses. In Minnesota, around 40,000 acres of farmland was dedicated to potato production in 2025. Potatoes are highly sensitive to water stress, requiring extensive irrigation inputs throughout the season, though excessive moisture can exacerbate disease pressure. This experiment examined the incidence of early blight in Dakota Russet (an abiotic stress tolerant variety) and Russet Burbank (the most widely grown variety in the USA) through in-field disease assessments. A field trial was conducted at the Sand Plain Research Farm in Becker, MN with 3 irrigation treatments: 60%, 80%, and 100% (full irrigation). This study aims to assess 1) if a decrease in irrigation can reduce the incidence of early blight and 2) if Dakota Russet or Russet Burbank have differing susceptibility to *A. solani*. Preliminary results indicate a high incidence of early blight overall, with no significant differences between irrigation treatments. Russet Burbank shows higher susceptibility throughout. Future research can include tracking early blight incidences with a larger range of irrigation treatments (such as 120% irrigation to simulate heavy rains), more varieties, and differing field conditions.
124.	**Maya Tellez** *Preoperative Pain and Pain Management Strategies in Children with Cerebral Palsy Undergoing Orthopedic Surgery* **Faculty Advisor:** Chantel Burkitt **Sponsoring Program**: UMN Pain Consortium **Home Institution:** Macalester College

	Abstract: Pain is common in children with Cerebral Palsy (CP). Preoperative pain and pain management strategies have not been well investigated in CP, limiting our understanding of pain burden and factors that may influence postoperative care and recovery. This study aimed to characterize preoperative pain in children with CP, identify the pain management strategies perceived as most effective, and examine how chronic pain status relates to pain management strategy use and caregiver confidence in reducing their child's pain. 236 individuals with CP (ages 5-18) participated prior to undergoing orthopedic surgery. Caregivers completed questionnaires about the child's pain. Standard measures of central tendency were calculated, and Mann-Whitney U tests were used to examine pain management strategy use and caregiver confidence. Over half of participants reported chronic pain and pain in the previous week. Changing positions and massage were the most effective individual pain-management strategies, while combinations of strategies were rated most effective overall. Caregivers of children with chronic pain used significantly more pain-management strategies and reported lower confidence in reducing their child's pain than caregivers of children without chronic pain. Preoperative chronic pain is common in children with CP and may be associated with greater pain management needs and lower caregiver confidence.
125.	**MiLani Terrell** *N/A* **Faculty Advisor:** Lauren Slosky **Mentors:** Crystal Lemchi & Megan Hall **Sponsoring Program**: UMN Pain Consortium **Home Institution:** Macalester College **Abstract:** The abstract is not completed. Here is what is done so far but this should not be submitted. Opioid Use Disorder (OUD) remains to be a leading major public health crisis, yet the biological mechanisms underlying OUD and relapse are not understood. Previous works have identified the medial prefrontal cortex (mPFC) as a major modulator of relapse-related behaviors. More specifically, neurotensin receptor-1 (NTSR1) expressing neurons in the mPFC have been found to play a role in relapse and therefore can serve as a potential therapeutic target for understanding mechanisms underlying opioid-related relapse. Our pilot study used RNAscope in situ hybridization to characterize NTSR1-expressing neurons in the mPFC and provided foundational evidence that these neurons were primarily glutamatergic. To build upon these findings, the present study will use the same methodology in male and female NTSR1-Cre wild-type (WT) and heterozygous (HET) mice to validate the glutamatergic identity of NTSR1-expressing neurons in the mPFC and to determine if there's a significant difference in cellular expression between WT and HET mice. KEY FINDINGS.
126.	**Eaan Thoeut** *"Still a Low-Rung Beat Assignment?": Media Coverage of Women's Sports in California* **Faculty Advisor:** Dunja Antunovic **Sponsoring Program**: McNair **Home Institution:** University of Minnesota Twin Cities **Abstract:** Despite the growth of professional women's sports, newsrooms can not keep up with that expansion. Newsrooms contain the journalists and decision-makers who create content. This study aims to understand newsroom routines and how they align with publication practices regarding women's sports to remedy the gap in media coverage of women's sports. Gatekeeping theory is the theoretical framework within this study. This refers to how newsrooms present, select, and publish articles for audiences. Semi-structured interviews were conducted with 12 journalists throughout Los Angeles and the Bay Area. These two markets are important because both have new and successful professional women's basketball and women's soccer teams. Within these newsrooms, staff sizes have decreased drastically. Because of the lower number of staff, it may be difficult to cover women's sports when most staff are assigned to other assignments that align with popular interests. Alongside that, women's sports experience a "wait and see" phenomenon where journalists wait for the teams to be successful before meriting coverage. Even though women's participation in sport has increased, newsrooms face structural barriers that prevent them from covering women's sports.
127.	**Connor Tremelling** *Influence of Intratumoral Microbe* Fusobacteria nucleatum *on Chemotherapy Efficacy* **Faculty Advisor:** Stephanie Huang **Mentors:** Zachary Larocca-Stravalle & Yuting Shan **Sponsoring Program**: SCoPE

	Home Institution: University of Wisconsin–La Crosse **Abstract:** The intratumoral microbiome is a relatively new avenue of cancer research that has shown promise in improving the effectiveness of chemotherapies. The bacteria that colonize tumors vary greatly in their biodiversity depending on the kind of tumor and the surrounding tissue. Correlations are observed between the kinds of bacteria populating a tumor and the response that tumor has to treatment, both in terms of general resistance mechanisms and differential response to different drugs. Data from single-cell RNA sequencing and spatial transcriptomics of colorectal cancer patient and cell line samples were applied to a machine-learning framework, scIDUC, and used to predict how markers of *Fusobacterium nucleatum*, a common intratumoral microbe, influences the effectiveness different anti-cancer drugs. We sought to validate these predictions in three drugs, neratinib, trametinib and oxaliplatin, by co-culturing HCT-116 colorectal cancer cell line with *F. nucleatum* and measuring cell viability after drug treatment with a WST-1 assay. This data will be used to test the hypothesis that host transcriptomic data can be utilized to accurately predict the influence of intratumoral microbiota on treatment efficacy. As research on it continues, the microbiome may become a crucial aspect of a patient's condition to consider when creating an individualized treatment plan.
128.	**Kaan Uslular** *The Impact of Menopause on Alzheimer's Pathology* **Faculty Advisor:** Dongming Cai **Mentors:** Katie Murphy & Kenny Vetter **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** Alzheimer's disease (AD) disproportionately affects women, with menopause being a potential contributor to this increased risk through the loss of ovarian hormones, particularly estrogen. The loss of estrogen may accelerate neurodegenerative processes by increasing amyloid beta accumulation, disrupting sleep and impairing glymphatic clearance. The mechanisms linking menopause, sleep disruption, and AD progress remain poorly understood. This project focuses on whether 4-vinylcyclohexene diepoxide (VCD) induced menopause exacerbates AD pathology and sleep disturbances in female 5xFAD mice, a model that develops amyloid beta plaques and cognitive deficits. Because sleep is essential for glymphatic clearance of amyloid beta, menopause associated sleep disruption may contribute to the progression of AD. Estrus cycle progression was monitored using vaginal lavage to confirm ovarian failure and determine reproductive status. Sleep activity was evaluated using electroencephalography (EEG) to examine menopause-associated sleep alterations. EEG recordings demonstrated disrupted sleep patterns in VCD-treated mice compared to controls. AD pathology in 5xFAD mice was confirmed by immunofluorescence staining of brain sections with antibodies for amyloid beta (6E10) and microglia (Iba1). Future work includes quantification of amyloid plaque burden and microglial activation. Findings will improve the understanding of how reproductive aging contributes to AD and help find therapeutic interventions in women's brain health.
129.	**Joy Vang** *Characterization of an Archived Guinea Pig* Cytomegalovirus *(GPCMV) HindIII Restriction Library Defines Laboratory-Dependent Divergence of the Prototype ATCC GPCMV Strain into Wild-Type and Deletion Variant Lineages* **Faculty Advisor:** Mark Schleiss **Mentors:** Mark Blackstad & Claudia Fernandez Alarcon **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** *Congenital cytomegalovirus* (cCMV) is the leading infectious cause of disability in children. Because human CMV does not infect laboratory animals, guinea pig *cytomegalovirus* (GPCMV) is used for cCMV research. The prototype GPCMV strain, isolated by Hartley and deposited with the ATCC in 1957, is widely used in vaccine studies. However, molecular characterization of the original ATCC stock in 2008 showed that the ATCC virus was surprisingly a mix of two strains: a full-length genome and a variant with a 1.6 kb deletion affecting immunogenic glycoprotein ORFs. A lineage used in vaccine studies in Cincinnati was shown by Schleiss et al. to have a clonal full-length genome, but another lineage used in many studies in New Haven (Yale variant) in the 1980s had never undergone genomic analyses. To address this knowledge deficit, an archived HindIII plasmid library cloned in pBR322 in the 1980s (gift of H.C. Isom) was sequenced using nanopore technology and aligned to the GPCMV reference genome. Analysis of three independent clones demonstrated that the Yale lineage, intriguingly, consisted exclusively of the 1.6 kb deletion variant, providing important context for comparing

	historical GPCMV vaccine and pathogenesis studies. Lessons from this model will inform and direct future human vaccine development.
130.	**Aleena Varghese** *Functional Characterization of CNOT1 Isoforms in the CCR4-NOT Complex* **Faculty Advisor:** Aaron Goldstrohm **Mentors:** Robert Connacher & Katherine McKenney **Sponsoring Program**: Independent Research **Home Institution:** University of Wisconsin–Madison **Abstract:** The CCR4-NOT complex is a multi-protein deadenylase complex that regulates mRNA stability in eukaryotic cells. CNOT1 is the central scaffold protein of the complex which binds to all the other subunits. CNOT1 has two isoforms, one long and the other short, that would result in substantially different complexes, but the role of these isoforms remains unknown. We hypothesized that both isoforms may have different roles in cell viability and mRNA regulation. First, we identified a hybrid exon that could potentially lead to the different isoforms. Western blot analysis of a CNOT1 hybrid exon reporter demonstrated expected slicing, but the functionality of the downstream promoter remains unclear. Second, we tagged either the long isoform or all isoforms of CNOT1 with an auxin-inducible degron (AID) in HCT116 cells to characterize the isoforms. This allows the long isoform or both isoforms to be selectively depleted. Growth and viability were assessed, and the CCR4-NOT complex's activity was tested using luciferase assays. We found that depleting only the long isoform did not significantly impair growth, viability, and CCR4-NOT complex activity, while depleting both isoforms led to significant negative effects. This indicates that the short isoform may be sufficient for certain functions of the CCR4-NOT complex.
131.	**Eric von Holtz** *The Role of Basolateral Amygdala Acetylcholine in Utilizing Stimulus-Outcome Associations* **Faculty Advisor:** Kurt Fraser **Mentors:** Gabrielle Russell **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** The basolateral amygdala is vital for reward learning, crucial for the generation of stimulus-outcome memories. Cholinergic projections to the basolateral amygdala are thought to update and modulate associative learning; however, little is known about the role acetylcholine signaling in the basolateral amygdala has for the encoding and retrieval of stimulus-outcome associations. In order to explore this gap, Long Evans rats (n = 24; 12 male; 12 female) first underwent Pavlovian conditioning where they learned one auditory cue predicted sucrose and another for maltodextrin. Thereafter, rats were trained on separate levers to earn sucrose and maltodextrin. Afterwards, the rats were implanted with intracranial cannulas targeting the basolateral amygdala to allow for the microinfusion of saline, the nicotinic antagonist mecamylamine, or the muscarinic antagonist scopolamine. At test, we will infuse the appropriate drug into the basolateral amygdala while rats lever press in the presence of cues. We hypothesize that manipulation of cholinergic signaling in the basolateral amygdala will result in the attenuation of the retrieval of stimulus-outcome associations as evidenced by lower lever-pressing for the reward that the cue predicts. Overall, this work aims to uncover the role cholinergic input to the basolateral amygdala modulates the formation, strength, and utilization of stimulus-outcome associations.
132.	**Joudy Wahbi** *Engineering Dual-Antigen TriKE-PACC Molecules to Enhance NK Cell Immunotherapy Against Non-Small Cell Lung Cancer (NSCLC)* **Faculty Advisor:** Martin Felices **Mentors:** Rachel Steinmentz **Sponsoring Program**: M-ASCEND **Home Institution:** University of Minnesota Twin Cities **Abstract:** Heterogeneity of tumors allows non-small cell lung cancer (NSCLC) to bypass single-antigen immunotherapies. Tri-specific Killer Engagers (TriKEs) target tumor-associated antigens while activating NK cells via CD16. In order to overcome the problem of antigen escape and increase targeting capabilities, we tested a modular TriKE-PACC platform designed to target two tumor-associated antigens, B7H3 and mesothelin. Four variants of TriKE-PACC molecules differing in antigen orientation and the IL-15Rα linker (extracellular domain

	or Sushi domain) were compared to conventional TriKE molecules. The binding ability, NK cell proliferation, functionality (CD107a, IFN-γ, and TNF-α), and NK-cell mediated cytotoxicity were tested for each construct. No significant difference was found between TriKE and TriKE-PACC constructs with regards to induction of NK cell proliferation (comparable to that of IL-15). Binding assays and xCELLigence assays confirmed antigen-specific recognition andNK-cell-mediated tumor killing , while knockout tumor cell models demonstrated the expected loss of binding and NK-cell activation when the targeted antigen was absent. Compared to TriKEs, dual-targeting TriKE-PACC constructs retained activity against cells missing either B7H3 or mesothelin, supporting broader antigen coverage. TriKE-PACC constructs enable dual-antigen targeting and preserve NK-cell proliferation, activation, and cytotoxicity, supporting its potential as a flexible immunotherapeutic strategy for heterogeneous NSCLC.
133.	**Wei Wang** *Developing a Tool for Studying Transcription Replication Collisions (TRCs) Using Split-APEX2* **Faculty Advisor:** Hai Dang Nguyen **Mentors:** Allsion Kim **Sponsoring Program**: LSSURP **Home Institution:** University of Minnesota Twin Cities **Abstract:** Transcription–replication collisions (TRCs) can occur when a replication fork encounters an actively transcribing RNA polymerase. These collisions can cause DNA damage, potentially contributing to diseases such as cancer. Although proximity ligation assays (PLA) can detect interactions between known proteins at collision sites, they cannot identify unknown nearby proteins. To address this limitation, we used split-APEX2 proximity labeling to identify novel proteins associated with TRCs. APEX2 is an enzyme-based labeling tool that generates biotin tags near specific subcellular regions. Unlike full-length APEX2, split-APEX2 enables selective labeling specifically where transcription and replication are both present. Split-APEX2 consists of two inactive fragments, AP, amino acids 1-200 of APEX2, and EX, amino acids 201-250 of APEX2. The anti-rabbit nanobody fused to AP (rNB-AP) allows the construct to bind to an anti-PCNA rabbit antibody. The anti-mouse fused to EX(mNB-EX) allows the construct to bind to an anti-RNAP II mouse antibody. These interactions direct the two fused proteins to TRCs, where PCNA and RNAP II proximity will reconstitute active APEX2, and biotinylates nearby proteins. Identifying these proteins may reveal novel molecular components that help resolve TRCs and improve our understanding of TRC-associated DNA damage in human health and cancer treatments.
134.	**Cierra Weaver** *Evaluating the Effects of Early Life Adversities on Pubertal Development in Adolescents* **Faculty Advisor:** Mark Fiecas **Mentors:** Kirsten McKone & William Asinger **Sponsoring Program**: Equitable Data Science **Home Institution:** Spelman College **Co-Presenter(s):** Christopher Turner, Pomona College **Abstract:** Alterations in pubertal timing are associated with detrimental mental and physical health outcomes. Although pubertal timing differs across racial and sex groups, other contributing factors are not fully understood. Early life adversity may impact pubertal timing. This project examines the effects of ELA on pubertal timing during adolescence. Data were collected from the longitudinal Adolescent Brain Cognitive Development Study (ABCD), the largest longitudinal study on adolescent development. Pubertal development was assessed using the parent-reported pubertal development scale, and ELA was measured across 11 adversity domains. Pubertal development was modeled using nonlinear mixed models, from which we extracted individual-specific pubertal timing. Linear regression models were used to examine the association between ELA, sex, race, and pubertal timing. Greater neighborhood and school safety was associated with an approximate one-year delay in pubertal timing, while family dysfunction and Black race were associated with about a half-year acceleration. Furthermore, ELA showed the strongest association with midpoint pubertal timing among Hispanic and Latino females and the weakest among Black adolescents. These findings provide evidence that family dysfunction accelerates pubertal development, whereas safer neighborhoods and schools delay pubertal development.

135.	**Jennifer Wen** *Development of a Dual-Transgene Oncolytic Adenovirus Expressing IFN-γ and a TGF-β Blocker for Pancreatic Cancer* **Faculty Advisor:** Masato Yamamoto **Mentors:** Mizuho Dahlman & Brett Roach **Sponsoring Program**: LSSURP **Home Institution:** Carleton College **Abstract:** Pancreatic cancer is the 3rd-leading cause of cancer deaths in the United States with few effective therapeutics. Oncolytic adenovirus (OAds) are promising anticancer agents capable of targeting tumor cells while enhancing antitumor immunity. Historically, wild type Ad5 OAds have been limited by low binding efficacy in cancer cells due to insufficient expression of the Ad5 receptor. Replacing the Ad5 knob with an Ad3 knob (5/3 fiber) improves infectivity to target alternative receptors. To achieve pancreatic tumor-specific replication, Cyclooxygenase-2 (COX-2) promoter can be incorporated into the E1 Region of the Ad vector. OAd antitumor efficacy can be further enhanced through incorporation of immunological effector genes. However, whether the adenoviral vector can accommodate multiple effector genes remains unclear. To address this, we generated an OAd expressing both Interferon **γ** (IFN**γ**) and a TGF β blocker, two immunological effectors with established antitumor activity. Recombinant adenovirus was generated via the AdEasy Adenoviral System and amplified in HER911 cells. Transgene expression and viral titer was measured via enzyme-linked immunosorbent assay (ELISA) and quantitative polymerase chain reaction (qPCR), respectively. These findings demonstrate the feasibility of engineering OAds to express two therapeutic transgenes. Future studies will evaluate dual-transgene OAd antitumor efficacy in pancreatic cancer models.
136.	**Audrey Winter** *In Vivo Recording of CA1 Hippocampal Pyramidal Cells and Interneurons In Epilepsy Using Genetically Encoded Fluorescent Voltage Indicators & Using Evoked Responses and Computational Analysis to Assess Seizure Risk* **Faculty Advisor:** Esther Krook-Magnuson **Mentors:** Brandon Hoang & Kat Paige **Sponsoring Program**: LSSURP **Home Institution:** Agnes Scott College **Abstract:** One out of twenty-six people will be diagnosed with epilepsy at some point in their lives, the most common being Temporal Lobe Epilepsy (TLE). While epilepsy medications for TLE have a high failure rate for this type causing many to still live in fear of seizures to still occur after treatments have been given. Two ways in which we are combating the high failure rate is through viral tagging of specific neuronal pathways to understand their role in new treatment methods and seizure risk assessment so that people who experience pharmacoresistance can still live a somewhat normal life. Within viral tagging, we're going to be identifying hippocampal pyramidal neurons that project to the Lateral Septum and Medial Entorhinal Cortex as well as hippocampal interneurons to further understand these connections. While we don't have results, current data indicates that these methods are feasible. By also using seizure risk assessments–where we are utilizing perturbations in a Kainic Acid Mouse Model to test the assessment of behavioral seizures–the research indicates a high possibility of understanding seizure likelihood in TLE within this model.
137.	**Andy Yang** *Mapping the Evidence on Hepatitis B and Liver Cancer in the Hmong Community Using a Socioecological Lens: A Scoping Review* **Faculty Advisor:** Serena Xiong **Sponsoring Program**: Independent Research **Home Institution:** Carleton College **Co-Presenter(s):** Evelyn Her, University of Wisconsin–La Crosse **Abstract:** Hmong communities experience disproportionately higher rates of hepatitis B virus (HBV) infection and hepatocellular cancer (HCC) compared with other Asian ethnic groups in Laos, Thailand, the United States of America, Vietnam, and China. Research regarding these disparities remains fragmented. This scoping review maps the existing evidence across the cancer care continuum (CC) and describes how levels of the socioecological model (SEM) contextualize these disparate outcomes. This review was conducted using Arksey and O'Malley's five-step methodological framework and adheres to PRISMA Extension for Scoping Reviews guidelines. Electronic database searches were conducted by a medical librarian for studies between January 1975 and January 2025. The studies were independently screened for eligibility by two researchers during two

	rounds of review (title & abstract and full text) against a predefined eligibility criterion. Articles were extracted using a qualitative codebook to map study characteristics and describe SEM levels and CC phases. Of the 369 articles identified, only 32 full-text articles were screened for eligibility. Data extraction and analysis are ongoing. Future directions include applying the results to inform multilevel public health initiatives, publishing the findings in a peer-reviewed journal, and disseminating findings to Hmong nonprofit organizations and other community partners.
138.	**Liv Ye** *Acetylcholine Signaling in the Ventral Tegmental Area Regulates Acquisition of Conditioned Fear* **Faculty Advisor:** Kurt Fraser **Sponsoring Program**: UROP/URS **Home Institution:** University of Minnesota Twin Cities **Abstract:** The ventral tegmental area (VTA) plays a significant role in classical conditioning, reward-related encoding, and motivational learning. Acetylcholine is an important neuromodulator that can shape dopamine-related signaling through nicotinic and muscarinic receptors, suggesting that it may influence learning processes mediated by the VTA. In the present study, we examined whether acetylcholine signaling in the VTA regulates the acquisition, consolidation, and expression of conditioned fear. To test this, we manipulated nicotinic and muscarinic receptors and acetylcholinesterase activity in the VTA across three fear-conditioning experiments. We examined effects on auditory cued fear, fear memory consolidation, and contextual fear conditioning, using freezing as the primary measure. Freezing behavior served as the primary measure of conditioned fear. We hypothesized that disrupting acetylcholine signaling in the VTA would alter conditioned freezing and reveal an important role for VTA cholinergic mechanisms in fear learning. Together, this work aimed to clarify how acetylcholine within the VTA modulates aversive associative learning and to extend current understanding of VTA function beyond reward-based behavior.
139.	**Leila Yorek Sundin** *Transposon Engineered γδ CAR-T Cells For The Treatment of NF1 Associated Malignant Peripheral Nerve Sheath Tumors* **Faculty Advisor:** Joseph Skeate **Mentors:** Ethan Neimeyer **Sponsoring Program**: Children's Cancer Research Fund **Home Institution:** University of Minnesota Twin Cities **Abstract:** Neurofibromatosis type 1 (NF1) is an autosomal dominant cancer predisposition syndrome linked to the development of Malignant Peripheral Nerve Sheath Tumors (MPNSTs). MPNSTs are aggressive, treatment-resistant sarcomas that arise from Schwann cells and cause significant morbidity, mortality, and are often diagnosed during childhood in NF1 patients. There is a critical need for novel therapeutics as conventional treatments have limited efficacy and significant side effects. Advances in genome engineering have unlocked new possibilities for cellular therapies in patients with rare or understudied disease. Gamma delta (γδ) T cells comprise 1-10% of the peripheral blood (PB) lymphocytes and are defined by their unique ability to recognize a limited repertoire of non-peptide, non-MHC-associated antigens expressed by transformed cells. ΓδT cells have many therapeutic advantages: they can be used as off-the-shelf therapeutics, function in hypoxic environments and act as antigen-presenting cells capable of priming adaptive immune cells. In this project we used the non-viral TcBuster transposon system to engineer γδT cells with chimeric antigen receptors (CARs) targeting two prominent MPNST surface antigens: B7-H3 and protein tyrosine kinase 7 (PTK7). To date, engineered cells harboring both individual CARs showed MPNST-specific reactivity and cytotoxicity as measured by intracellular flow cytometric staining and luciferase-based killing assays.
140.	**Sarah Yusuf** *Hot Pink Screen: A Critical Analysis of Youth Belonging and the Development of a Congruent Digital and In-Person Identity in a Post Mono Cultural World* **Faculty Advisor:** **Sponsoring Program**: Independent Research **Home Institution:** ISD 196 **Abstract:** In contemporary discourse, there has been much talk of a “post-mono cultural” world, one where vast swathes of Americans no longer crowd around their television sets eagerly watching the same sitcoms, reading the same books and engaging in the same general set of cultural touchstones (ie: same expected or

	mainstream institutional outlets through which the vast majority of society can draw a commonly accepted understanding and sensibility). Nowhere else is this clearer than in the age cohort Gen Z, whose experiences through the Covid-19 pandemic and substantial loss of communal institutions to changing patterns of media consumption has led to the loss of what was once implicitly considered a key part of American life. The first generation to have truly grown alongside the development of the modern internet and the resulting outsized impact it has held, strong correlation between decreasing impacts of a common (institutional and socially promoted) culture, in favor of more hyperspecific subcultures that reflect the impact and construction of digital "personas" are demonstrated. Through interviews and analyses of user profiles on two platforms, this research aims to bring scholarly attention to the impact of the modern internet on establishing and maintaining post mono cultural communities.
141.	**Amy Zheng** *Characterization of Spinal Glutamatergic Interneurons Involved in Locomotor Output in Larval Zebrafish* **Faculty Advisor:** Mark Masino **Sponsoring Program**: LSSURP **Home Institution:** University of Illinois at Urbana-Champaign **Abstract:** Locomotion in vertebrates is generated by spinal interneuron networks, central pattern generators, that produce rhythmic motor output. Although glutamatergic excitation is necessary for locomotion, the role of genetically defined subsets of glutamatergic neurons is unclear. The V2a subset of glutamatergic neurons is defined by the vsx2 promoter. Using larval zebrafish, channelrhodopsin was expressed under the vsx2 promoter and swimming was optogenetically activated in spinalized preparations while recording swimming behavior with a high-speed (180 frames/sec) video camera. Intensity response curves were generated by applying increasing light intensity (1, 2, 4, 6, 8, 10 mW/cm^2) and the elicited locomotor output was plotted. Our analysis revealed two distinct populations of responses to photostimulation; high and low responders. High responders exhibited a greater number of swimming episodes with longer durations, whereas low responders produced fewer episodes with shorter durations. However, characterization of the transgenic reporter revealed channelrhodopsin expression in cells beyond the expected V2a population, raising concerns about the specificity of this line. This finding limits our ability to attribute the behavioral results specifically to V2a neurons, but identifies an important validity concern. Future studies will compare channelrhodopsin expression with in situ hybridization to confirm vsx2 mRNA co-localization.
142.	**William Zhong** *Utilizing Machine Learning to Quantify the Effect of Caregiver-Related Adversity on Adolescent Psychopathology through Cortical Thickness Mediation* **Faculty Advisor:** Mark Fiecas **Mentors:** Ziren Jiang & Will Asinger **Sponsoring Program**: Equitable Data Science **Home Institution:** Carleton College **Co-Presenter(s):** Ryan Mickelborough, Macalester College **Abstract:** Early life adversity (ELA) in the caregiver environment is linked to psychopathology, but how this risk is mediated by average cortical thickness remains unclear. Using data from the Adolescent Brain Cognitive Development (ABCD) study, causal mediation analysis under a modified treatment policy, with average cortical thickness as the mediator, was utilized to estimate average total, natural indirect, and natural direct effects of caregiver-related ELA (caregiver psychopathology, lack of support, low monitoring) on self-injurious thoughts and behaviors (SITB: suicidal ideation, suicide attempt, non-suicidal self-injury) and other psychopathology outcomes (internalizing, externalizing, depression, anxiety, ADHD). Nuisance parameters were estimated via super learner (GLM, random forest, XGBoost) for outcome regressions and neural-network-based Riesz learning for density ratios. Preliminary results (n=11853) show adversity type differentially affects the other psychopathologies versus SITB outcomes: caregiver psychopathology drives the other psychopathology outcomes more strongly, while low monitoring and lack of support show substantially stronger SITB effects, largely through indirect pathways. These findings suggest caregiver-related adversity impacts SITB and other psychopathology outcomes in domain-dependent ways. This supports the decomposition of caregiver adversity subtypes when identifying neurodevelopmental targets for intervention. Further, results point to cortical thickness as a candidate mechanistic link specific to psychopathological risk.