URSCA SYMPOSIUM: Celebration of Student Scholars
15 April 2026 | Concordia College

Poster Session 1: Poster Numbers 1-30 (KCC Centrum), 31-48 (KCC Atrium)
Poster Session 2: Poster Numbers 49-78 (KCC Centrum), 79-96 (KCC Atrium)

Poster Session 1 | 8:55 – 10:15 a.m.

Knutson Campus Center Centrum

P01. "Vehicle Routing Problems with Pickup and Delivery"

Student Presenter: Brady Andrews

Mentored by: Dr. Gregory Tanner

Abstract: This project explores Vehicle Routing Problems with Pickup and Delivery. Vehicle Routing Problems (VRP) are optimization problems that find the most cost-effective route to reach a set of desired locations given a set number of vehicles. VRPs with Pickup and Delivery introduce the requirement that the vehicle traveling to a location must be carrying the product(s) desired at that location. This project aims to use best practices in VRPs with Pickup and Delivery to develop a solution for the transportation needs at RDO Equipment in Moorhead. The main challenge with determining an optimal solution is the large number of variables introduced to represent each product. Thus, many of these best practices involve heuristics strategies such as genetic algorithms and simulated annealing to achieve near-optimal solutions that are computationally viable. Additionally, the standard algorithms may require further modifications to match restrictions specific to RDO Equipment's standard practices. A successful final product would result in a determining a near-optimal route that that improves the efficiency of product transportation for RDO Equipment.

P02. “Climate Migration in Central Asia: A Gendered Vulnerability Trap”

Student Presenter: Tony Berndt

Mentored by: Dr. Jenn Sweatman

Abstract: Climate change is one of the most significant issues facing the world today, driving resource shortages, environmental collapses, human health crises, and significant displacement of human populations. Focusing on Central Asia as a vulnerable region to the effects of climate change, this poster presentation asks how Central Asia’s climate migrants are impacted by political and economic circumstances around them. Does this impact vary across gender? This poster presentation argues that climate change is a primary driving force in intraregional migration, through agricultural failures and impacts on human health due to extreme heat, changes in precipitation and water availability, and natural disaster. This migration, separated into gendered climate migration and nongendered climate refugees, maintains an economic vulnerability trap, in which those who stay in the inhospitable sending state with failing agriculture are increasingly dependent on economic remittances sent from migrants in states facing political and economic challenges, such as Russia, reducing the stability and predictability of sending remittances from receiving states to networks in sending states. This project utilizes quantitative data to advance a theoretical argument grounded in political migration theory. Drawing on measurements and indices from international organizations, this project synthesizes data and trends across the five states of Central Asia (Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan) since their creation with the dissolution of the Soviet Union in 1991. This project aims to demonstrate the disparity in gendered impacts of climate change through a migration lens.

P03. “Eyes on the Hunt: Sclerotic Ring Variation in Raptors”

Student Presenters: Bridget Danielson, Serena Middendorf

Mentored by: Dr. Joseph Whittaker

Abstract: Raptors possess specialized visual adaptations that allow them to detect prey at great distances while maintaining the ability to focus on nearby objects. One feature associated with this capability is the sclerotic ring, a bony structure within the eye that supports the globe and contributes to visual function. Despite differences in hunting strategies and lifestyles among raptor species, all possess this anatomical feature. In this ongoing project, we are analyzing sclerotic rings from multiple raptor species and comparing their structural characteristics. Our goal is to determine whether differences in predatory behavior, and the ways in which species rely on vision, are associated with variation in sclerotic ring morphology. Thus far, we have collected eye diameter measurements from nine pairs of eyes and measurements of entire sclerotic ring diameter, interior diameter, and ring depth from four pairs of eyes. As additional data are collected, we anticipate identifying trends that may link sclerotic ring morphology with ecological lifestyle. In particular, we predict that species that rely heavily on long-distance vision will exhibit relatively deeper sclerotic rings.

P04. “Bat Detection in Minnesota Urban and Rural Areas Using AudioMoth Recorders”

Student Presenters: Makena Hedlund, Delia Denis, James Rende

Mentored by: Dr. Joseph Whittaker, Dr. Mike Bush

Abstract: With the rise in white-nose syndrome affecting the populations of bats, it is important to understand how frequently bats are being detected in an area. Knowing this frequency can aid in preserving and restoring habitats in which bats routinely use. This allows us to identify where bats live, hunt, and where white-nose syndrome would most likely spread. Mist netting is a common way to capture and identify bats in an area. However, this method is time consuming, stressful for bats, and requires specific, hard to get permits. Bat detectors, like mist netting, can also collect data regarding species richness This method collects identification calls instead, and does not interfere with or distress the bats. This is achieved using AudioMoths, a recording device that detects bat echolocation. Bat echolocation has specific “swoops” that we can convert and visualize on spectrograms. Ultrasonic sound detectors collect bat call data, including social and feeding calls. This research helps to quantify bat calls in different landscapes in the greater Fargo/Moorhead areas. Acoustic recorders were placed at five locations, simultaneously, with differing landscapes across Clay County, Minnesota. They recorded from 8:30 p.m. to 7:00 a.m. for three nights for two weeks until frost occurred. The data collected suggests that location is a factor in determining the density of bat calls. The results suggest bat calls are denser in rural, forested areas near water in comparison to urban areas. This information provides insight into what environments to focus on in conservation to best help support bat populations.

P05. “Bat Detection Using Machine Learning”

Student Presenter: Sam Bolger

Mentored by: Dr. Gregory Tanner

Abstract: Studying bat populations using audio recordings creates a huge data problem because most recordings are just noise like wind, rain, or insects. Going through all of that by hand is not realistic, so this project focuses on building a system that can automatically detect when bats are present in the recordings. The goal of this project is to develop a machine learning model that can classify audio as either bat or no bat. The main idea is that combining signal processing with a convolutional neural network can make accurate predictions while saving a lot of time compared to manual review. To do this, long audio recordings were broken into smaller clips and converted into spectrograms that show frequency patterns in the 18 to 80 kHz range where bat calls occur. These spectrograms were used as input for a MobileNetV2-based model trained on labeled examples of bat calls and background noise. The dataset was built through both automated filtering and manual verification to improve data quality. The final model performs very well on real-world recordings and is able to identify bat activity even in noisy conditions. This system makes it possible to process large amounts of audio data efficiently and helps make long-term bat monitoring more practical and scalable.

P06. “We’re Just Here for the Food: Organizational Behavior in the Food Industry”

Student Presenters: Erik Marchesano, Bailey Plante, Brody Fischer, Carson Hutton, Kate Stephens

Mentored by: Dr. Shontarius Aikens

Abstract: Behind every customer experience in the food industry are frontline employees working under fast-paced and often high-pressure conditions. The food industry is a demanding environment where employee performance plays a critical role in overall organizational success. However, many workplaces in this sector face ongoing challenges such as high stress, poor communication, ineffective leadership, and high employee turnover. This study examines how key organizational behavior factors (including motivation, leadership, communication, stress, trust, fairness, work design, feedback, rewards, and turnover) affect employee performance and retention in the food industry. It is hypothesized that demanding work conditions and limited rewards reduce motivation, while strong leadership, clear communication, and fair treatment improve employee performance and retention. To explore these relationships, this study will use qualitative interviews with managers from restaurants, food service companies, and food retail organizations. The responses will be analyzed to identify common themes and evaluate how well they support the proposed hypotheses. The anticipated results suggest that high stress, poor communication, and ineffective work design contribute to employee dissatisfaction and higher turnover rates. In contrast, effective leadership, consistent feedback, and meaningful rewards are expected to improve motivation and performance. Overall, this study provides practical insights that can help managers improve employee experiences, reduce turnover, and enhance performance within the food industry.
Keywords: food industry, organizational behavior, employee motivation, leadership, turnover, workplace stress.

P07. “Analysis of the Construction Industry”

Student Presenters: Katelyn Gulbranson, Hannah Corbin, Ben LaPard, Tucker Skime, Isaac Sisneros

Mentored by: Dr. Shontarius Aikens

Abstract: For this project, based on our understanding of the industry, we created a “top 10 hypothesis list” that our team believes are the top 10 issues of concern for managers within the construction industry. This list includes communication, decision making, leadership, trust, company culture, ethical behavior, motivation, performance, cohesion, and goal setting. To validate our initial top 10 hypotheses list, our team will analyze real workplace examples, review Organizational Behavior concepts from our book and academic sources, and gather feedback from individuals with management experience to determine which issues most strongly impact organizational success. Our research process includes each team member conducting five face-to-face interviews with members who work closely with and in the construction industry. The questions used in the interviews ranged from management styles to industry challenges, with the intention of maximizing the information received from the interviewees. Using this information we gather from the 25 interviews, our team will reassess the rankings of our list, so the final list accurately represents the most important concerns managers face in real life scenarios rather than relying only on initial assumptions. We suspect our list will change in order, but not necessarily in content. Our overall goal is to gain a deeper insight at a management level into how the construction industry specifically leads their teams in the workplace.

P08. “OB in the retail world”

Student Presenters: Enricco Rolle, Alex Kriesel, Maxton Meyer, Isaiah Schmitz

Mentored by: Dr. Shontarius Aikens

Abstract: This study explores key organizational behavior challenges within large and small retail organizations, with a focus on employee retention, motivation, and performance. Increasing job complexity, diverse workforces, and high turnover rates make it essential to understand how factors such as job satisfaction, leadership, communication, workload, and organizational justice influence employee attitudes and behaviors. This research argues that improving these organizational behavior factors is critical to enhancing employee engagement and overall performance. Using a framework based on individual, interpersonal, and organizational processes, this study develops ten hypotheses related to common workplace issues, including career advancement opportunities, scheduling fairness, leadership effectiveness, team dynamics, and training and development. A qualitative research approach will be used to evaluate these hypotheses through structured interviews with managers in various roles. This method allows for direct insight into real-world management challenges and supports comparison between theoretical concepts and practical experiences. Anticipated findings suggest that high employee turnover is strongly associated with limited advancement opportunities, unfair scheduling practices, and excessive workload. In contrast, supportive leadership, clear communication, and effective teamwork are expected to improve employee engagement and job performance. Results may also indicate that while performance-based rewards can increase short-term productivity, long-term motivation depends more on job satisfaction and organizational support. Overall, this study provides practical insights into how organizational behavior strategies can reduce turnover, improve employee satisfaction, and strengthen performance outcomes.

P09. “The Evolution of TCavProductions”

Student Presenters: Trenten Cavanes, Jordan Petron

Mentored by: Heather McDougall, J.D.

Abstract: This presentation explores the transformative journey of TCavProductions, detailing the strategic pivot from a small startup to an accelerated production business. By examining the "before and after" of a critical capital addition, we provide a roadmap for how targeted funding can bridge the gap between creative potential and market presence.The initial phase of TCavProductions was defined by resourcefulness and high-quality output restricted by low-visibility. The primary challenge was the ability to reach a broader audience. Growth was organic but slow, as most energy was spent on production rather than strategic outreach or professional-grade marketing. In early 2025, TCavProductions was awarded funding by the Cobbertunity Fund, which served as the primary catalyst for the company’s next chapter. The funds were strategically allocated toward advertising materials and professional branding assets. This allowed the business to finally project an external image that matched the internal quality of its productions. The presentation reflects on the dual nature of this growth: Quantitative Growth: We analyze the statistical surge following the investment, including increased client acquisition and individuals reached. Qualitative Growth: Beyond the numbers, the grant facilitated a shift in entrepreneurial mindset. This section reflects on the professional maturity of the brand and the personal evolution of the founder, moving from a "freelancer" mentality to a "business owner" perspective. Ultimately, this session demonstrates how the Cobbertunity Fund didn't just buy materials; it bought the bandwidth to scale, the tools to compete, and the confidence to lead in a crowded production marketplace.

P10. “The Ethnographic Essay”

Student Presenters: Gigi Graham, Tyler Kraft, Kai Black, Mia Morones

Mentored by: Dr. Karla Knutson

Abstract: Ethnographic field research is a method used to gain a deep understanding of a particular group or culture. This can be done through participant observation, as well as engagement through interviews. By documenting everyday interactions and special occasions, ethnographers help outsiders understand these communities. The main purpose of an ethnography is to share this insight through a written article, essay, or book. Ethnographic research has a large range of ways it can impact communities. Businesses use field research to observe how people interact or respond to products; in other fields, ethnographic research is used to highlight overlooked and sensitive communities. This leads to greater social awareness and sometimes change in policy. Even unethical research practices can shape the way we practice research ethics. It is important to avoid approaching data with an expected outcome. This leaves researchers close-minded. Instead, researchers must remain open and allow patterns to emerge naturally. Even though there is not one way to conduct field research, there is generally a pattern: select a community or setting, take quick notes of observations or interviews, expand those into “fieldnotes”, identify recurring themes, and reorganise according to themes. This reorganised version of fieldnotes can be used to analyse data or as a draft of what will be published. While there is no one universal methodology, different groups or cultures require different levels of attention and observation. Part of the researcher's job is determining this level of need in order to understand their communities on a deeper level.

P11. “The Impact of Grief and Loneliness in Older Adults in Assisted Living Homes”

Student Presenters: Hailey Cloutier, Reese LaRocque, Ceci Buzzeo, Sam Lindsay

Mentored by: Dr. Phillip Lemaster

Abstract: Grief and loneliness, and their coping mechanisms, are underexplored issues amongst older adults in assisted living homes. In this literature review, we investigated the factors influencing grief and loneliness: spousal death, loss of family and friends, and lifestyle changes such as physical loss and loss of independence. All of these aspects can severely impact an individual's physical, emotional, and psychological well-being. The average stay in an assisted living facility in the U.S. is 28 months (Jain et al. 2021); many residents during this time experience symptoms of depression and grief due to losses, loneliness, or other factors. The death of a spouse can cause difficulty sleeping, weakened immunity, hypertension, cardiac issues, depression, anxiety, and increased risk of mortality (Conlon & Aldredge, 2013). With depression, suicidal thoughts occur at rates between 5-33%, and themes preceding suicidal thoughts are often personal loss, loneliness, and loss of control (Jain et al. 2021). Coping strategies must be implemented because of the high levels of grief, loneliness, and depression within assisted living homes. It has been found that many assisted living facilities have brought about good coping skills/strategies that have helped individuals get through their grief or loneliness. Some of the effective strategies that have emerged are spirituality, social support, and self-care, which have all been key factors in improving an individual's stay and care in assisted living. The grief and loneliness that persist in this underrepresented group is an important topic to examine due to the impacts it brings upon older adults.

P12. “Importance of Autonomy in Older Adulthood”

Student Presenters: Lauren Bangs, Sydney Kostman, Genevieve Gruba

Mentored by: Dr. Philip Lemaster

Abstract: Life expectancy is increasing every year, meaning that understanding how to maintain autonomy and quality of life among older adults has become increasingly important. Autonomy is the ability to make independent choices and maintain control over one's life. Autonomy plays a huge role in an older adult's identity, dignity, and well-being (Gobillot et al. 2025). Research has proven that autonomy is influenced by many biological, social, and environmental factors that come with aging. An example includes age-related physiological changes such as declining autonomic nervous system, which can negatively impact a person's health, increasing vulnerability to cardiovascular disease or cognitive disorders (Alrosan et al., 2024). Additionally, chronic conditions and functional limitations have been seen to be associated with lower quality of life among the older generations (Wilk et al., 2024).This presentation strives to review current research on autonomy and quality of life in aging populations. We plan to examine how autonomy goes beyond physical independence to include a person's identity and meaningful decision-making in daily living (Heide, 2022). We will be discussing health and lifestyle factors that can influence a person's autonomy, which includes things like physical activity, nutrition, and disease prevention. Those factors are important for maintaining function in aging populations (King & Guralnik, 2010; Payette, 2005). We can also evaluate environmental and social influences like person-centered care and supportive relationships specifically in assisted living or nursing homes. These have been proven to show an increased sense of control and well-being (McCabe et al., 2021; Moilanen et al., 2020).

P13. “Moorhead Community Homelessness Awareness Study”

Student Presenter: Gannon Brooks

Mentored by: Dr. Daniel Biebighauser

Abstract: Those that suffer from homelessness are met with stereotypes from the public that convey individuals as responsible for their situation through personal reasons such as drug and alcohol abuse or unwillingness to work. This study examines community perceptions of homelessness in Moorhead to evaluate how they align with common stereotypes towards homeless populations. My main argument is that increasing awareness of structural issues like housing affordability and access to services can help reduce harmful stereotypes. My data was collected through a community survey and an interview with a nonprofit leader working in homelessness and poverty reduction initiatives. The survey results show that respondents most frequently identified drug and alcohol abuse as the major reason that people fall into homelessness. Additionally, 86% of participants believed that Moorhead lacks sufficient services for individuals experiencing homelessness, and 60% suggested increasing available housing, support systems, and services. During my interview with a leader from United Way, Taylor Syverston, systemic factors like lack of affordable housing and economic instability are the primary drivers for homelessness. She also commented on how detrimental common public misconceptions can be to those suffering from homelessness. Survey findings show that community awareness of structural factors is strong, but stereotypes persist. Addressing these misconceptions through education and community engagement can improve both public perception and local responses to homelessness.

P14. “Housing Instability, Youth Homelessness, and Juvenile Recidivism”

Student Presenter: Oliver Fluegel-Murray

Mentored by: Dr. Michelle Lelwica

Abstract: This research critically analyzes housing instability as one of the strongest predictors of juvenile recidivism. Drawing on scholarly research, this project highlights the siloing of youth homelessness services and reintegration programs, which, unintentionally yet needlessly, discharge countless young people into unsafe or unstable living situations. It also explores how expanding the scope of housing stability in juvenile justice aftercare would enable the youth justice system to reduce both homelessness and recidivism simultaneously. Engaging an interdisciplinary, outcome-oriented framework, this project integrates research on juvenile justice, homelessness policy, and ethics, drawing on existing literature, public data, policy reports, and program materials. It reviews local and national research on the reciprocal relationship between homelessness and justice involvement, examines Transitional Living Programs (TLPs) as intervention models, and uses programs and organizations operating in Clay County, Minnesota, such as CLIPS and YouthWorks, as case studies to envision a more effective housing-centered juvenile re-entry system. Comparing and contrasting the goals, means, and outcomes of services exposes the structural gaps in coordination. Ultimately, my research reveals that housing functions as a crucial stabilizing factor in reducing recidivism and improving general outcomes like employment, education, and subjective well-being. It further posits that programs like CLIPS show significant promise and that direct partnership with local TLPs could help distribute the burdens of re-entry support while improving the overall efficacy of community-based housing systems. It concludes by advocating that juvenile justice systems should approach housing as a core re-entry need, recommending interorganizational collaboration, expanded transitional living, and housing-centered discharge planning.

P15. “Connections Between Wake Episodes, Mental Health, Diet, and Cognitive Function in Older Adults with Overweight or Obesity”

Student Presenters: Emily Rengo, Naima Sharif

Mentored by: Dr. Betsy Cogan

Abstract: Introduction: Mental health conditions and poor sleep amplify health risks in those with obesity. However, links between health and specific sleep metrics are less understood. We aim to explore the relationship between these measures in aging adults with overweight or obesity. Methods: Older adults with overweight/obesity (avg age=59.5±5.9y; avg BMI=28.9±2.2 kg/m2) completed a 3-day food record and sleep questionnaires to determine dietary intake, number of wake episodes (WE), and wake after sleep onset (WASO). Surveys assessing psychosocial function were also completed. Cognitive function was assessed using the Montreal Cognitive Assessment Scale (MoCA). A Pearsons correlation analysis was used to analyze links between sleep and other outcomes. Results: Ten participants were included in the analysis. There were positive correlations between WASO and protein intake (r=0.65, p=0.04). Higher WE was associated with greater energy intake (r=0.69, p=0.04), higher Beck’s Depression Index score (r=0.70, p=0.02), greater in-the-moment anxiety assessed by the State Trait Anxiety Inventory (r=0.88, p=0.05), and obesity-related psychosocial impairment assessed by obesity-related problems scale (r=0.71, p=0.02). Poor cognitive performance on the verbal fluency task was associated with higher WE (r=-0.76, p=0.01). Health metrics including body mass index, body fat percentage, blood lipids, glucose, and inflammatory markers were not correlated with WASO or WE. Conclusion: In our sample, disturbed sleep, marked by greater WASO and WE, was associated with poorer mental health and cognitive function. More research is needed to further clarify the links between sleep, diet, and cognition in this population due to our small sample size.

P16. “2QRU: What Could it Possibly Do?”

Student Presenters: Dawson Fleck, Jordan Nicholson, Max Baumgartner

Mentored by: Dr. Julie Mach

Abstract: Advances in large-scale structural genomics initiatives, particularly the Protein Structure Initiative, have dramatically increased the rate of protein structure elucidation. Despite this rapid growth in structural information, determining protein function remains a major challenge. Functional characterization is essential for understanding enzyme systems in organisms and for identifying proteins that may be useful in biotechnology and pharmaceutical development. The protein 2QRU, isolated from Enterococcus faecalis, has a resolved structure but an unknown biochemical role. E. faecalis is part of the normal human microbiome, found primarily in the large intestine, assumed to aid in the digestion of simple sugars, glycerol, and some lipids. During the Spring 2026 semester, the potential function of 2QRU was investigated using a combination of bioinformatic analysis, artificial intelligence-based structural tools, and wet-lab experimentation. Comparative sequence and structural analyses were performed against homologous proteins in the Protein Data Bank. These analyses suggest that 2QRU belongs to the enzyme subclass EC 3.1.1, corresponding to carboxylic ester hydrolases. Structural similarity to known enzymes within this group indicates that 2QRU likely functions as an ester-hydrolyzing enzyme, although the exact substrate is currently unknown. Ongoing activity assays are expected to confirm this predicted activity and further determine the specific enzyme type within the EC 3.1.1 subclass, and potential regulatory mechanisms.

P17. “3FEQ: Strength in Numbers (All 16 of Them)”

Student Presenters: Luke Brendefur, Tyler Winterrowd

Mentored by: Dr. Julie Mach

Abstract: 3FEQ, a functionally unknown protein, has a scientifically proven structure. Using a variety of databases, a function was proposed for its enzyme activity. Bioinformatics programs compared amino acid sequences to known functional domains, to elucidate the function of 3FEQ. A TIM-Barrel Structure was identified in the structure of 3FEQ. The enzyme is proposed to be a hydrolase enzyme in the ECEC class 3.5.1. A search in the FoldSeek Database provided us with structures of homologous proteins, 4C60 and 8HIS, both of which were compared to 3FEQ to discover its active site. We hypothesize that 3FEQ is an ochratoxinase similar to 4C60 and 8IHS. Ochratoxinases break the linear amide bond of Ochratoxin A. Ochratoxin A is a mycotoxin which is produced by certain fungi, like *Aspergillus* and *Penicillium*. This mycotoxin is a big contributor to food contaminants in agricultural products which can cause major health risks around the globe. Ochratoxin A can suppress the immune system and is a carcinogen. With 3FEQ being found in the Sargasso Sea, the humid and warm conditions are perfect for Ochratoxin A to thrive. The residues in 3FEQ that are involved in the active site and metal coordination of Zn2+ ions were proposed based off similar amino acid residues on 4C60 and 8IHS. Further work in purification and specific ligand assays is planned to support the hypothetical function of 3FEQ.

P18. “Cra-Z Chromatography: Bringing Dye Analysis from Washable Markers to the General Chemistry Lab”

Student Presenters: Lily Heskin, Steya Tian

Mentored by: Dr. Graeme R. A. Wyllie

Abstract: The main objective of our research was to develop a new experiment that showcases High-Performance Liquid Chromatography (HPLC) in the General Chemistry lab. Previous experiments relied on extraction and analysis of food dyes from samples of Skittles. In recent years, artificial food dyes have faced scrutiny and are at risk of removal from the market. Our experiment aimed to find a viable substitute replacing the candies with the dyes from washable markers. A range of commercially available markers were investigated through Thin Layer Chromatography (TLC), UV-Vis spectroscopy, and HPLC analysis to identify the dyes within them. We created a database containing a breakdown of the dyes found in a regular box of twenty markers, several of which contain multiple dyes. We found some of the markers contained one or more standard food dyes (Blue 1, Yellow 5, Yellow 6, Red 40, Red 3), whilst many contained different unknown dyes. From here, we researched dyes from the Food and Drug Administration (FDA) Regulatory Status of Color Additives database to determine the identities of several of these unknown dyes. From these data, we selected twelve viable Cra-Z-Art markers for General Chemistry students to analyze. Suitable experiments were developed which allowed students to effectively identify and quantify dyes in one of these markers. Results in our research were compared with those obtained by the students from the Fall 2025 General Chemistry lab.

P19. “Variational Quantum Algorithms for Computing Excited States in Small Molecules on Near-Term Quantum Devices.”

Student Presenter: Abdihakim Adan

Mentored by: Dr. Ayush Asthana, Dr. Darin Ulness

Abstract: The Variational Quantum Eigensolver (VQE) is the dominant algorithm for electronic structure computations on Noisy Intermediate-Scale Quantum (NISQ) devices. However, its application to electronically excited states is essential for photochemistry, catalytic behaviour, and optical materials, and it poses unique algorithmic and resource challenges. This research offers a comprehensive methodology to evaluate, analyse, and enhance the leading excited-state VQE models with the goal of establishing robust pathways for chemical accuracy on near-term quantum hardware. I did a comparative analysis of three techniques: Variational Quantum Deflation (VQD), Subspace-Search VQE (SSVQE), and the Folded Spectrum method (FS-VQE). Assessed resource mitigation strategies, including Pauli grouping for measurement control and Symmetry-Preserving Ansätze (SPA) for strong correlation. Additionally, I benchmarked subspace expansion techniques like quantum self-consistent Equation-of-Motion (q-sc-EOM) versus Quantum Subspace Expansion (QSE) using H_2 and N_2 as model systems. Findings quantify a fundamental trade-off: VQD achieves enhanced sequential accuracy, while SSVQE provides greater quantum efficiency via a single optimisation. Importantly, q-sc-EOM produces reliable results when QSE does not; as the condition number of QSE's overlap matrix rises, its errors grow, but q-sc-EOM's identity overlap matrix protects it from statistical sampling errors. This analysis provides an essential performance hierarchy and functional toolkit for quantum computational chemists, enabling reliable excited-state simulations with chemical precision on near-term quantum processors.

P20. “From Engineered Inorganic Perovskite Colloids to 3D Printed Structures”

Student Presenter: Ashlyn Campbell

Mentored by: Dr. Saroj Thapa

Abstract: Perovskite nanocrystals (NCs) are semiconductors that can be used in solar cells, batteries, and optoelectronics. Common NCs are notoriously unstable when exposed to moisture, oxygen, ultraviolet light (UV), and heat. Reducing the cost of versatile and efficient semiconductors using sustainable synthesis methods may lead to the next breakthrough in renewable energy. Various iterations of NCs were created by altering the ratio of potassium (K) to cesium (Cs) within the A-site of the NCs. After synthesis, each sample’s optical properties were analyzed with a spectrophotometer to find a baseline. Two NC variants (0% and 20% K), were suspended in transparent UV-curing resin and printed in an MSLA 3D-printer, then analyzed to determine how excitation and adsorption were affected. Through an iterative experimental synthesis method, the amount of resin suspended NCs required for 3D-printing and the compounds required for ligand assisted reprecipitation were minimized. This minimized generated waste and permitted the synthesis of fine NCs. Through CAD, custom reservoirs and print heads were designed and fabricated using PLA, laminator paper, and a pop can. This allowed for 3D-printing with only 10% of the initial required resin volume. After cleaning, spectrophotometry showed the NCs maintained optical properties and were isolated from moisture, air, and UV within the curing bandwidth. Further research should be conducted to determine the durability of this protective method, but the initial results are promising. With further exploration and refinement, a more efficient, versatile, and stable semiconductor may be possible, creating exciting new opportunities in renewable energy.

P21. “Juvenile Detention Center Staff Training in The United States”

Student Presenters: Alexandra Runyan, Gwen Lindahl, Milton Hillegass

Mentored by: Dr. Michelle Lelwica

Abstract: Low level, direct-care staff in youth detention centers spend the most day-to-day time supervising and interacting with residents, but their training in evidence-based, trauma-informed practices are often less standardized, and sometimes less intensive, than the training provided to therapists, educators, or clinical teams. To address this topic we will research the history of youth detention facilities, the training of direct-care staff in different states, and current empirically supported training practices that result in an environment where youth feel seen. With this project we hope to bring awareness to the strengths and weaknesses of juvenile detention center practices in our country.

P22. “Plant Census at Henderson WMA”

Student Presenter: Liam Weis

Mentored by: Dr. Joseph Whittaker

Abstract: Henderson Wildlife Management Area (WMA), located 10 miles east of Bismarck, North Dakota, is managed by the North Dakota Game and Fish (NDGF). The area was heavily invaded by Kentucky bluegrass, prompting restoration efforts beginning in 2019 to reestablish native grasses and forbs. Site preparation included a soybean and corn rotation, and in spring 2022, 100 acres were seeded with a native mix consisting of 80% grasses and 26% forbs. By fall 2022, vegetation establishment was underway and continues to be monitored under the Natural Resources Conservation Service (NRCS). The long-term goal is to maintain plant diversity through high-intensity, short-duration grazing every other year, adjusting management strategies as needed. Vegetation was assessed using plant census methods to track forb bloom timing and estimate species abundance, along with line point intercept to measure percent cover, bare ground, basal cover, and species composition. These methods provide both general and detailed data and are conducted once per growing season during peak conditions. Results from these assessments indicate a healthy and diverse plant community, suggesting that current management practices are effective. The most recent data, collected in late summer 2025, support continued use of these methods. Monitoring will continue in future seasons to ensure long-term ecosystem health and stability.

P23. "Vascular Pathway Modulation in *Quercus macrocarpa* Gall Development"

Student Presenters: Cael Schlauderaff, Delia Denis

Mentored by: Dr. Mallorie Taylor-Teeples

Abstract: Galls are abnormal plant growths induced by diverse organisms, including fungi, bacteria, viruses, insects, and mites, and represent a striking example of cross-kingdom interaction. These structures create specialized niches that provide protection and nutrients for the inducing organism while altering host plant morphology. This study focuses on galls formed on *Quercus macrocarpa* (bur oak) by the cynipid wasp *Bassettia flavipes*. Previous work suggests that gall-inducing insects can reprogram host vascular development to support larval growth, though the molecular and temporal dynamics remain unclear. Do larvae continuously manipulate host vasculature, or is reprogramming restricted to early gall formation? To explore this, reverse transcriptase PCR (RT-PCR) primers were designed to target conserved vascular genes, using the *Q. robur* genome as a reference due to limited *Q. macrocarpa* sequence data. *Arabidopsis thaliana* vascular gene analogs were identified in *Q. robur* via BLAST. Putative orthologs of PHLOEM INTERCALATED WITH XYLEM (PXY), VASCULAR-RELATED NAC-DOMAIN7 (VND7), ACAULIS5 (ACL5), and ARABIDOPSIS THALIANA HOMEOBOX8 (ATHB8) were targeted for expression analysis. RNA extracted from gall and non-gall tissues across developmental stages was used for quantitative RT-PCR (RT-qPCR). RT-qPCR analysis revealed stage-dependent modulation of vascular gene expression in gall tissue relative to non-galled controls. This work contributes to a growing understanding of how insect effectors manipulate plant developmental programs, providing broader insight into the molecular mechanisms underlying cross-kingdom developmental reprogramming.

P24. “Crop Scouting Wheat and Soybeans in Northwest MN”

Student Presenters: Jordan Hunnicutt, Angie Peltier, Jochum Weirsma

Mentored by: Dr. Anthony Hanson, University of MN Extension

Abstract: Crop scouting is a tool for assessing crops for potential risks and outcomes. Determining insect and disease presence, as well as overall plant health, in fields can guide decision making regarding insecticide and fungicide use. Scouting involved checking wheat and soybeans through observation and sweep netting. From May-July 2025, I scouted 25 wheat fields, volunteered by growers, and revisited each once in early August– a total of 125 visits, about 5 visits per field. From July-August 2025, I scouted 28 randomly selected soybean fields. Each field was visited on average once weekly. Scouting data was used to produce weekly maps that were posted online and farmers who volunteered fields received weekly emails. Aphids were the most common insect pest seen overall and were more abundant in soybeans than in wheat. However, they never exceeded the economic threshold of 250 aphids per soybean plant. The highest count was a field in Wilkin County with an average of 60 aphids per plant. This indicated to farmers that the aphid populations were a low risk and didn’t require insecticide application in 2025. Tan spot and Septoria were the most prominent diseases in wheat. These fungal diseases thrive in the wet, warm weather that occurred during the scouting period. It is evident that scouting is a useful tool for gathering diverse data and information about crops. Crop scouting can be useful for recommending pesticides when needed and avoiding use when not justified. These results demonstrate the importance of routine scouting for Integrated Pest Management.

P25. “Christian Ethics and the Transhumanist Question”

Student Presenter: Ethan Leopold

Mentored by: Dr. Michael Johnson

Abstract: This presentation is an examination of transhumanism and posthumanism as defined as the goal of moving beyond the limitations of human biology and the body, and its relationship with Christian ethics. This addresses a relevant problem in Christian ethics--whether or not attempting to surpass human biological limitations and the human body itself, as many tech elites are in favor of, is compatible with a Christian ethical worldview. Utilizing the works of philosophers, theologians, and ethicists, this presentation shows the incompatibility of this philosophy with a Christian ethical worldview

P26. “Effective & Efficient Language Learning: Analyzing the Possible Role of AI”

Student Presenters: Qwame Martin, Daniel Skrade

Mentored by: Dr. Lisa Twomey

Abstract: This research project aimed to explore whether Artificial Intelligence is a viable language learning tool. As advanced-low speakers with strong grammatical foundations, we question the most effective way to continue to improve our Spanish. For example, how to improve our spontaneous conversation skills, expand our vocabulary, improve our pronunciation/fluidity of speaking, and be able to listen and follow native speakers. Many language learners lack consistent access to native speakers and exposure to different dialects or regional verbiage, which limits conversational patterns and cultural contexts. However, AI is a tool that is easily accessible and adaptable, so we explored how we could benefit from consistent conversations with AI chatbots. We discovered that AI can serve as a beneficial language-learning tool for advanced-low Spanish learners and has the ability to simulate diverse dialects and speech styles. Our research question is “In what ways does regular interaction with conversational AI benefit advanced-low Spanish learners, including exposure to dialectal variation and verbiage?” To respond, we each spent at least 180 minutes conversing with a tutor, either a chatbot or with someone in real life. We then rated each tutoring session through a three-question 1-5 Likert scale and wrote a reflection, including how we felt about the conversation and learned vocabulary.

P27. “Effectiveness of Second-Language (L2) Learning with Aritifical Intelligence”

Student Presenters: Maggie Brown, Olivia Hanson

Mentored by: Dr. Lisa Twomey

Abstract: As AI becomes increasingly immersed in our day to day lives, specifically within education, it is important to examine its linguistic abilities, as well as its cultural knowledge. Research suggests that AI will be able to help with the technical aspects of learning a second language such as grammar, vocabulary, and sentence structure, even outperforming traditional instruction models. Evaluating limitations in its cultural competence further defines its ability to be utilized in educational settings. Our research examines the effectiveness of artificial intelligence (AI) as a tool for language and cultural learning. Using a combination of secondary research alongside personal experiences using AI Spanish tutoring, we will compare feedback that AI gives us regarding our second language abilities to achieve a deeper understanding of AI accuracy and depth. We will measure AI’s understanding of languages and cultural sensitivity. We anticipate that AI will display strength in the mechanics of language learning, but be limited in its cultural competency.

P28. “Artificial Intelligence and Cultural Understanding in Spanish Language Learning”

Student Presenter: Camila Gutierrez

Mentored by: Dr. Lisa Twomey

Abstract: Artificial intelligence is increasingly prevalent in education, particularly for students learning new languages. Many students use AI tools to practice vocabulary, grammar, and writing. However, language learning is not only about grammar and vocabulary; it also involves understanding culture. Spanish is spoken in many countries, each with its own traditions, customs, and social norms. Because of this, it is important to explore whether AI can help students learn about cultural topics as well as the language itself. The purpose of this project is to examine how artificial intelligence can support students in learning about the cultures of Spanish-speaking countries. This research asks whether AI can provide helpful and accurate explanations of cultural topics for students studying Spanish. To explore this question, I will ask AI different questions about cultural topics such as holidays, food, traditions, and everyday customs in Spanish-speaking countries. The responses will then be compared with information from class materials and scholarly sources to evaluate their accuracy and depth The expected results suggest that AI can give students quick and helpful introductions to cultural topics. At the same time, the research may show that AI sometimes simplifies cultural information and works best as a support tool alongside teachers and course materials.

P29. “Artificial Intelligence and Language Learning”

Student Presenter: Isabelle Vos

Mentored by: Dr. Lisa Twomey

Abstract: I am researching AI as a language learning tool outside of our classroom and its effectiveness. AI has many benefits, but I do have the basis of believing that human interaction and teaching is better in the long run for language learning. My initial hypothesis is that while AI is very useful as a personalized learning tool, there are more benefits culturally and learning-wise from learning language from humans. I think that I will find a lot of data saying how AI is very useful, but I think that the interface and cultural bias. I will be using evidence from the class discussions of our tutoring with AI as well as my own experiences. In addition, I have found multiple scholarly articles with data that I will also be using. The scholarly articles will give an academic perspective with numerical and experimental evidence while the experiences from myself and the class will give a human example of the ideas discussed in the articles.

P30. “Representación de la Cultura en Inteligencia Artificial”

Student Presenter: Gwendolyn Lindahl

Mentored by: Dr. Lisa Twomey

Abstract: AI's grasp is becoming global, but does its algorithms realistically reflect the deep nuance of culture and society? During weekly "Spanish tutoring" interactions with Chat GPT I've asked it to assume the roles of different women from Latin American countries and noted the responses it gives to culturally significant questions. This information, combined with other research on Chat GPT's ability to portray culture has inspired me to create an artistic depiction of my interaction with AI. It takes the form of a portrait with many features but no cohesive personhood. This piece is portrayed alongside art I have asked AI to generate based on our interactions for comparison. Through these portraits I argue that while AI can provide a surface level understanding of different cultures, it will never be able to capture the experience of sharing a learned language with a native speaker.

Poster Session 1 | 8:55 – 10:15 a.m.

Knutson Campus Center Atrium

P31. “Little Cormorant Lake”

Student Presenter: Brennan Steele

Mentored by: Dr. Mike Bush

Abstract: Little Cormorant Lake, located in Becker County, Minnesota, is a 1,067 acre groundwater seepage lake situated within the Otter Tail River View major watershed. A uniquely shaped lake, its littoral zone spans 58% of the lake and provides substantial aquatic habitat. The lake sits in the North Central Hardwood Forest ecoregion, an area characterized with elevated nutrient inputs because of surrounding agriculture. Elevated nutrient inputs combined with development and recreational pressure raise water quality concerns. Little Cormorant Lake water quality trends are mixed. Secchi depth has improved, though artificially elevated because of zebra mussel presence. Water temperature has risen significantly, reducing dissolved oxygen in the water and promoting algal growth. Phosphorus levels are increasing near eutrophic levels, which is a significant concern for a lake with no inlets or outlets. Chlorophyll-a levels have been increasing, coinciding with the rise in phosphorus levels and water temperatures. Biological assessments show strong fish diversity supported by an aeration system and consistent walleye stocking by the DNR and a private group. Priority actions include reducing phosphorus input through soil health practices, fertilizer limits, and shoreline buffers. Officially documenting zebra mussels and curly leaf pondweed to unlock management funding. Additional efforts such as restricting wake boat use, implementing shoreline stabilization, and joining the Cormorant Lakes Watershed District would strengthen assistance needed to implement these recommendations.

P32. “Star Lake Water Quality Assessment”

Student Presenter: Joshua Kolling

Mentored by: Dr. Mike Bush

Abstract: Freshwater lakes in agricultural regions are increasingly stressed by nutrient loading, shoreline development, and invasive species. This makes long-term monitoring essential for maintaining ecological health and recreational value. This study evaluates Star Lake in Otter Tail County, MN, a mesotrophic lake of high biological significance that supports diverse wildlife and heavy human recreation use. The objective was to determine whether long-term physical, chemical, and biological data indicate improving, stable, or declining water quality under human and ecological pressures. Data from the Minnesota Pollution Control Agency and MN Department of Natural Resources were analyzed for trends in water clarity, temperature, pH, total phosphorus, and chlorophyll-a concentrations. Historical datasets were graphed to identify trends and patterns in lake conditions over time. Additional context regarding shoreline development, lake usage, and invasive species management was obtained from a personal interview with a lake resident. Results indicate that Star Lake currently maintains relatively good water quality according to data analysis. However, these apparent improvements may be partially due to zebra mussel filtration rather than reduced nutrient inputs. Continued development, invasive species presence, and watershed land use changes emphasize the need for ongoing monitoring and stewardship efforts. These efforts are essential to preserve ecological stability and long-term recreational value of Star Lake.

P33. “A Water Quality Study Of Langdon Lake”

Student Presenter: Samuel Dioszeghy

Mentored by: Dr. Mike Bush

Abstract: Small lakes located within urban and suburban watersheds often experience disproportionate ecological stress from nutrient loading, development, and historical management practices. Langdon Lake is a 143-acre lake in Mound, Minnesota, within the Minnehaha Creek Watershed District. This lake provides an example of how human activity can change and impact ecological systems and how management efforts can partially restore them. Throughout the 1980s and early 1990s, the lake experienced severe eutrophication driven largely by phosphorus inputs from a nearby municipal wastewater treatment facility. These inputs contributed to extremely poor water clarity, high algal productivity, and oxygen conditions that were frequently unsuitable for aquatic life. This study examines how the physical and chemical characteristics of Langdon Lake have changed over time and evaluates whether past restoration and management efforts have improved the system. Historical monitoring data from the Minnesota Department of Natural Resources and the Minnehaha Creek Watershed District were analyzed to assess long-term trends in key indicators of lake health, including Secchi depth, temperature, dissolved oxygen, pH, phosphorus, and chlorophyll a. Additional historical context was obtained through interviews with watershed managers and archival records related to the lake’s management history. Preliminary analysis suggests that nutrient reductions following improved wastewater management and a 1998 alum treatment contributed to measurable improvements in several water quality indicators. However, the lake continues to display eutrophic characteristics and remains vulnerable to external nutrient inputs, internal phosphorus loading, and seasonal oxygen depletion events such as the 2013–2014 winter fish kill.

P34. “Surveying Tick Species and Pathogens in Northwestern Minnesota”

Student Presenters: Riley Duppong, Gabriella Castro, Seema Mustafa

Mentored by: Dr. Emerson Towey

Abstract: Tick-borne disease has tripled in the United States in the last decade. This increase is a concerning public health threat, especially in regions like northwestern Minnesota that are historically underserved by research and surveying. In Minnesota, the most common and medically relevant tick species is the American dog tick (*Dermacentor variabilis*). In the last half century, the black-legged tick (*Ixodes scapularis*), once confined to the southeast U.S., has been rapidly spreading northwest into Minnesota. Other species that present an increasing threat include the Brown Dog tick (*Rhipicephalus sanguineus*) and the Lone Star tick (*Amblyomma americanum*). This study aims to identify and map the most common tick species and tick-borne pathogens in northwestern Minnesota, with the end goal of communicating this data with the public. Ticks were collected from various field sites around northwest Minnesota or donated by locals. Each tick’s species and pathogens were confirmed by qPCR, and data were tracked and analyzed using Excel and ArcGIS. These data will be publicly accessible through ArcGIS StoryMaps. Preliminary results show that in northwestern Minnesota, *D. variabilis* is the most common tick species, comprising over 75% of specimens. *I. scapularis* is also present, comprising the remaining 25% of specimens. So far, more than 50% of specimens tested positive for a variety of pathogens, including *Borrelia burgdorferi* (Lyme disease) and *Rickettsia rickettsii* (Rocky Mountain spotted fever). We anticipate this study will communicate crucial health data and help the public make informed decisions when participating in outdoor activities.

P35. “Macroinvertebrate Diversity of the Little Pigeon River, Tennessee”

Student Presenters: Charlotte Dove, Phia Revoir, Sam Dioszeghy, Rosella Geraci, Grace Henderson, Chloe Nyberg, Tyra Skjeret, Stella Peterson, Felisha Dale, Nora Schwieters, Peter Weinzierl, Olivia Swenson

Mentored by: Dr. Mike Bush

Abstract: Aquatic macroinvertebrates are commonly-used bioindicators for stream health and function. Because of their varied life histories, the presence/absence and abundance of particular species groups can inform aquatic ecologists if a stream is impaired or not. Streams that have watersheds with severe slopes (greater than 4%) are particularly susceptible to the impacts of urbanization and forms of land management such as forestry and mining. The Little Pigeon River in eastern Tennessee drains out of Great Smoky Mountains National Park, an area with many mountains and forested mountainsides. Approximately 80 years since intense forestry practices ceased, the Little Pigeon River has regained its status as a biodiversity hotspot for fishes and aquatic macroinvertebrates. To assess to the diversity and abundance of macroinvertebrates, two different river stretches were sampled immediately outside of the national park. Eight separate kicknet surveys were conducted across the two river stretches, with surveys conducted at one meter intervals across the width of river or until the river became too deep to effectively sample. Water depths and sediment size were also recorded. Shallow water was positively correlated with macroinvertebrate density, as was sediment size. However, beyond sediment size of several centimeters, diversity began to decrease, suggesting that shallow depths and medium-sized sediment (“riffle” habitats) were optimal habitat for aquatic macroinvertebrates. While kicknet surveys are effective at assessing diversity of larger macroinvertebrates, smaller macroinvertebrates, such as Diptera larvae, often pass through the net mesh uncollected, suggesting that observed biodiversity metrics may be lower than what is actually occurring.

P36. “Fetal Development in Space: Radiation and Genetic Variation in Monozygotic Twins”

Student Presenters: Jack Nichol, Melinda Chen, Daniela Heggestad, Milgo Abdi

Mentored by: Dr. Krys Strand

Abstract: As humans prepare for long-term settlement in space, the questions of reproduction and fetal development are paramount to the success of human life beyond Earth. This proposed study explores the effects of space radiation on human fetal development in the womb. Our hypothesis is that if women of varying demographics carry identical twins to full term in space, the increased radiation exposure to the fetuses will result in greater genetic variation between the twins in the form of single nucleotide polymorphisms (SNPs). In our proposal, 40 women of different racial identities carrying identical twins would travel to a space station for the duration of their pregnancy. After birth, the number of SNPs in the twins would be quantified and compared to typical numbers in terrestrial developed identical twins. We anticipate a higher presence of SNPs between identical twins developed in space compared to the typical level observed in their terrestrial counterparts. This would indicate that space radiation and microgravity could be a major barrier to fetal development in space settlements, making effective countermeasures vital for safe development. We do not anticipate an effect of race on number of SNPs. This study raises major ethical concerns. Radiation exposure and other space-related stressors could pose risks to the mother during pregnancy. Ethical issues also arise from exposing fetuses, who cannot provide consent, to high levels of radiation and other environmental stressors associated with spaceflight.

P37. “Addressing Neonatal Abstinence Syndrome (NAS) in Rural and Indigenous Communities”

Student Presenter: Annika Johnson

Mentored by: Dr. Julie Rutherford

Abstract: Neonatal Abstinence Syndrome (NAS) is a withdrawal condition experienced by newborns exposed to substances in utero (Stanford Medicine, 2026). This condition has been linked to the recent rise in opioid use across the U.S. The burden of NAS is not distributed equally. Rural communities and Indigenous populations experience disproportionately high rates of NAS due to limited access to treatment, structural barriers in healthcare systems, and high rates of substance use (Len et al., 2021, Zven et al., 2025). NAS should be understood not solely as a medical condition, but as a public health issue shaped by systemic inequities, particularly in rural and Indigenous communities. To investigate this, numerous articles, studies, and public health reports were analyzed to identify patterns in NAS prevalence and healthcare access. This literature review examines how social and geographic factors contribute to disparities in NAS incidence and outcomes. Special attention was given to research on rural and Indigenous healthcare systems in the U.S. and prevention strategies designed for these specific populations. Findings suggest that geographic isolation, limited prenatal care, gaps in NAS education for providers and communities, and systemic inequalities affecting rural and Indigenous populations all play a major role in NAS disparities. The literature indicates that culturally responsive healthcare models, increased provider and community education on NAS, and access to maternal addiction treatment may significantly reduce NAS incidence and improve outcomes for mothers and infants in these regions of the U.S. (Cooper et al., 2022, American Academy of Pediatrics, n.d.).

P38. “Effect of Cortisol Levels on Immune Function in Long-Duration Spaceflight”

Student Presenters: Annika Johnson, Oriana Richter, Jillian Walz, Lissa Lee

Mentored by: Dr. Krys Strand

Abstract: The purpose of this proposed study is to investigate the impact of elevated cortisol on immune system function during long-term spaceflight. While previous research has examined the effects of stress on immune function and the physiological stressors associated with space travel, limited research has explored the relationship between these factors together in the context of extended missions. We hypothesize that prolonged exposure to spaceflight stressors will increase cortisol levels and lead to measurable suppression or dysregulation of immune function. To investigate this, cortisol levels of five crew members would be measured during a 60-day space mission. Saliva samples would be collected every five days in the evening to monitor cortisol levels, and blood samples would also be collected at five-day intervals to analyze immune system markers. These markers would include T-cell activity, leukocyte count, and cytokine production. We anticipate a positive correlation between cortisol levels and mission duration when compared to pre-flight baseline measurements. As cortisol levels increase, crew members may experience immune dysregulation characterized by altered cytokine signaling, impaired cell-mediated immunity, and changes in T-cell activation. Implications include broader research on how chronic stress affects the immune system, inform astronaut training and preparation programs by emphasizing stress management techniques, and help space agencies develop countermeasures to protect astronauts’ immune health during long-duration missions. These could also contribute to safer human exploration of environments such as the Moon, and eventually Mars, by improving strategies for monitoring and managing stress-related immune suppression during long-duration space missions.

P39. “How Teacher Behavior Affects Classroom Management”

Student Presenters: Eden Weinhandl, Kia Nelson

Mentored by: Dr. Teri Langlie

Abstract: The significance of our project is looking at how teacher response relates to classroom disruptions. Our hypothesis is that negative teacher behavior is going to increse the amount of overall disruption. Our method of research will take place in the form of a literary review. We are anticipating our results to correlate to our hypothesis.

P40. “Modeling Calm: A Study of Elementary Classroom Management”

Student Presenter: Anna Person

Mentored by: Dr. Teri Langlie

Abstract: Modern-day classrooms have been facing increasingly difficult behavior outbursts among students of all ages. Some researchers point to the pandemic, poor parenting, home life, and a significant increase in screen time. Others point to how schools are organized for students and the need for improved classroom management professional development to all staff. The purpose of this study, focusing only on elementary school classrooms, is to (a) research and observe the state of behavior in classrooms today, exploring the possible causes, (b) observe a wide variety of classrooms across the Moorhead district (those who use Catalyst, a behavior management curriculum, and those who don't), and (c) conclude, with research and observation analysis in order to determine why students are acting out and the best practices for teachers and schools to use moving forward. I will be researching scholarly, peer reviewed articles while also shadowing Catalyst coach Mollie Moen across the Moorhead School District. I also will be entering classrooms of teachers in the Moorhead area who do not use Catalyst practices for a well-rounded research foundation. This research will highlight some of the most prevalent causes of student misbehavior and help to define the most effective classroom management strategies that will apply to all ages, districts, and classrooms throughout elementary schools. This research will find both similarities and differences between school environments (those who use management professional development school-wide, and those who have teachers create their own classroom environments).

P41. “AI and Cognition”

Student Presenters: Laila Ahmed, Arine Omer, Alin Oray

Mentored by: Innovation Challenge neuroscience faculty

Abstract: Frequent interaction with AI systems has become nearly unavoidable in academic and professional settings, yet little is known about the cognitive and neural costs of this growing dependence. Research suggests that easy access to AI-generated information may weaken attention, reduce cognitive effort, and alter how individuals engage with tasks. Building on prior findings that frequent AI users show lower memory recall and distinct neural activity patterns, this study investigates how sustained AI use shapes attention, agency, and mental effort over time. We hypothesize that individuals who use AI frequently will demonstrate slower sustained-attention performance, higher mental fatigue, and measurable differences in EEG activity related to cognitive effort compared to infrequent users. To test this, we will recruit 200 college students and categorize them into frequent and infrequent AI-use groups based on a pre-study questionnaire. Participants will complete three components, Number one being an AI-based writing task while EEG records alpha and beta activity to assess cognitive effort and attentional control; (2) would be a 30-minute continuous performance task measuring reaction time, accuracy, and omissions; lastly would include surveys and interviews assessing perceived agency, distraction, and mental fatigue. Quantitative data will compare the participants behavioral performance and EEG patterns across groups, while qualitative data will describe the impact of AI on their focus and cognitive endurance. We anticipate that frequent AI users will rely on different cognitive strategies, show reduced sustained attention, and exhibit neural indicators of increased mental fatigue. These findings aim to clarify how AI reshapes core cognitive processes.

P42. “Fostering Student Interest in Nutrition Science: Exploring Professional Development for Middle School Science Teachers”

Student Presenters: Carli Olson

Mentored by: Dr. Ashley Roseno, Dr. Meredith Wagner

Abstract: Background: Research indicates a significant decline in student interest and understanding related to science topics beginning in middle school. Various types of professional development programs have been used to enhance the skills and knowledge of teachers; however, some are more effective than others. The purpose of this study was to assess teacher perceptions about quality instructional practices and strategies to inform the development of integrative nutrition and science professional development experiences. Methods: A 19-item researcher-developed needs assessment survey was shared with grades 3-8 science teachers in the Midwest (n=48). Prior to sending the survey to teachers, it underwent content and face validity as well as pilot testing. The survey included level of agreement Likert-scale, multiple-response, ranking, open-response, and frequency items that addressed two constructs, including teacher perceptions of science engagement and instructional practices and support. Results: Participants indicated agreement or strong agreement that exposure to real-world applications improves student interest in health science careers (74%) and enhances student engagement in science topics (81%). Additionally, training in inquiry-based and hands-on strategies (45%) and hands-on experiment kits (66%) were identified as most impactful for engaging students in science. Conclusion: Findings suggest professional development practices should include real-world application and hands-on activities in classrooms to better engage students in science topics and foster interest in health careers. This creates an opportunity to promote collaboration between science teachers and nutrition and dietetics professionals on the creation of professional development experiences using application-based nutrition science activities.

P43. “Understanding Teacher-Perceived Barriers to STEM Engagement in Midwestern Classrooms”

Student Presenter: Jacee Vang

Mentored by: Dr. Ashley Roseno, Dr. Meredith Wagner

Abstract: Background: Dietetics and other health science disciplines face declining workforce entry, partly due to decreased student interest in science. A lack of culturally relevant curricula has been identified as a barrier, as science education often centers on Western perspectives that may not resonate with diverse students. Within culturally relevant curricula, Mezirow’s transformative learning theory, which encourages critical reflection on prior assumptions to construct new meanings, may help students examine how cultural identity shapes their understanding of science and support engagement in Science, Technology, Engineering, and Mathematics (STEM). Methods: A 19-item needs assessment survey including Likert scale and open-ended questions was distributed to grade 3-8 teachers across Midwestern states after establishing content and face validity. Teacher emails were collected through school websites or district contacts. Forty-eight teachers completed the survey, and data were analyzed using SPSS. Results: Most teachers reported student engagement in science varied based on the relevance of content to students’ lives (88%). Fewer perceived lack of representation (33%), language barriers (23%), or limited STEM role models (50%) as barriers. Teachers identified hands-on experiment kits (73%) and limited access to science resources (73%) as key factors influencing engagement. Most also agreed that real-world applications increased students’ interest (81%) and engagement (90%). Conclusions: Teachers’ perceptions of barriers to STEM interest differed from existing literature, suggesting a potential gap between research and classroom perspectives. However, the sample lacked demographic diversity (94% White/Caucasian), which may have impacted findings. Future research should examine how teacher demographics influence perceived barriers to STEM engagement.

P44. “Student Engagement and Understanding of Open Science in Psychology: A Multi-Institutional, Follow-Up Study”

Student Presenters: Josie Brown, Haley Walsh-Frisby

Mentored by: Dr. Mona Ibrahim

Abstract: Replication studies have historically been undervalued across scientific fields, contributing to what has been termed the “reproducibility crisis.” In psychology, many established findings have proven difficult to replicate, highlighting the need for greater transparency and methodological rigor. Open science practices—such as data sharing, preregistration, and use of platforms like the Open Science Framework—aim to address these issues. Another key factor in improving reproducibility is enhancing sample diversity, which carries both methodological and social justice implications. To promote awareness of these principles, undergraduate Research Methods students (2017, 2019, and 2024–2025 cohorts) participated in instructional and applied projects centered on replication, open science, and diversity in research. Surveys assessed changes in awareness and understanding of inclusive research practices before and after course participation. Results showed that students demonstrated greater recognition of transparent and inclusive research principles at posttest, supporting the value of integrating these topics into psychology education. A follow-up survey extended this work by examining how students’ experiences influenced their long-term perspectives, habits, and mental health. Findings underscore the importance of embedding open science and diversity-focused practices in psychological research training to encourage transparency, reproducibility, and inclusivity across the field.

P45. “The Effects of Isolation on Circadian Rhythm, Psychosocial Behaviors, and Mental Health for Future Space Exploration”

Student Presenters: Alexa Routledge, Julia Wolf, Anika Jones, Josie Brown

Mentored by: Dr. Krys Strand

Abstract: In recent years, the future of space travel has become more anticipated with many unknowns. Prolonged isolation, a key component to long-duration space travel, has been found to have significant psychological and physiological effects, some of which will be analyzed throughout this research. This proposed study explores the effects of a 90-day isolation period on circadian rhythm, group dynamics, and mental health. Methodology includes a rigorous baseline data collection including three initial monthly health screenings and three weeks of continuous nightly sleep analysis via Fitbit actigraphy. During the mission, nightly REM/NREM cycles and sleep latency will be monitored alongside self-reported psychological and physiological assessments. We hypothesize that excessive confinement will trigger progressive circadian rhythm shifts and a decline in sleep efficiency, which will significantly correlate with increased reports of psychological distress and reduced social cohesion. By identifying these physiological percussors to behavioral decline, this research aims to inform the development of countermeasures. Such data are vital for ensuring astronaut well-being and success during future Mars transit and habitation, where environmental stressors and communication delays exacerbate the neurophysiological challenges of extreme isolation. This research will help to act as a framework for maintaining human performance in isolated, confined, and extreme environments.

P46. “From Forensic Fandoms to Resource Integrators: A Review of Fan Engagement and Participatory Labor”

Student Presenters: Hana Weegman

Mentored by: Dr. Aileen Bulsig

Abstract: Digital media today has changed how people engage with their favorite survival horror video games. Those who once only watched become active helpers who build stories together inside large, linked worlds that cross films, games, and social accounts. Old buyer models record simple acts like purchases or views, but they miss the many sides of free fan work, such as the steady change of personal profiles, and the shared collective intelligence that guides online groups. This project mixed close reading of posts with an analysis of fan-generated theories and talk inside forums to learn what drives strong fan action. The study examines the independent survival horror franchise Five Nights at Freddy's—a series known for its cryptic lore and massive online following—to explore how hidden clues and interactive media set off "forensic" fan customs, how dense "guess sheets" arise, and how small famous users and their public trade influence. Initial analyses show that planned story gaps give raw narrative material that fans weave into fresh group lore, as the line between official canon and crowd "fanon" grows thin. The paper ends with a clear map that shows how current digital works spark heavy feeling or thought and notes the shifting, often unequal, power play between makers next to this deeply involved crowd.

P47. “Effects of Long-Duration Spaceflight on Female Cardiovascular Health”

Student Presenters: Erika Mork, Keelyn Wittenberg, Emily Brugman, Carissa Dalen

Mentored by: Dr. Krys Strand

Abstract: Our mission is to investigate how long-duration spaceflight affects cardiovascular health in females, a population that remains understudied in space medicine research. This study will compare cardiovascular responses in females and males to identify potential sex-based differences. We hypothesize that long-duration spaceflight will result in more pronounced negative effects on cardiovascular health in females compared to males. To evaluate this, we will use electrocardiograms (ECG) and ambulatory monitoring to measure electrical heart activity, blood pressure, and pulse rates before, during, and after extended space missions. These measurements will allow us to track changes over time and assess the degree of cardiovascular adaptation or dysfunction. We expect to observe greater deviations in blood pressure, heart rate, and electrical activity in females than in males, suggesting increased susceptibility to the physiological stresses of long-duration spaceflight.

P48. “Microgravity Effects on Bone Density”

Student Presenters: Arine Omer, Sean Laurel, Sylvia Gitamo

Mentored by: Dr. Krys Strand

Abstract: Microgravity during spaceflight has a major impact on the human skeletal system, especially during long-duration missions. On Earth, bones are constantly exposed to mechanical stress from supporting body weight, stimulating continuous remodeling and helping maintain bone strength. In microgravity, this mechanical loading is drastically reduced, causing the body to break down bone tissue faster than it can rebuild it. As a result, astronauts often experience significant reductions in bone mineral density, particularly in weight-bearing bones such as the hips, femurs, and spine. These losses can occur rapidly, sometimes at rates far exceeding those seen in age-related bone diseases on Earth. In addition to reduced mechanical stress, other spaceflight-related factors may contribute to bone loss. Fluid shifts toward the upper body can alter hormonal and cellular signaling involved in bone maintenance, while changes in the immune system may influence inflammation and bone turnover. Researchers are actively studying these interconnected effects to better understand the full scope of skeletal changes in space. To counteract bone loss, astronauts follow rigorous exercise protocols using specialized equipment designed to mimic weight-bearing activity in microgravity. Resistance exercise, in particular, has been shown to slow bone density decline, though it does not completely prevent it. Understanding how microgravity affects the skeletal system is essential for protecting astronaut health during future long-duration missions, including planned travel to the Moon and Mars. Insights from this research may also improve our understanding of bone diseases such as osteoporosis on Earth and contribute to the development of more effective treatments.

Poster Session 2 | 3:55 – 5:15 p.m.

Knutson Campus Center Centrum

P49. "How Movement in the Classroom Affects Student Engagement"

Student Presenter: Lauren Sekely

Mentored by: Dr. Teri Langlie

Abstract: This research looks at how adding movement into the classroom can support student engagement and learning. As teachers try to meet the needs of all students, movement can be a simple and effective way to help students stay focused and involved. This topic connects to ideas like whole-child learning and embodied cognition, which show that movement plays a role in how students think and learn. The purpose of this project is to show how intentional movement, like brain breaks or active lessons, can improve focus, increase on-task behavior, and create a more positive classroom environment. This research is being conducted through literary research using scholarly articles, government sources, and classroom-based resources focused on physical activity in schools. Across the research, there is a clear pattern: movement helps students stay engaged, improves concentration, and supports better classroom dynamics. Many sources also show that movement can be easily built into daily routines in realistic ways. Overall, this research shows that movement is a practical and powerful tool that can support both student learning and well-being in the classroom.

P50. “More Than Books: An Ethnographic Study of Space, Use, Student Connection, and Needs at Carl B. Ylvisaker”

Student Presenter: Lukas Stofer

Mentored by: Dr. Karla Knutson

Abstract: College libraries are a critical location for college students to study, collaborate, and feel connected with their peers. If there is a lack of resources and space within a library, that can lead to students not scoring as well in classes, as well as feeling isolated. Through ethnographic fieldwork, interviews, and participant observation, I will learn about Concordia College students who use the Carl B. Ylvisaker Library. I will be spending 24 hours in the library with roughly 6 of those hours for interviews, resulting in 35 total interviews. From the interviews, I will find how often, when, where, and what needs they demand the most in order for the library to be as beneficial as possible. On top of my interest in issues of frequency and scheduling of use of the library, for every interview I am doing a “coloring game", an idea from an ethnographic paper by Illinois State University. The purpose of the game is to illustrate what aspects of the library are deemed to be not as important to students at Concordia College. From these results, further action should be taken by Carl B. Ylvisaker Library in order to improve the academic needs of Concordia College students. I will share the results of my findings through a presentation.

P51. “Organizational Behavior Challenges Facing Managers in the Education Industry”

Student Presenters: Nicklaus Savidge, Andrew Hinojos, Kylie Huseth, Zach Pribyl

Mentored by: Dr. Shontarius Aikens

Abstract: The education industry faces a central organizational challenge: education managers must balance instructional quality with operational demands amid teacher burnout, high turnover, regulatory shifts, technological change, and equity concerns. Understanding the most significant organizational behavior issues affecting these leaders is essential for improving educator well-being and student outcomes. This study examines the top organizational behavior concerns facing managers and leaders in the education industry. Drawing on the Academy of Management's Organizational Behavior domain framework, our team developed an initial "Top 10" list of hypotheses ranking the issues we predict are most pressing for education leaders. These hypotheses span employee burnout and stress, organizational culture, communication effectiveness, professional development, resistance to change, team dynamics, regulatory constraints on decision-making, teacher autonomy, workload and compensation equity, and leadership style. To validate these hypotheses, each team member is conducting at least 5 semi-structured interviews with managers and leaders in education, including principals, administrators, and academic instructors. Collectively, our team will interview at least twenty individuals. Interview questions address leadership influence on motivation, strategies for managing burnout, organizational culture's effect on collaboration, employee responses to change, and the impact of external policies on managerial effectiveness. Responses will be analyzed for recurring themes and compared against our initial rankings. We anticipate that burnout, leadership style, and communication will emerge as the most critical concerns, and that our revised rankings will reflect the complex relationship between individual well-being and organizational systems within education.

P52. “Key Organizational Challenges in the Hospitality Industry”

Student Presenters: James LaVoy-Brunette, Grant Anderson, Mason Swanson, Victor Ambenge

Mentored by: Dr. Shontarious Aikens

Abstract: This research looks at the biggest challenges that managers face in the hospitality industry, especially those that can affect employee performance and customer experience. The hospitality industry relies heavily on frontline employees, and their interactions directly influence customer satisfaction and overall business success. Based on what we have learned in class, our group first believed that employee turnover, leadership, and factors like stress, communication, and training would have the biggest impact on how well companies perform. To test these ideas, we interviewed managers in the industry to compare what we think with what actually happens in the real workplace. Overall, the interviews supported most of our original ideas, especially the importance of employee turnover and leadership. But we also found that communication between managers and employees, along with scheduling fairness, played a bigger role than we first thought. These factors have a massive impact on employee morale, motivation, and performance. Our results show that while turnover is still a major issue, improving communication, leadership, and scheduling are some of the most effective ways for managers to improve employee performance and customer experience.

P53. “Understanding Organizational Behavior in Retail: Insights from Fargo–Moorhead Managers”

Student Presenters: Tayte Lecy, Dae Henderson, Mark Noah, Clay Erickson

Mentored by: Dr. Shontarius Aikens

Abstract: The retail industry is a huge part of the Fargo–Moorhead economy, with both national chains and locally owned businesses. However, retail organizations often face challenges such as high employee turnover, workforce management, demanding customer service expectations, and the need for efficient work across multiple shifts. Understanding how Organizational Behavior (OB) concepts influence employee performance, engagement, and retention is important for managers operating in this industry. The purpose of this project is to examine OB factors such as motivation, leadership style, teamwork, trust, organizational culture, and work-life balance, affect employee behavior and outcomes in retail organizations in the Fargo–Moorhead area. Our team developed an initial list of ten hypotheses based on OB theory, predicting that factors such as effective leadership, strong teamwork, clear goals, and supportive culture would positively influence employee “buy-in" and retention. To evaluate these hypotheses, our team will conduct interviews with retail managers in the Fargo–Moorhead area. Each team member will interview multiple managers using a set of questions focused on motivation strategies, leadership approaches, conflict management, teamwork, and business practices. The interview responses will then be analyzed and compared with our initial hypotheses. The estimated results of this research will identify key OB practices that retail managers use to improve employee performance, engagement, and retention. These findings will help us modify our hypotheses and provide recommendations for retail organizations looking to strengthen their workplace culture and stability.

P54. “The Extraction of UV Filters Using Deep Eutectic Solvent-Based Ferrofluid”

Student Presenters: Olivia Shelton

Mentored by: Dr. Mark Jensen

Abstract: Green analytical chemistry aims to reduce pollution and waste by developing environmentally friendly alternatives to conventional solvents. Deep eutectic solvents (DESs) are an emerging class of green solvents formed by combining a hydrogen bond donor (HBD) and a hydrogen bond acceptor (HBA). These components interact to create a liquid phase that can be used for extractions. DESs are inexpensive, easy to synthesize, and offer a more sustainable alternative to traditional organic solvents. In this study, a DES based ferrofluid was synthesized and utilized in the extraction of ultraviolet (UV) filters. High-performance liquid chromatography (HPLC) was used to quantify the extracted UV filters. An extraction procedure was developed and optimized. Menthol (HBA) and thymol (HBD) (1:5 molar ratio) were selected as the DES components, UV solutions ranging from 0.2-250 ppb were used for extraction, and R^2 values consistently above 0.998 were obtained with the exclusion of one UV filter. For future work, this extraction method will address other analytes, particularly phthalates, which pose more significant consumer health concerns.

P55. “The Synthesis of RAPTA-based Organometallic Anticancer Drugs”

Student Presenters: Mohamed Mustafa, Max Baumgartner

Mentored by: Dr. Donald "Chopper" Krogstad

Abstract: Ruthenium-based organometallic compounds have gained attention as potential anticancer drugs because of their unique properties and lower toxicity compared to traditional treatments. In this study, RAPTA-type complexes, which contain a ruthenium(II) center bonded to a para-cymene arene group and the ligand 1,3,5-triaza-7-phosphaadamantane (PTA), were synthesized and examined. These compounds are important because their structure improves solubility and helps them pass through cell membranes, allowing them to function more effectively in biological systems. All reactions were carried out under oxygen-free conditions using Schlenk techniques to prevent unwanted side reactions. The synthesis involved refluxing reactions for extended periods and careful control of solvent conditions. When needed, solvent was removed to promote product formation, and solid products were collected using frit filtration. Two different substitution patterns were explored: one researcher synthesized the para-substituted product, while the other focused on the meta-substituted form, allowing for comparison of how structure influences the final product. Overall, the successful preparation of RAPTA-based complexes shows that these methods can reliably produce compounds with potential medical applications. This work adds to ongoing research on ruthenium-based drugs and highlights how small structural differences may impact their effectiveness as anticancer agents.

P56. “Bioinformatic Prediction and Experimental Validation of Esterase Activity in Protein 4Q7Q”

Student Presenters: Jackline Peace Nanyonga, Peyton Breidenbach, Abby Lovelace

Mentored by: Dr. Julie Mach

Abstract: There are many existing proteins that have been identified, specifically in the Protein Data Bank, that do not yet have a known function. In the field of biochemistry, our knowledge about organisms with these proteins is limited without knowing their function. The objective of our research is to determine a likely function for the protein 4Q7Q by utilizing multiple bioinformatic and biochemical wet lab experimental approaches. Structural comparison using SPRITE identified several known proteins that have similar structural integrity, which suggests that 4Q7Q may function as an esterase. BLAST’s sequence analysis helped compare and orient our protein within the SGNH/GDSL hydrolase family, which are enzymes that catalyze the hydrolysis of ester bonds. InterPro also supported this classification by identifying conserved SGNH hydrolase domains within 4Q7Q. FOLDSEEK also revealed structural similarities between 4Q7Q and several lipases and esterases. Based on these results, we hypothesize that protein 4Q7Q functions as a carboxylic ester hydrolase (EC 3.1.1). We will continue our wet lab work through purification of our expressed protein as well as enzymatic assays to test for ester hydrolysis activity. So far, our wet lab work has consisted of transformation of cells, expression of our protein, and eventually purification. We have since been able to successful visualize the correct protein size through gel electrophoresis. Our next steps include proposing and carrying out an appropriate reaction to test our hypothesis.

P57. "Proposed Targeted Optimization of Nutritional Intake and Exercise Protocols to Significantly Reduce the Rate of Muscle Atrophy and Bone Mineral Density Loss During Prolonged Exposure to Microgravity."

Student Presenters: Kyla Nygaard, Braden Jackson, Riham Jameel, Charlotte Dove

Mentored by: Dr. Krys Strand

Abstract: Long-duration spaceflight exposes astronauts to microgravity, accelerating skeletal muscle atrophy and bone mineral density (BMD) loss, which threaten mission performance and long-term health. Current countermeasures, primarily resistance exercise and standardized nutrition, mitigate but do not fully prevent these effects. Key gaps remain in optimizing and integrating nutritional strategies and exercise modalities within spacecraft constraints. Hypothesis: Optimized, targeted combinations of nutrition and exercise will significantly reduce muscle atrophy and BMD loss during prolonged microgravity exposure. Proposed Methods: This study synthesizes physiological, nutritional, and aerospace engineering research to identify effective, feasible countermeasures. It will: (1) evaluate nutritional strategies such as protein timing, amino acid supplementation, and optimization of vitamin D and calcium; (2) assess exercise modalities including high-intensity interval training, advanced resistance devices, and vibration-based systems for efficacy and feasibility in spacecraft; (3) analyze engineering and logistical constraints affecting implementation; and (4) propose an integrated, mission-ready protocol. Anticipated Results: The proposed combined strategy is expected to reduce muscle mass loss and BMD decline compared to current International Space Station protocols, improving astronaut health during and after missions. Implications: Findings will support the development of evidence-based nutritional guidelines and exercise regimens that enhance musculoskeletal resilience in microgravity, contributing to safer long-duration missions such as lunar habitation and Mars exploration. By bridging terrestrial biomedical knowledge with spaceflight constraints, this research addresses a critical barrier to sustained human presence in deep space.

P58. “Fungi in Space: Mushroom Cultivation in Extraterrestrial Regolith Simulants for Sustainable Food Systems”

Student Presenters: Rosella Geraci, Jeremiah Stevens, John DeJong

Mentored by: Dr. Krys Strand

Abstract: This study will investigate the feasibility of cultivating nutritionally and cognitively beneficial mushrooms in substrates containing Martian and lunar regolith simulants as a potential component of sustainable food production for long-duration space missions. Although many mushroom species are known for their nutritional value and reported benefits to memory, cognitive function, metabolic health, and gastrointestinal conditions, research examining their growth in extraterrestrial regolith simulants remains limited. This study will test the hypothesis that certain mushroom species can establish mycelial networks and potentially produce fruiting bodies in mixtures of regolith simulant and recycled biological material, contributing to a closed-loop life-support system alongside plant cultivation. Laboratory culturing methods will be used to propagate several types of mushrooms, including Oyster, Lion’s Mane, and Cordyceps. Mycelium will first be cultured on potato dextrose agar plates and then transplanted into experimental substrates composed of regolith simulant combined with varying ratios of recycled organic material. For Cordyceps, the study will also explore the potential of growth facilitated by spent dubia cockroaches as a renewable organic substrate. We anticipate that Oyster and Lion’s Mane mushrooms will demonstrate the ability to expand mycelial networks across multiple substrate ratios due to their adaptability to diverse substrates, whereas Cordyceps growth may be more limited because of its requirement for highly nutritious substrates or a living host to develop fruiting bodies. The results of this study could help inform future research on fungal food systems for terrestrial applications, long-duration spaceflight, and eventual extraterrestrial missions and settlement.

P59. “Identifying Microbial Keystone Species in High-Salinity Soils”

Student Presenters: Carley Motz, Avery Folsom, Ditam Chakraborty

Mentored by: Dr. Samiran Banerjee

Abstract: Microbial keystone taxa are highly connected members of microbial communities that strongly influence microbiome structure and function, regardless of their abundance across space and time. Identifying these key organisms is important for understanding how microbial communities operate and may allow microbiome functions to be guided towards desired outcomes. High-salinity soils, where excessive salt levels prevent crops from growing, present a major challenge for agriculture. This project aimed to identify key microbial community members in these environments and determine which taxa act as keystone species. This study utilized soils from long-term experimental plots maintained at high salinity (10 dS/m) at the Langdon Research and Extension Center, North Dakota. Individual bacterial cells were isolated using the GALT Prospector and identified through Sanger sequencing of the 16S rRNA gene. To investigate community-level interactions, bacterial isolates were combined into synthetic communities and grown in high-salinity liquid media to observe microbial function under salt stress. Previously generated sequencing data from the same soils were analyzed using the SILVA database to provide baseline community composition for comparison with new datasets. Network analysis was used to identify highly connected taxa as potential keystone species. By combining individual isolates with community-level experiments, this study aims to identify microbes that persist in high-salinity soils and may influence soil microbiome function. Anticipated results include the identification of keystone taxa and a better understanding of their role in maintaining microbial community structure and soil resilience under saline conditions.

P60. "Transcriptional Profiling of THP-1-differentiated Macrophages During Spotted Fever Group (SFG) *Rickettsia* Infection"

Student Presenters: Gabriella Castro, Seema Mustafa

Mentored by: Dr. Emerson Towey

Abstract: Spotted Fever Group (SFG) *Rickettsia* are tick-borne, intracellular bacteria transmitted to humans through tick blood-feeding capable of causing acute febrile illness. Certain pathogenic SFG species can invade human macrophages, facilitating systemic dissemination and severe disease. Understanding how these bacteria invade and survive within host cells is critical to elucidating their pathogenic mechanisms. This study compares the growth of *Rickettsia parkeri*, a known human pathogen, to *Rickettsia montanensis*, a typically non-pathogenic species, in THP-1-derived macrophages. Previous studies suggest that *R. montanensis* is unable to survive in these cells; however, recent findings indicate survival at a high multiplicity of infection (MOI 100). If *R. montanensis* can persist in macrophages, it may exploit host cells in a manner similar to pathogenic SFG species. The objective of this study is to characterize the host-cell transcriptional response to rickettsial infection by assessing pro-inflammatory cytokine (PIC) gene expression in THP-1-derived macrophages infected with *R. montanensis* or *R. parkeri*. PIC expression provides insight into macrophage immune activation and the ability to respond to intracellular pathogens. THP-1 cells were differentiated into macrophages using PMA and subsequently infected with either rickettsial species. DNA and RNA were extracted and analyzed using qPCR and RT-qPCR. Based on prior research, both species are expected to sustain growth in macrophages. We hypothesized that macrophages infected with *R. parkeri* and *R. montanensis* will exhibit reduced PIC expression over 24 hours post-infection. Conversely, elevated cytokine expression in *R. montanensis*-infected cells may reflect an enhanced immune response, potentially explaining its limited pathogenicity in humans.

P61. "Determining Alternative Antibiotic Efficiency in SFG *Rickettsia* Infections"

Student Presenters: Seema Mustafa

Mentored by: Dr. Emerson Towey

Abstract: Antibiotic resistance and efficiency are growing global health concerns, especially for diseases with limited treatment options. For spotted fever group (SFG) *Rickettsia* species, doxycycline, a drug with potentially harsh side effects, is the primary treatment. *Rickettsia parkeri* is a tick-borne, intracellular bacterium in the SFG that can cause mild to moderate illness in humans. It is found to be less virulent than *R. rickettsii* (Rocky Mountain spotted fever) and *R. conorii* (Mediterranean spotted fever), allowing it to serve as an optimal model for laboratory studies involving pathogenic SFG rickettsiae. This study uses *R. parkeri* str. Portsmouth as a model to investigate the effectiveness of alternative antibiotics against SFG rickettsiae. *R. parkeri* was cultured in Vero (ATCC CCL-81) cells and bacterial growth was monitored at various time intervals. Samples were analyzed using qPCR to measure bacterial growth over time in this host cell line. The study then compares the effect of two antibiotics on rickettsial growth. First, omadacycline was chosen, because it belongs in the tetracycline drug class like doxycycline. The second drug, erythromycin, a macrolide with intracellular activity, was a promising drug alternative for those allergic to tetracyclines drugs. By using *R. parkeri* as a representative organism, this study aims to provide a foundation in finding treatment options beyond doxycycline and getting ahead of potential antibiotic resistance in often fatal, SFG rickettsial infections. Preliminary results suggest that both antibiotics could be effective replacements for doxycycline in the event of patient allergies or acquired antibiotic resistance within SFG rickettsiae.

P62. “The Expression and Characterization of GMA6_37 and Mbo2_CDS_48 Phage Protein”

Student Presenters: Khoi Pham, Jack Sticha

Mentored by: Dr. Julie Mach

Abstract: The rise of antibiotic resistance in bacteria necessitates the discovery of novel therapeutic agents, such as bacteriophages and their lytic enzymes. Thus, the purpose of this research project is to characterize function of two unknown phage proteins, GMA6_37 and Mbo2_CDS_48, taken from the PhageDB. It is hypothesized that these proteins belong to specific class of hydrolases and their catalytic mechanisms can be identified through a combination of bioinformatics tools and AlphaFold structure modelling. The investigative process involved structural prediction of the targeted protein using AlphaFold Server and BLAST, UniProt, HHpred, PBD and Foldseek databases to identify structural homologs to the predicted structure. The predicted structure is then aligned with its structural homolog using ChimeraX and SPRITE to identify a conversed motif. Preliminary computational results suggest that both GMA6_37 and Mbo2_CDS_48 are likely members of the NlpC/P60 domain family (Peptidase Family C40). This domain family is characterized by the DCS motif sequence where a conserved cysteine residue (C) acts as a nucleophile for hydrolyzing peptidoglycan cross-links, serving an important role in bacterial cell wall homeostasis and division. While structural similarities may suggest that these lytic enzymes utilize the same mechanism for breaching through bacterial cell wall, these findings remain speculative. Therefore, to shed light on the functionality of these proteins, protein purification and enzymatic assays are needed to definitively confirm and enzymatic activity and substrate specificity.

P63. “Mathematical Modeling in Epidemiology: Simulating a Measles Outbreak”

Student Presenter: Luke Brendefur

Mentored by: Dr. Julia Walk

Abstract: Measles is a highly infectious virus that can spread rapidly through a population if left unchecked. Modeling the spread of diseases like measles helps us understand transmission rates in populations and predict future outbreaks. We focused on a 2025 measles outbreak in Texas to create a mathematical model, building on the traditional SIR model by including vaccination status. We developed an SVIR model that tracks susceptible, vaccinated, infected, and recovered individuals throughout the outbreak. Using data from the Texas Department of Health Services, we estimated model parameters in Mathematica and demonstrated how the size of the vaccinated population influences the length of the outbreak.

P64. “Human Activity and Urban Wild Turkey Behavior Patterns: Spatial Analysis and Policy Recommendations”

Student Presenters: John Lawrence, Brennan Steele, Linnea French, Christian Hayden, Ryan Kloster

Mentored by: Dr. Jenn Sweatman

Abstract: This study examines the relationship between human activity and wild turkey (*Meleagris gallopavo*) behavior on and around Concordia College in Moorhead, Minnesota. We used field observations mapped into GIS and student interaction surveys to identify patterns in turkey behavior and movement. Results show that turkeys consistently congregate in open areas with abundant vegetation, areas like the green corridor along the red river and open areas of Concordia’s campus. Throughout the day they will then disperse into the neighborhoods during times of reduced traffic. Survey results indicate that most students on campus have had interactions with the turkeys and have concerns about traffic disruption and cleanliness in regards to their waste. These findings suggest that these turkeys have adapted well to an urban environment. In response to this, we propose a new turkey management strategy involving regulated bow hunting of turkeys within city limits. This is presented as a cost-effective, community driven solution. Overall this research highlights the complex interplay between human society and urban ecology, emphasizing the need for further ecology based policy.

P65. “Relationship Between Richardson’s Ground Squirrel Burrow Condition to Population Size”

Student Presenters: Tierney Stevenson, Caitlin Haasser, Reygan McCanna, Maria Ramstad

Mentored by: Dr. Mike Bush, Dr. Joseph Whittaker

Abstract: Richardson’s ground squirrels (RGS, *Urocitellus richardsonii*) are the largest ground squirrels in northwestern Minnesota prairies and their burrow placement and grooming may have significance regarding population size. Previous research has indicated that ground squirrel burrows are generally placed near visual obstructions. Additionally, the condition of burrows varies over time and use[JW1.1][JW1.2][JW1.3]. Our research sought to determine the significance of burrow attributes and their relationship to population size. We used global navigation satellite system (GNSS) devices to plot burrow location data on ArcGIS[JW2.1] field maps. We collected data about vegetation height, thistle presence, hole diameter, opening direction, and hole condition in three sites around Minnesota with previously estimated population sizes of RGS (Site 1: 23 RGS, Site 2: 21 RGS, and Site 3: 14 RGS). Data for 761 holes was collected from the three sites and JMP was used to determine data significance in comparison to population size. Groomed burrow sites were significantly more abundant in site 1 compared to the other sites indicating a relationship between groomed burrow condition and larger population size. The recently abandoned condition was most common in sites 2 and 3 indicating a relationship between abandoned burrows and smaller population size. Among all three sites, old RGS burrows were least common. We found no significance in hole diameter and opening direction. In future work, data from thistle presence and vegetation height can be analyzed as we’ve noted interesting trends that may be biologically significant.

P66. “Assessing Microplastic Presence in the Gastrointestinal Tracts of Tree and Ground Squirrels (Sciuridae) Across Urban and Rural Environments”

Student Presenters: Eleanor Puzzo, Keelyn Wittenberg, Yuden Dorji, Fatima Mohammed, Favziya Rasulova, Mubina Rasule, Sharon Mac-George Nwabi

Mentored by: Dr. Joseph Whittaker

Abstract: Microplastics (MPs) are becoming a widespread environmental contaminant with growing implications for wildlife health. The ingestion of MPs has been associated with gastrointestinal blockage, internal abrasions, and altered feeding behavior, potentially reducing nutrient acquisition and overall fitness. Small omnivorous rodents such as squirrels regularly interact with both natural and human modified environments and may therefore be particularly susceptible to microplastic exposure. This study builds directly on previous work in this system that first documented microplastic ingestion in terrestrial squirrels. We examined the gastrointestinal tracts of multiple squirrel species including, *Sciurus carolinensis* (eastern gray squirrel) and *Ictidomys tridecemlineatus* (thirteen-lined ground squirrel), collected from both urban and rural environments. Gastrointestinal tracts from salvaged specimens were digested using a 10% potassium hydroxide (KOH) solution to remove organic material. The remaining material was then vacuum filtered, and suspected microplastic particles were visually identified and quantified using a dissecting microscope, allowing for the assessment of particle abundance and size. While preliminary observations confirm the presence of microplastics in all examined samples, the number of specimens analyzed was smaller than originally planned. This limited the ability to make definitive conclusions on the presence or absence of microplastics. Building on previous work, this study focuses on refining sample preparation and filtration procedures to improve microplastic recovery and consistency of detection. Future work aims to expand sampling across a greater diversity of squirrel species, locations, and individuals, which will enable a more comprehensive understanding of patterns of microplastic ingestion across terrestrial habitats and the factors influencing exposure risk.

P67. "Presence of Microplastics in the Guts of *Gryllus pennsylvanicus* Crickets at Concordia College"

Student Presenters: Ashlee Schueller, Megan Greshowak, Gale Klevan Schmitz

Mentored by: Dr. Joseph Whittaker, Dr. D. Bryan Bishop

Abstract: Microplastics have become a growing environmental concern because they can be harmful to humans, animals, and ecosystems, yet there has been limited research on their presence in wild terrestrial insects. Our study aims to explore the presence of microplastics in the guts of *Gryllus pennsylvanicus* (the fall field cricket) at Concordia College campus in Moorhead, Minnesota. Crickets were wild caught and frozen until dissection. They were thawed and then weighed, measured for length and sex determined. The gastrointestinal tract was then removed and placed in a 10% KOH solution for 162 hours, then filtered and examined under a dissecting microscope to determine the presence of microplastics. Fibers were identified as microplastics through the hot needle test. Our results showed a significant presence of microplastics in the guts of *Gryllus pennsylvanicus* crickets found on Concordia College campus. Further research into identification of microplastics and/or detecting nanoplastics is recommended.

P68. “Prevalence and Polymer Composition of Microplastics in the Prairie Pothole Region of North Dakota”

Student Presenters: Rowan Lindholm, Ella Shinn

Mentored by: Dr. Jenn Sweatman Dr. Graeme R.A. Wyllie

Abstract: Concern about microplastic (plastic fragments and fibers <5mm) pollution has grown in recent years due to its large unknown impacts on the environment. This study investigates the prevalence and composition of microplastics in the Prairie Pothole Region of North Dakota. Three water samples were collected in three different potholes within each of four Wildlife Management Areas (WMAs), resulting in a total of 36 samples. Samples were filtered alongside a control to account for contamination. Suspected microplastics were identified using a dissecting microscope, and polymer composition was identified using infrared (IR) spectroscopy. A total of 173 suspected microplastics were observed, with 136 particles viable for IR spectroscopy. Overall, microplastics comprised 95.6% of the 136 analyzed particles. The majority of the identified microplastics (91.5%) are suspected to be aged polyethylene (PE) due to exposure to UV light and an oxidative environment. Additional polymers were detected, including polyethylene terephthalate (PETE), ethylene-vinyl acetate (EVA), polymethyl methacrylate (PMMA), and nylon. Black was the most common particle color (42.2%), followed by blue and red. Microplastics were detected in every pothole that was sampled, with Knox Slough WMA in Benson County, ND, having the highest microplastic abundance. The majority of the polymers identified are used in very common, single-use products that are prevalent pollutants in the environment. Identifying the sources of these microplastics can support management and mitigation efforts aimed at reducing the use of single-use plastics and limiting further contamination of prairie wetland ecosystems.

P69. “Bilingual Salience Priming, Gender, and Theory of Mind”

Student Presenters: Derek Dorsey, Hazel Bring

Mentored by: Dr. Rowena Xia

Abstract: The aim of this study was to further examine the impact of priming bilingual salience, specifically whether it would prompt stronger Theory of Mind (ToM). Six hundred seventy-three (673) bilingual participants were recruited via Prolific. Participants were randomly assigned to write about their bilingual identity or a hobby (control condition). ToM was assessed via the Director Task, a computerized perspective-taking game, and the Independent Reactivity Index scale (IRI), which included 28 questions assessing perspective-taking and empathetic concern. Bilingual background data was collected via the Language and Social Background Questionnaire (LSBQ). Bilingual salience priming was found to be effective given the significant difference found via the manipulation check questions. No significant findings were found for IRI scores or Director Task results based on the different conditions. A secondary analysis assessed the role of gender and its interaction with bilingualism. Based on LSBQ composite factor scores (cfs) and Director Task scores, bilingual men showed improved Director Tasks scores. For LSBQ cfs and IRI scores, the difference between LSBQ-categorized monolinguals and bilinguals was gender-dependent, with bilingual men having better empathetic concern than monolingual men, a pattern not found with the participants that were women.

P70-73. “FRENCH 112: How Work-Based Learning Impacts Career Readiness”

Student Presenters:

P70. Mia Donner, Abigail Guttormson, Dante Novembre, Layne Polen

P71. Emma Swanson, Caden Larson, Aidan O'Shea, Trinity Kirschenmann

P72. Eliza McIntyre, Hank Bell, Lauren Diers, Andrew Annette

P73. Harper Wilson, Merissa Witte, Kinan Khatib, Katie Storbakken

Mentored by: Dr. Rachel Dwyer

Abstract: FREN 112 is part of a national grant investigating work-based learning and how a beginning French class can address the NACE Competencies, including communication, critical thinking, equity and inclusion, leadership, professionalism, and teamwork, and technology. Employers have identified a number of skills, knowledge, and attitudes that they need new employees to demonstrate and that are often lacking. We wanted to explore if those skills could be developed in a beginning French class through work-based learning. Students in FREN 112 were partnered with Neurolabs conducting market research and product testing throughout the semester. We want to understand how this partnership in FREN 112 helps with career readiness for any major. Students will display and discuss their posters showing elements of their portfolios and preliminary reflections on each of the aforementioned areas.

P74. “Oracle Chamber Music Festival: How a Non-Profit Music Organization Builds Intergenerational, Intercultural, and Interdisciplinary Community While Providing Barrier-Free Music Education”

Student Presenters: Phia Revoir, Caroline Becker, Brady Burss, Taj Baang

Mentored by: Dr. Eduard Teregulov

Abstract: Four Concordia Orchestra students—Taj Baang, Caroline Becker, Brady Burss, and Phia Revoir—attended the Oracle Piano Society’s annual Chamber Music Festival. Students participating in the festival lived in community for a week at El Rancho Robles, guided by local community leaders and professional musicians. Beyond cultivating a high level of musical excellence, the format of the festival, faculty mentors, and student participants encourage long-lasting interdisciplinary and intercultural relationships. At the festival, students get the opportunity to learn from community leaders the power music has to bring people from all walks of life together. Students also gain a clear understanding of the importance of barrier-free music education in underserved communities. This presentation will create space for students who attended to share their stories of how this experience has both inspired and impacted their lives.

P75. “Non-Profit Grant Writing: A Creative and Collaborative Internship Experience”

Student Presenter: Phia Revoir

Mentored by: Dr. Leila Zakhirova, Stephanie Carpenter

Abstract: Grant writing is a powerful and highly sought after skill within institutions and organizations. During the spring semester of 2025, I worked in collaboration with Wilderness Canoe Base (WCB) a non-profit camp located on the edge of Minnesota's Boundary Waters Canoe Area. This experience introduced me to important skills such as grant-seeking and grant-writing. Under mentorship from leaders at WCB as well as grant-writing experts from St. Scholastica and Concordia College, I learned to view grant-seeking and grant-writing less from a institutional, technical field. This presentation explores my transition from viewing grant-seeking as a rigid administrative task to a persuasive, creative act of problem-solving accessible to anyone.

P76. “Generative Artificial Intelligence’s Impact on Uniqueness in Writing”

Student Presenter: Megan Noggle

Mentored by: Dr. Aileen Buslig

Abstract: This study focuses on how the use of generative artificial intelligence (Gen-AI) may impact users’ writing capabilities. Previous studies have found a comparative depletion in brain activity when using Gen-AI to write essays (Kosmyna et al., 2025), and that a dependence on Gen-AI can lead to the skills it is being relied on for ultimately being unlearned by the user (Budzyń et al., 2025). The purpose of this study is to identify whether these impacts extend to users’ unique writing styles following the immediate use of Gen-AI for creative writing. Participants will write a series of short stories, averaging around 500 words, first on their own, then with the assistance of Gen-AI, and immediately following interactions with Gen-AI. The first and third stories will then be compared to measure changes and categorized by their most prominent elements into distinct writing style categories. It is anticipated that the writing following Gen-AI interaction will be more stylistically similar to Gen-AI writing than writing conducted without any Gen-AI interaction.

P77. “Promageddon: The Dismantling of Prom Culture”

Student Presenter: Liv Wojahn

Mentored by: Dr. Darren Valenta, Dominic Meyers

Abstract: This research examines the culture of high school prom in the United States, focusing on the social, economic, and historical factors that shape the event and contribute to persistent inequality. Prom, a long-standing tradition, continues to exert significant influence on adolescents and their families. Modern prom culture reinforces rigid gender norms, including expectations surrounding attire and appearance standards that impose substantial financial burdens on families. The research utilizes a cultural interpretive analysis that considers prom’s historical roots, current applications, and alternatives for future inclusive cultural development. Results uncover emerging counter-cultural alternatives aimed at fostering inclusivity and reducing financial burdens, including anti-prom events (MORP) and community-based prom closets that provide free formalwear. These results suggest that these alternative practices demonstrate promising pathways for reducing barriers and promoting more inclusive prom experiences.

P78. "'Is he...you know... 🍆?': Sexuality- and Gender-Based Emoji Dialects"

Student Presenter: Jordon Perkins

Mentored by: Dr. Aileen Buslig

Abstract: With the expansion of emoji keyboards to include same-sex couples and three gender options, LGBTQ+ people have additional opportunities to express themselves in ways that are explicitly Queer. Though LGBTQ+ people have been noted as speaking differently from their cisgender and heterosexual (cishet) peers since the 1940s (Calder, 2021), researchers have failed to adequately research LGBTQ+ speech patterns online as emoji evolve, and studies on gendered emoji use continue to exclude individuals that live outside of the binary. Through surveying, this study aims to understand how LGBTQ+ people use emoji in their online vocabularies and which emoji are distinctly used by LGBTQ+ people, cishet people, and those of different gender groups. Distinct emoji are emoji used often by one group and rarely by others. Additionally, participants will be surveyed on whether their gender-specified emoji usage (for example 🙅‍♀️, 🙅‍♂️, or 🙅) aligns with their gender identity. I predict that LGBTQ+ people will show more varied emoji usage across different emoji categories when compared to cishet people, there will be distinct emoji found for each group surveyed, and that most participants will use gender-specified emoji that align with their gender identity. These findings will help researchers better understand the nuances of digital LGBTQ+ communication and more adequately represent the ways different people groups use emoji in their everyday lives.

Poster Session 2 | 3:55 – 5:15 p.m.

Knutson Campus Center Atrium

P79. “Training Neural Networks to Identify Phase Transtions”

Student Presenters: Logan Olson, Levi Patton

Mentored by: Dr. Luiz Manzoni

Abstract: We used neural networks to study the behavior of the two-dimensional Ising model near the critical point. The two-dimensional Ising model, which simulates collective behavior in magnetic materials, consists of a square lattice with $L \times L$ spins, each constrained to a spin-up or spin-down state. Using a Monte Carlo method, we simulated thermal fluctuations across a range of temperatures and obtained final spin configurations once the system reached thermal equilibrium. These configurations served as input for a dense feedforward neural network, which was trained to recognize structural patterns associated with different temperatures and to classify unlabeled configurations as ordered or disordered. Additionally, a convolutional neural network was trained to predict the temperature of an Ising system from its microscopic configurations. This work illustrates that even simple neural networks can effectively learn phase transition behavior from raw microscopic data; further work will focus on optimizing accuracy

P80. “Synchronized Multimodal Retrival Augumentation Generation (RAG) Pipeline for Process Video Data.”

Student Presenter: Temiloluwa Afolabi

Mentored by: Damian Lampl

Abstract: This research presents a software application designed to simulate artificial intelligence video monitoring focused on a synchronized multimodal Retrieval-Augmented Generation (RAG) pipeline. The system integrates open-source Large Language Models (LLMs), Vision-Language Models (VLMs), Speech-to-Text (STT), and object detection algorithms to process and interpret raw video data. The architecture extracts timed audio transcriptions and frame-level visual features, to a JSON (JavaScript object notation) schema which is then inserted into a database, after which vector embeddings are generated for both the extracted JSON schema and user queries to facilitate precise information retrieval. The study evaluates various open-source model pairings to find the best way to help a computer accurately "understand" and reduce retrieval errors from information coming from different models. The experimental results demonstrate that the integrated pipeline effectively enables autonomous video comprehension, providing accurate natural language responses with specific temporal and frame-level answers.

P81. “Impacts of Barley on the Survivability of Minnows”

Student Presenter: Al Sterling

Mentored by: Dr. Mike Bush

Abstract: Anthropogenic development has been associated with an overwhelming increase in nutrients in many of our nation’s water systems, leading to eutrophication and excess cyanobacterial growth. Cyanobacterial blooms are a recurring problem in freshwater environments that degrade water quality and produce harmful cyanotoxins. These cyanotoxins are harmful to the nervous system, liver, kidneys, and internal irritant, resulting in the need for finding methods for safely controlling cyanobacteria growth. Recently, the use of barley-derived materials that release algal-inhibiting compounds during decomposition has gained attention as a non-chemical way to control cyanobacteria blooms. However, its interaction with ichthyofauna is not well understood. Over a two-week period, four tanks of fathead minnows were exposed to environments with varying amounts of barley contained in mesh bags in the tanks. The fish were counted and each tank assessed daily for those two weeks, noting water clarity and level of barley growth. Observations of the patterns of mortality rates, overall physical appearance, and behavioral changes of the fish indicated minimal mortality due to the explicit presence of barley but indicated elevated levels of mortality associated with poor oxygenation of the water due to higher concentrations of barley in the water. The result of this study suggests that barley-based treatments may provide a more natural, non-chemical, method for mitigating cyanobacterial growth while emphasizing the importance of more thorough evaluation of ecological impacts on non-target aquatic species before broader and larger scale application in our water systems.

P82. “Using EthoVision Deep Learning to Measure the Effect of Vivaldi Music Enrichment on Zebrafish Behavior”

Student Presenters: Annika Griffith, Cayley Borrud, Anusheh Shreonty, Riham Jameel Setiya Hamidi

Mentored by: Dr. Krys Strand, Harshana De Silva Feelixge

Abstract: We used the recently added deep learning feature in the behavior tracking software EthoVision 17 (Noldus) to evaluate the effects of Vivaldi music on adult male and female wildtype zebrafish during the novel tank and novel object recognition tests. Zebrafish were housed in shoals in glass tanks and standard water and lighting conditions. Subjects were transferred to smaller temporary containers the morning of individual testing in each apparatus. Half of the 90 fish in our study were tested without music enrichment in the morning followed by repeated testing with music enrichment in the afternoon. The reverse schedule was used for the second cohort on alternating days. Selections from Vivaldi’s The Four Seasons in major keys were delivered centrally below each testing tank using piezo speakers controlled by a computer. We will share results of our analysis using a generalized linear mixed model approach. Preliminary analysis shows that music enrichment did not affect overall movement of the fish during behavior testing but did have an effect on object recognition outcomes in the novel object recognition test.

P83. “Under Construction: Exotic Animals and Enclosures”

Student Presenter: Fenley Grumann

Mentored by: Dr. Krys Strand

Abstract: This presentation examines the ongoing modifications made to animal enclosures maintained by the Exotic Animal Care and Husbandry (EACH) club, with a focus on improving animal welfare through bettering environmental enrichment and standards. Continuous efforts are being made to enhance living conditions by adjusting enclosure size, structure, and internal features to better meet species-specific needs. The purpose of this work is to inform about the benefits of sustained development and refinement of care guidelines, particularly those related to enclosure design, while also acknowledging the practical constraints of operating within pre-existing structures and limited financial resources. Research methods included the application of care standards from AZA-accredited institutions and other professionals, systematic monitoring of animal behavior, and insights gained from direct experience working with exotic species. Observed outcomes of these interventions indicate positive behavioral changes, including reductions in stress-related behaviors (glass surfing), as well as improvements in appetite and physical activity. Overall, this presentation aims to foster greater interest in advancing animal care practices and to provide a clearer understanding of the necessity and impact of frequent enclosure modifications in managed animal care settings such as in the Integrated Science Center.

P84. “AI Chatbots in Second-Language Learning: A Comparative Study of ChatGPT and Copilot for Advanced Spanish Practice”

Student Presenter: McKenna Monger

Mentored by: Dr. Lisa Twomey

Abstract: This study investigates the use of popular artificial intelligence “chatbots” as a language learning tool for advanced Spanish speakers with a native English-speaking background. Specifically, the study assesses two language skills during tutoring sessions: grammatical accuracy and speech fluency. It was hypothesized that weekly tutoring with an AI chatbot would improve fluency and proficiency in the verbal expression of a second language. This hypothesis was assessed through a five-week comparative case study involving tutoring with ChatGPT and Microsoft Copilot verbal chatbots. Each week, the language learner engaged in fifteen-minute spoken conversations with each of the respective chatbots on a variety of topics. Results were analyzed using quantitative Likert-scale measures and qualitative reflections from both the learner and the chatbot. It is expected that Likert-scale ratings of fluency from both the learner and the chatbots will increase over time, indicating improved language expression. Additionally, the number of flagged grammatical errors is expected to decrease throughout the study. It is also expected that communication with chatbots will not significantly impact cultural competency related to the Spanish-speaking world, as technology has an incomplete understanding of culture, an inherently human concept. This aspect will be assessed qualitatively through the participants’ reflections on each conversation as a supplemental portion of this study.

P85. “How AI Impacts Everyday Life in Different Countries”

Student Presenter: Claire Campbell

Mentored by: Dr. Lisa Twomey

Abstract: My focus of study is learning how artificial intelligence impacts daily life in different parts of the world. I especially want to learn how it has impacted Spanish-speaking countries. I want to know how different people use AI in different parts of the world. I think AI has a great impact on daily life. I believe it is very different in different parts of the world. I will use different evidence that I find on the internet. I will also possibly go to the library for different people's opinions. I also want to use different books to learn more about this topic. I am anticipating that AI is not commonly used in different parts of the world as much as it is here.

P86. “Learning about Spanish Speaking cultures using AI”

Student Presenter: Aaron Staryszak

Mentored by: Dr. Lisa Twomey

Abstract: In my presentation I plan on presenting about AI's ability to understand and explain aspects of different cultures. This topic is significant with the expanding usage of AI today and possible biases and stereotypes against or for certain groups in our diverse world. AI is trained on people and can give out false information which can be dangerous. My hypothesis is that AI will have a general, but poor understanding of other countries' cultures and use many stereotypes and make assumptions. The purpose of my project is to compare AI's understanding of culture to actual people's understanding of their culture. I will speak with native Spanish speakers and ask a variety about their important aspects of their culture, and what their culture means to them as well as other general questions and follow-up questions. I will then ask the same list of questions to different AI bots such as Copilot and ChatGPT and ask for the AI's reasoning behind their response. Finally, I will compare all the responses and look for patterns in the AI's responses. My anticipated results are that my hypothesis will be correct and that the AI's responses will be very different from the real responses and AI will likely use many stereotypes when answering the questions.

P87. “Build-Your-Own Language Tutor: How to Design Effective Prompts and Structure Sessions in ChatGPT Voice Mode for Spoken Spanish Practice”

Student Presenter: Oliver Fluegel-Murray

Mentored by: Dr. Lisa Twomey

Abstract: Increasing accessibility of artificial intelligence (AI) in education has led to questions of its utility shifting away from whether it can be useful at all, toward how, and under what conditions, it can be used pedagogically. This project examines ChatGPT voice mode as a tutor for spoken Spanish, focusing on how prompt design, session structure, and feedback style shape the tutoring experience. The project investigates how different forms of pedagogical setup may influence conversation flow, grammatical feedback, speaking confidence, and overall usability. Using an iterative learner case study, this project analyzes a series of voice-mode Spanish tutoring sessions conducted over time, along with planning notes, chat logs, and reflective journal entries. Taking a process-oriented approach, it traces how different revisions to prompt design and session organization affected conversation flow, speaking confidence, and grammatical correction. It also incorporates outside literature on AI, education, and language learning. It concludes with a set of findings for AI-assisted independent language-learning, with implications for students and foreign- or second-language teachers, offering recommendations for more effectively structuring AI voice tutoring. The result is a clearer understanding of where such tools appear helpful, where they remain limited or unreliable, and what kinds of user guidance they require.

P88. “Growing Energy, Growing Communities: Ethanol in Peru”

Student Presenter: Lydia Fynboh

Mentored by: Karin Hillstrom

Abstract: Growing up on a farm in rural Minnesota, corn production shaped the landscape and the local economy. As I learned more about agriculture and renewable energy, I began to see how crops can influence both the environment and community development through biofuel production. This study proposes the expansion of my local ethanol plant, Chippewa Valley Ethanol Company (CVEC), to the La Libertad region in northwestern Peru. This collaboration fuses CVEC’s cooperative business model and values—a democratic, member-owned enterprise that prioritizes community well-being—with Peru’s deep agricultural traditions and strong community-oriented culture. By focusing on regenerative farming and economic stewardship, the expansion aims to support rural farmers, strengthen local economies, and promote environmentally sustainable practices. Qualitative research evaluated CVEC’s cooperative structure and its historical success. The feasibility of expanding the company to Peru was investigated by analyzing national and regional factors, including Peru’s government-mandated ethanol blending requirements, business culture, land use considerations, and broader social, political, and economical conditions. These findings were considered alongside regional agricultural practices—particularly sugarcane production in the La Libertad region. Based on similarities between Latin American business culture and the practices, values, and goals of CVEC, the preliminary findings of this project suggest that Peru’s agricultural capacity, renewable energy goals, and cultural emphasis on farming communities support potential for the expansion of CVEC. This proposal demonstrates what the future of agriculture, environmental sustainability, and community development could look like if cooperative models, like CVEC, expand and integrate into new cultures and communities.

P89. “Does AI-Based Tutoring Reduce Foreign Language Anxiety While Improving Grammar Acquisition?”

Student Presenters: Serena Middendorf, Kiara Wakefield, Aneli Zavala, Franco Isis Nunez-Martinez

Mentored by: Dr. Lisa Twomey

Abstract: Foreign language anxiety is a barrier for many students when communicating in a second language. With the increasing development of artificial intelligence (AI), it is important to evaluate whether this technology could improve language education. In this ongoing research, we use AI tutoring to investigate its effect on foreign language anxiety. We expect AI tutoring to reduce foreign language anxiety and, in turn, reduce grammatical errors by providing students a low-pressure environment while giving individualized feedback on sentence structure, verb conjugation, word choice, etc. We hypothesize that a decrease in anxiety will correlate with improved grammatical accuracy and overall linguistic outcomes. To conduct our study, we gave the SPAN 380 class a survey about their experience with AI tutoring, and if they feel that speaking with AI lowers their foreign language anxiety, consequently improving their ability to communicate in real-life Spanish contexts. Additionally, we have collected data on grammatical proficiency by tracking total words spoken, number of errors, and types of errors per conversation. Thus far, we have seen minor improvements in grammatical errors. At the end of our research, we anticipate finding an inverse relationship between anxiety and grammar performance through the use of AI. We hope our research will help others understand the impact of AI and how it can be responsibly integrated into learning environments.

P90. “Social Activity Effects on Cognitive Decline in Older Adults”

Student Presenters: Tyra Skjeret, Taylyn Cope, Lila Lanctot

Mentored by: Dr. Philip Lemaster

Abstract: Cognitive decline is a common challenge associated with aging and can significantly affect memory, decision-making, and overall quality of life. As populations continue to age worldwide, identifying factors that may help slow or prevent cognitive decline has become an important area of research. One factor that has received increasing attention is social activity and social connectedness among older adults. Research suggests that individuals who maintain stronger social engagement tend to experience slower cognitive decline and a lower risk of developing conditions such as mild cognitive impairment and dementia. In contrast, social isolation and loneliness have been linked to poorer cognitive outcomes and reduced mental wellbeing. This presentation reviews recent research examining the relationship between social activity and cognitive health in aging populations. First, we will describe the biological and psychological processes involved in cognitive decline and explain how aging affects brain structures related to memory and learning. Next, we examine evidence showing how social participation, including regular interaction with others and involvement in group activities, may help delay or reduce cognitive decline. We also discuss barriers that prevent some older adults from remaining socially engaged, such as limited opportunities, mobility challenges, or lack of companionship. Finally, we highlight potential strategies and interventions that may help increase social engagement among older adults in order to support cognitive health and overall wellbeing.

P91. “How does Intentional Human Connection Affect the Life Satisfaction and Health of Older Adults?”

Student Presenters: Eli Hunt, Daniel Skrade, Serenity Martinez

Mentored by: Dr. Philip Lemaster

Abstract: Humans are social creatures and require an active social life. In our older years, it becomes harder to create and maintain our relationships, but research shows it is important to intentionally seek out social connections. In fact, it may be one of the most important parts to aging successfully, as isolation is associated with higher risk of depression, anxiety, chronic illness, and early death (Newman et al., 2020). Additionally, those who report more social interaction also report being more satisfied with their lives than those who do not (Kim et al., 2024). It is not only how much social interaction we get but also the quality of our interactions. Throughout our poster, we will discuss how participating in social activity affects our health and well-being. Next, we will discuss how the different types of relationships, familial and friendships, and the quality of those relationships, plays an effect on life satisfaction as well as how religiosity plays a role in life satisfaction. Finally, we will give suggestions on how to improve social connections.

P92. “Dietary Intake of Polyphenols, Antioxidant Vitamins, and Cognitive Performance in Aging Adults with Overweight or Obesity”

Student Presenters: Naima Sharif, Emily Rengo

Mentored by: Dr. Betsy Cogan

Abstract: Polyphenols and antioxidant vitamins have been investigated for their neuroprotective properties; however, connections between dietary antioxidant vitamin and polyphenol intake determined by Automated Self-Administered Dietary Assessment Tool (ASA24) and cognitive performance assessed using Montreal Cognitive Assessment (MoCA) are unknown. We aimed to examine the associations between diet, health, and cognitive performance in older adults with obesity. In this study, older adults (n=15; age=60±5y; BMI=29±2 kg/m^2) with overweight or obesity completed a 3-day food record using ASA24. Dietary polyphenol content was calculated using the Phenol-Explorer database. Anthropometrics, fasting blood glucose, and lipids were collected, and cognitive performance was assessed using MoCA. Participants, on average, consumed 3,093±2,287mg of polyphenols, 1,400±1,049µg of Vitamin A, and 1,250±969IU of Vitamin D. Greater vitamin A intake was positively associated with diabetes risk, metabolic syndrome pathology, and Framingham Risk Score (p<0.05 for all). Additionally, higher vitamin A intake is associated with greater vascular age (r=0.56, p =0.04). For cognitive outcomes, greater vitamin D intake was associated with higher overall MoCA scores, while greater vitamin E intake was associated with better performance on memory tasks (r=0.59, p=0.03). Notably, higher polyphenol intake was associated with poorer performance on the verbal fluency task (r=-0.64, p = 0.01). Our findings suggest that dietary intake of antioxidants and polyphenols have differing cardiometabolic and cognitive effects in aging adults. Larger studies are needed to clarify the relationship between dietary antioxidants, polyphenols, and cognition in aging populations.

P93. “Challenging Assumptions: Pharmacokinetics and Pharmacodynamics Responses in Sedation and Analgesia for Patients with Down Syndrome”

Student Presenter: Alyssa Larson

Mentored by: Dr. Jennifer DeJong

Abstract: Individuals with Down syndrome frequently undergo surgical and diagnostic procedures requiring anesthesia and sedation; however, longstanding clinical assumptions suggest they require altered analgesic or sedative dosing due to perceived differences in metabolism and pain response. These assumptions may contribute to inconsistent medication management and potential bias in perioperative care. The purpose of this project was to examine current evidence regarding pharmacokinetic and pharmacodynamic responses to anesthetic, opioid, and sedative medications in pediatric and adult patients with Down syndrome and to evaluate whether modified dosing practices are supported by research. A literature review was conducted using peer-reviewed clinical studies, systematic reviews, case studies, and pharmacologic analyses focusing on anesthesia management, opioid and benzodiazepine use, and perioperative outcomes in individuals with Down syndrome. Sources were analyzed for trends in medication metabolism, sedation effectiveness, safety outcomes, and postoperative recovery. Findings consistently demonstrated that, despite known physiologic and metabolic differences associated with trisomy 21, patients with Down syndrome generally exhibited comparable opioid and sedative requirements compared to individuals without Down syndrome. Multiple pharmacokinetic studies found no clinically significant differences in morphine or midazolam or dosing needs, suggesting that previously perceived differences may stem from challenges in pain assessment, comorbidities, or provider bias, rather than true drug metabolism alterations. Evidence supports individualized assessment rather than routine dose adjustments. This project highlights the importance of evidence-based perioperative nursing and anesthesia care, emphasizing accurate pain assessment, awareness of multisystem comorbidities, and avoidance of unsupported assumptions to promote safe, equitable medication management for patients with Down syndrome.

P94. “DPAL: A National Collaboration for Pharmaceutical Analysis”

Student Presenter: Carter Weiser

Mentored by: Dr. Graeme R.A. Wyllie

Abstract: Forgery of pharmaceuticals in low-middle income countries (LMICs) is a large-scale issue. Patients in these countries often cannot be certain whether the drugs they receive are high quality or if they are even the correct product. DPAL, the Distributed Pharmaceutical Analysis Lab, is a project developed by Marya Lieberman and her team at the University of Notre Dame in Indiana. Pharmaceutical samples from LMICs are distributed to other laboratories throughout the country for product analysis. The goal of the project is to determine whether the samples received contain the correct amount of active ingredient(s) and if they contain significant contaminants. Knowing the actual composition of the pharmaceuticals allows for much safer and effective patient treatment by assisting the agencies responsible for distributing the pharmaceuticals in identifying sources of contamination. Ampicillin is a well-known antibiotic used worldwide. My work at Concordia has focused on using the general chemistry lab HPLC (High-Performance Liquid Chromatography) machine for the analysis of ampicillin samples. The methodology used has been brought to the standards set by the DPAL methodology manual. This involves establishing linearity, precision, accuracy, range, and spike recovery. We have created, optimized, and calibrated methods for the HPLC based on the requirements in the manual to be used for analysis of ampicillin. Once the correct data forms have been filled out, we will have then sent them back to Notre Dame for approval. This allows for authentic unknown samples to be received from the university and analyzed.

P95. “Supporting Healing to Reduce Recidivism Among Justice-Involved Girls”

Student Presenters: Annika Johnson, Ella Hess, Jordan Jensen

Mentored by: Dr. Michelle Lelwica

Abstract: Recidivism among justice-involved girls is often closely linked to histories of trauma, particularly sexual abuse, interpersonal violence, and exposure to other forms of violence. Research shows that girls in the juvenile justice system experience gender-based trauma at disproportionately higher rates compared to boys. However, institutional responses within the juvenile justice system do not always adequately address these underlying experiences of trauma due to gender-based violence. When trauma remains untreated, justice-involved girls face an increased risk of continued harm and repeated system involvement. This project will draw on interdisciplinary scholarly research examining trauma histories among justice-involved girls, particularly those involving sexual and gender-based violence. It will also engage feminist analyses of historical religious and cultural attitudes toward female sexuality and power, including the influence of Christian teachings. In addition, the project will review research on juvenile recidivism and best practices for trauma-informed care to identify approaches that better support girls in the juvenile justice system. This project examines the factors that contribute to recidivism, particularly those due to gender-based and sexual violence. Additionally, it assesses how Christianity’s teachings about sin, power, and gender roles have historically shaped cultural attitudes towards sexual violence. By exploring how societal attitudes towards gender and sexual violence intersect with girls’ trauma histories, this project highlights the importance of trauma-informed care within the juvenile justice system. Implementing trauma-informed approaches that acknowledge the unique experiences of girls in the juvenile system may help reduce recidivism and create more supportive pathways towards healing and rehabilitation.

P96. “Trauma and Transmission: How Sexual Assault Influences Adolescent Offending Patterns”

Student Presenters: Eric Cockhill, Spencer Schumacher, Owen Hoover

Mentored by: Dr. Michelle Lelwica

Abstract: There has been an overwhelming mass incarceration in the United States dating back to the 1970s. Within this mass incarceration are juveniles who are being sentenced to detention facilities across the countries. What most people do not realize is that most of these kids are not here for committing crimes. Most of these kids are in here for technical violations of probations, or addiction. However, what led these kids to be sentenced to juvenile detention is a different story. The results show that there is an undeniable link between the trauma that young kids have received in their childhood lives that leads them to committing small crimes or growing an addiction. The goal of the project we want to display is to bring awareness to people who either think that these young kids deserve to be locked up or people who just do not understand at all what is going on in these children's lives.