UNDERGRADUATE RESEARCH AND INQUIRY ACROSS THE DISCIPLINES

POSTER PRESENTATION ABSTRACT BOOK

APRIL 18TH, 2026

Table of Contents

Individual Poster Presentations

Anderson, Ross

University of Wyoming (UW)
SURE program, School of Computing

Spending and Human Mobility during the 2022 Yellowstone Flood

In 2022, floods devastate the Yellowstone National Park region, destroying multiple roads, requiring park services to evacuate visitors. This natural disaster deprived surrounding towns for the rest of the year, due to loss of tourism income. The purpose of this project was to analyze this time period and see how park visitors and business owners reacted to events during the summer. We analyzed data from credit card spending at multiple POIs (Places of Interest), as well as cell phone tracking throughout the region to determine where individuals were during the event and what they were buying. Using this data, we created some helpful insights into how people think during a natural disaster and what could be done to help businesses and visitors be more prepared for the future.

Barrus, Cutter

University of Wyoming (UW)
INBRE, Wyoming Research Scholars Program

Individual Xenopus tadpoles display distinct and enduring visual preferences

How neurons self-assemble into circuits that give rise to behaviors is a fundamental question in neuroscience. We address this question in the visual system of the Xenopus tadpole, a powerful developmental model to study how circuits form and function. Tadpoles begin displaying several visually guided behaviors by developmental stage 48 – just 10 days postfertilization. These behaviors include an innate preference for green over light, and light over dark. Until now, these visual preferences have been characterized by studying groups of tadpoles and reporting the group average. The reported average, however, does not necessarily reflect the behavior of individuals. To address this, we are studying the visual preferences displayed by individual tadpoles. Thus far, our data show that individual tadpoles display varied behavior relative to one another: some tadpoles display a strong preference for light over dark while others prefer dark over light; some display a strong preference for green over light while others prefer light over green. Also, individual preferences were found to be relatively consistent over time. These findings indicate that the group average does not reflect what individuals are doing, which gives rise to the intriguing notion that tadpoles from the same clutch have distinct personalities. We hypothesize, based on our previous work, that individual behaviors are manifested through different levels of endogenous serotonin. To test this, we are experimentally decreasing and increasing serotonin transmission to examine how it affects individual preferences.

Barth, Austin

University of Wyoming (UW)
Wyoming Research Scholars Program, SURE program, School Of Computing

Testing Long-Term Memory of Territorial Neighbors in Chestnut-Backed Antbirds (Poliocrania exsul)

A common pattern among long-lived territorial bird species is that they respond with less aggression towards familiar territorial neighbors compared to strangers (the "dear enemy" effect). Previous research has established the dear enemy effect in many species; however, it remains unclear whether this neighbor-stranger discrimination is based on cumulative past interactions (memory) or recent, within-season territorial encounters. Some species may maintain long-term memory of previous neighbors after territories have changed. We examined if Poliocrania exsul maintains acoustic memory of previous territorial neighbors. Working in central Panama with a long-term banded population, we conducted a field playback experiment to test if territorial songs of previous neighbors (dead at least one year) were perceived as equally threatening as current neighbors, comparing these to stranger song playbacks. We predicted that this species would exhibit neighbor–stranger discrimination, showing the least aggression shown towards neighbors and most aggression shown towards strangers. Furthermore, we predicted that, if capacity for long-term memory for neighbors is present, we should see an intermediate response towards previous neighbors (higher than responses to stranger intrusion). We tested these predictions and estimated the causal impact of these treatments using a novel time-order Structural Causal Model that accounted for patterns of joint territorial defense (distance from speaker, songs, and calls) by territorial males and females. This work is the first known test of memory related to neighbor-stranger discrimination in any bird species and has implications for the understanding of long-term persistence of population structure.

Blakely, Harrison Edward

University of Wyoming (UW)

Analysis, tone, and power: The influence of differential verdict procedures on jury deliberations

Legal scholars have debated the costs and benefits of different verdict procedures. Despite this legal interest in different verdict procedures, little research has examined the impact of verdict procedure on jury deliberation. The current research tested whether a reasoning requirement changes the content of deliberation and whether those changes differ based on plaintiff ethnicity. Our research question seeks to answer whether deliberation differs based on general or reasoned verdict procedures. With this, does the deliberation style depend on plaintiff ethnicity? Participants listened to a recording of a mock trial involving defamation. During the trial, we manipulated the plaintiff's ethnicity. Then, they deliberated with other jurors using either a general or reasoned verdict procedure. We transcribed the recordings and examined the number of words spoken and the content of the deliberations. Verdict procedure fundamentally changes the content of the deliberation. Participants use fewer words overall, less positive language, and more charged language in the reasoned verdict condition than in the general verdict condition. These changes in deliberation content are more extreme when the plaintiff is White (versus Latinx).

Bolden, Sydney

University of Wyoming (UW)
Wyoming Research Scholars Program

Probing the Dielectric Enigma of Candidate Polar Metals

The quest to find materials that combine seemingly incompatible properties represents a central challenge in modern condensed matter physics. My research focuses on one of the most intriguing puzzles: the search for "polar metals," materials that simultaneously exhibit polar, ferroelectric behavior and robust metallic conductivity. Conventionally, these states are considered mutually exclusive because free electrons in a metal should screen any internal polarizing fields that drive ferroelectricity. However, discoveries in quantum-confined systems suggest this conventional wisdom may not tell the whole story. My proposed research aims to resolve this fundamental paradox by applying dielectric spectroscopy to understand how polarization and conductivity might coexist in emerging classes of materials. I will systematically probe the charge dynamics in two candidate classes of putative polar metals using broadband dielectric spectroscopy. The first class is q1D molybdenum chalcogenide chain compounds (e.g., $Rb_2Mo_6Se_6$ [8]), which show complex electrodynamic behavior at cryogenic temperatures, suggesting an emergent polar instability. The second is a new family of heavy metal-oxychloride perovskites, which possess an intrinsic polar lattice yet remain metallic. My primary tool will be a comprehensive impedance spectroscopy suite, employing AC sources and lock-in amplifiers to measure the complex dielectric permittivity $\varepsilon^*(\omega)$ from mHz to MHz frequencies, at temperatures from 1.8 K to 350 K, and in magnetic fields up to 7 T.

Brongo, Lily

University of Wyoming (UW)
SURE program, School Of Computing, Electrical & Computer Engineering Senior Design (EE 4830)

Mind and Mission: Quantifying Virtual Navigation Performance under Stress using Biobehavioral Markers

The capacity to navigate complex, high-stakes environments under pressure is a critical determinant of success in fields ranging from aviation to emergency response. While the impact of stress on operational performance is well-documented, its objective assessment remains a challenge. Traditional tools like self-report questionnaires are intrusive, subjective, and temporally limited. Advances in multimodal sensing—including biosensors, immersive VR, eye-tracking, and motion capture—now permit the real-time quantification of performance under experimentally controlled stress. This integrated approach facilitates the analysis of fused biobehavioral data, creating a novel framework for predicting human performance and elucidating authentic psychophysiological stress responses. In this pilot study, seven participants performed a spaceship flying task in immersive VR. While secured to an inverted table to maintain upright or reclined postures, participants navigated at either slow or fast speeds using a joystick held in left hand. Multimodal biobehavioral data including heart rate, eye fixation points, and performance metrics were collected synchronously in real-time. We identified ten biobehavioral variables that robustly differentiated stress conditions. A model based on seven variables reliably detected stress induced by high-speed flight. In contrast, stress from the horizontal posture was not consistently captured. These findings demonstrate that biobehavioral markers can objectively quantify distinct components of operational stress. We successfully delineated a signature for cognitive-motor stress, establishing a foundation for developing comprehensive, multi-faceted assessment tools. Future research will expand on these preliminary models to capture a broader spectrum of stressors.

Bybee, Ethan D

University of Wyoming (UW)
CHE 3900, Undergraduate Research

Effects of Cathode Material on Lithium-Ion Battery Performance

The importance of the cathode material is that it is a major determining component in the performance (energy density and cycle life) of batteries. The investigation of new materials and processes of synthesis is a very crucial part of the development of more efficient and powerful batteries. The main question that is being investigated is, what changes can be made to the cathode materials of lithium-ion batteries to improve their function in all aspects? The main method of manipulating the cathode material in the coin cells is through changes in the synthesis process of the active material. This could be done by changing the annealing temperature that they are placed in the furnace at, duration of time or the atmosphere that they are in. To see the resulting changes in crystalline structure, X-ray diffraction was used to measure these differences. This measurement is quite important to identify differences in structure that occur due to manipulation of the synthesis process. The last component of the data collecting is the data that is obtained from cycling the resulting coin cells to see how they perform. Cycling data gives clues as to the cycling stability and capacity of each material that is tested. This data is collected to see how the performance of each coin cell stabilizes or mitigates after use. The combination of these two sets of data will allow for judgements to be made about the viability of each material for use as a cathode in coin cell batteries.

Cardine, Allyson

University of Wyoming (UW)
Wyoming Research Scholars Program

Synthetic Flavins as Monoamine Oxidase Analogs

Flavins are bright yellow, three-ringed, bioactive compounds that are important components of several metabolic pathways. In particular, vitamin B2 (riboflavin) and flavin adenine nucleotide (FAD) incorporate flavin cores, and the former is a vital part of monoamine oxidase (MAO) activation. Since MAO is the primary protein responsible for tryptamines like serotonin's metabolism. Synthetic flavins offer significant promise for studying fundamental reactions of serotonergic compounds in terms of their susceptibility to metabolism. Using flavins compounds as a proxy for the MAO enzyme, this project explored the synthesis of flavin derivatives with varying functional groups and ability to accept a hydrogen anion from tryptamines. This poster is a review of the methylation techniques attempted to synthesize the flavin derivatives. Specifically, utilization of varying methylation agents and reaction conditions to attempt methylation. Including techniques developed in previous research projects and new methods incorporated from the literature.

Carter, Hailey

University of Wyoming (UW)
First-Gen Capstone Research Project, First Gen Research Mentorship

Celiac Disease in Women with a prior diagnosis of T1D Across the World

This review examines the correlation between a prior diagnosis of type one diabetes to a later diagnosis of celiac disease, specifically in women across the world. The purpose of this research aims to better understand the correlation of the diseases in relation to one another. This research inquiry includes various secondary sources and one primary source, a patient who has been affected by both conditions. While this research focuses on women, in both males and females, it is estimated that 6- 8% of those with type one diabetes also have a confirmed biopsy result of celiac disease. In other words, more than one million children and adolescents worldwide live with type one diabetes, and it is found slightly more often in adults. Of these, around 100, 000 or more have been diagnosed with both type one diabetes and celiac disease. Research states that 60- 70% of celiac diagnoses, in general, are women. About 1% of people without type one diabetes have celiac disease. However, this percentage of diagnoses increases to 5- 10% with a prior diagnosis of type one diabetes. The correlation between these diseases are the genes HLA-DQ2 and HLA- DQ8. Type one diabetes is diagnosed first, and a later diagnosis of celiac disease often found shortly after. Further research aims to understand why these diseases occur in certain women, why type one diabetes is diagnosed first with a later onset of celiac, and why celiac presents asymptomatic in patients with type one diabetes.

Casillas, Kristian

University of Wyoming (UW)
Wyoming Research Scholars Program

The Excavation, Preparation, and Identification of a Newly Discovered Turtle Fossil from Glendo, Wyoming

In March of 2025, a fossilized turtle shell was discovered weathering out of the ground near Glendo, Wyoming. I'd proposed to excavate this fossil turtle shell and determine the geological formation it was deposited in, prepare the fossil turtle, determine its taxonomic identity, and investigate the taphonomy of the specimen to understand how the fossil turtle was preserved. Studying this fossil turtle provided a unique opportunity to 'dissect' this turtle to look inside the shell and hopefully find additional skeletal material. The discovery of limb bones provided new and essential specimens for future research. Studying the taphonomy of the fossil also enables us to interpret the depositional environment and decay scenario for this location in Wyoming's geologic past.

Catlin, Bryn

University of Wyoming (UW)
INBRE

Identifying the Hippocampal Citrullinome in Wild-Type Mice

Peptidylarginine deiminases (PADs) are a family of enzymes that post-translationally citrullinate proteins, altering protein structure and function. They are present in the hippocampus and cerebral cortex of the brain among other tissues. PAD enzymes are regulated by estrogen, and their expression fluctuates with hormone levels across the estrous cycle in female mice where the highest levels are in the estrus stage as compared to the lowest during the diestrus stage. As a result, PADs are investigated for their role in autoimmune and neurodegenerative disorders in females. Alzheimer's Disease (AD) is a neurodegenerative disorder that impairs thinking, reasoning, behavior, and memory. In relation to AD specifically, PADs citrullinate amyloid-β peptides, facilitating the aggregation of these peptides into amyloid plaques that result in neurodegeneration and the manifestation of pathological AD symptoms. AD affects women at disproportionately high rates, with nearly two thirds of the five million Americans living with AD being women. Women also experience more severe pathology and faster disease progression, and the mechanisms behind this sex disparity are not fully understood. To investigate the role of citrullination in relation to the progression of cognitive decline between the sexes, hippocampi were collected from 3- and 7-month-old wild-type female mice in estrus, and from 3- and 7-month-old male wild-type mice. Cit-proteins were then identified by mass spectrometry analysis. Proteomic analysis shows a unique subset of cit-proteins that are only present in female mice as compared to males, and another subset that are only present in the 7-month females. Additionally, pathway analysis reveals Alzheimer's related cit-proteins as one of the predominant pathways in the hippocampi citrullinome. Comparing and contrasting the citrullinome in the hippocampi of both estrus wild-type female mice and wild-type male mice may aid in investigating the progression of cognitive decline between the sexes, improving our understanding of this neurodegenerative disorder and pointing towards possible therapeutic strategies.

Chatterley, Dylan

University of Wyoming (UW)
Honors College Capstone

Mock Juror Decision-Making in Intimate Partner Violence Cases with Victims with Borderline Personality Disorder

Research indicates victim gender significantly predicts mock juror decision-making in intimate partner violence (IPV) cases. Additionally, individuals with borderline personality disorder (BPD), an extremely stigmatized disorder, are at increased risk for being victims of IPV. The current study will examine the effects of victim gender and BPD psychoeducation on mock juror biases/decision-making in IPV cases. The researchers hypothesized that mock jurors presented with the female victim and no psychoeducation will render more guilty verdicts compared to the male victim with psychoeducation. This research will increase understanding of the stigma that victims of IPV with BPD face due to their gender and diagnosis. Additionally, it will inform psychoeducation practices in relation to expert witness testimony.

Christensen, Stephen Benjamin

University of Wyoming (UW)
INBRE, Wyoming Research Scholars Program

Circuit-Level Dissection of Persistent Behavior

Persistent behavior, the ability to sustain goal-directed responding amid obstacles, is disrupted across psychiatric conditions including depression and schizophrenia, yet its underlying excitatory and inhibitory circuit mechanisms remain poorly characterized. Here we present an intersectional strategy to simultaneously map both populations during effort-based operant behavior, using TRAP2 × Ai9 X GAD67-Cre mice combined with home-cage FED3 operant behavior and spatial transcriptomics.TRAP2 drives TdTomato expression in all neurons active during a defined tamoxifen window, while GAD67 immunolabeling identifies the GABAergic subset within that active population. Neurons that are TdTomato-positive but GAD67-negative are predominantly excitatory, enabling simultaneous E/I ensemble resolution from a single experiment. Mice perform either a Fixed Ratio 2 (FR2) schedule at a 1:1 poke-to-pellet ratio, or a Random Progressive Ratio (RPR) schedule in which a random integer (1–10) determines the poke requirement per trial, introducing effort cost uncertainty as a novel behavioral variable. Tamoxifen is administered six hours prior to nocturnal FED3 access to align peak recombination to task engagement. Coronal sections characterize broad activation differences between schedules, while sagittal sections are registered to a wildtype Visium spatial transcriptomics reference, providing cell-type validation of both excitatory and inhibitory ensemble identities. We predict that RPR selectively modulates the balance of E/I recruitment, revealing a circuit signature of persistent behavior under uncertainty with direct translational relevance to motivation disorders.

Clymore, Kayla

University of Wyoming (UW)
NSF Research Experience for Undergraduates

Modular Synthesis Approaches in 2D COF Construction

Covalent organic frameworks (COFs) are porous, crystalline materials with tunable architectures that make them promising candidates for a range of environmental and electronic applications. This project explores two synthetic strategies for tailoring COF properties: functionalization of the node and structural modification of the linker. These complementary approaches offer greater control over chemical stability, porosity, and electronic behavior. By applying these design principles, we aim to develop COFs suitable for applications such as water purification, filtration, and conductivity tuning, highlighting the versatility and modularity of COF synthesis.

Considine, Timothy James

University of Wyoming (UW)
SURE program, School Of Computing

Tracking Global Atmospheric Moisture Transport

Atmospheric moisture transport is an essential component of the Earth's water cycle, carrying water vapor thousands of miles and controlling which regions of the globe receive precipitation and which do not. Studying atmospheric moisture transport can help us to understand the mechanisms that contribute to anomalous precipitation such as extreme precipitation events and drought across different regions. To build a foundation for this and future research we applied a moisture tracking model to an atmospheric reanalysis dataset to produce a novel dataset that links regions of evaporation to regions of precipitation. We accomplished this by creating a computational pipeline and utilizing parallel computing to automate the WAM2Layers moisture tracking model in the NCAR supercomputer to run for each region in a grid of the Earth's surface. We then created some preliminary data visualizations to support further analysis of this dataset.

Coxbill, Bree

University of Wyoming (UW)
INBRE

Impact of early life overnutrition on synaptic function in the dorsal vagal complex

Childhood obesity is a prevalent health issue, yet adolescent obesity rates have quadrupled since the 1990's. Obesity predisposes young children to be at risk of developing other diseases later in life, including chronic diseases like Type 2 diabetes, cardiovascular diseases, and mental health disorders. A major gap in knowledge is how early-life overnutrition impacts brain-body communication. The hindbrain is the first area of the brain to receive information from the gut and is critical for the regulation of food intake. In this study, we use a mouse model of early-life overnutrition to address how this environmental perturbation impacts synaptic signaling in dorsal vagal complex (DVC). The NTS receives excitatory glutamatergic inputs from the gut through the vagus nerve, which leads to feelings of fullness. There are also inhibitory interneurons in the DVC that can influence how these signals are relayed to the rest of the brain. The specific aim of this is study is to determine how early-life overnutrition impacts synaptic function in the DVC. We used immunohistochemistry techniques to stain for markers of inhibitory transmission. Specifically, we will look at GABA receptors that contribute to relaying information from the gut to the brain. This work lays the foundation for future studies, where we can utilize these mechanisms to develop both drug targets and behavioral interventions to restore proper brain-body communication in children and adults suffering from obesity and related metabolic disorders.

Cunningham, Shawn

University of Wyoming (UW)
Wyoming Research Scholars Program, NASA Space Grant

Accurate Three-Dimensional Guidance Control for UAV Intercept

As warfare in Europe has evolved rapidly to be largely reliant on unmanned and semiautonomous technology, path-following unmanned aerial vehicles (UAVs) that can follow complex three-dimensional paths are becoming of increasing interest. Path-following guidance algorithms utilize a look-ahead approach to derive commands for an unmanned aerial vehicle (UAV). A proportional-integral-derivative (PID) compensator typically is used to generate these guidance commands by setting a reference point along the desired track and calculating an appropriate lateral acceleration command to correct. This approach has been used to create a guidance control law for UAVs that allows for reduced cross-track error along complex three dimensional paths. Previous analysis of this guidance control method shows promising results, but little research explores nonlinear guidance control methods other than the PID compensator. This research intends to investigate the practicality of other nonlinear control methods, namely those of a higher order compensator [1]. As the complexity of guidance paths is increased, higher order compensators could provide promising ways to allow for adaptive control to quickly changing variables. To analyze this, simulations based on two and three-dimensional guidance control utilizing PID guidance controllers will be re-created. Upon replication of simulated results, higher order guidance control will be implemented and refined to analyze the efficacy of alternate controllers for nonlinear guidance.

d'Arge, Arielle

University of Wyoming (UW)
Wyoming Research Scholars Program

Environmental Referenda and Ecological Rationality

This project seeks to create a database of ecological referenda in the Rocky Mountain West (Colorado, Idaho, Montana, Utah, and Wyoming) for the purpose of determining ecological rationality among individual voters. I collected all ecologically related referenda in these states, and am in the process of coding a database, which will be a resource for future researchers, legislators, and students. The goal of this database is to provide a foundation for further research related to referenda and ecological rationality in the Rocky Mountain West. This project is part of a larger DOE grant where we hope to create a database of ecological referenda on a national scale.

Edman, Claire

University of Wyoming (UW)

Integrating Secondary Education Mathematics with Disability Studies

Students with disabilities disproportionately fall behind in mathematics classes in high school compared to their non-disabled peers. Yet, these students are guaranteed an equitable education by the Individuals with Disabilities Education Act (IDEA). Although there is a body of research in the field of secondary education mathematics looking at how to bridge this gap, this research is limited to education perspectives. By bringing in the perspectives of scholars in disability studies theory, new insight is discovered in how to create mathematics classrooms with more equitable opportunities for students with disabilities. This leads to implications for how mathematics is taught, the culture that we build in our classrooms, and training for pre-service teachers.

Erickson, Ashlynn Nora

University of Wyoming (UW)
NASA Space Grant, Wyoming Research Scholars Program

Superconducting Nanoresonators

Superconducting coplanar resonators provide a versatile platform for high-sensitivity microwave measurements, owing to their large quality (Q) factors and strong dependence on the local electromagnetic environment. A series of nanoconstricted superconducting resonators were designed and simulated, aimed at enabling qubit readout through magnon–photon hybridization. By incorporating focused ion beam–milled nanoconstrictions, a substantial enhancement of in-plane magnetic fields while preserving resonator performance was achieved.Systematic variations in resonator geometry, including length, coupling capacitance, and kinetic inductance were investigated using the high-frequency electromagnetic simulation software Sonnet. It was demonstrated that increasing resonator coupling reduces both the resonant frequency and Q-factor. In contrast, tuning via kinetic inductance enables broad frequency adjustability without degrading Q, therefore maintaining sensitivity. Fine frequency control is further achieved through lithographic adjustments to the coupling capacitor. Our results indicate that high-Q resonances ($Q > 5 \times 10^3$) are attainable under minimal coupling conditions, with additional improvements possible through optimized geometry and material selection.

Farrington, Tatiana

University of Wyoming (UW)
INBRE

Examining Organizational and Individual Factors for Moral Distress in CNAs

Background: Moral distress occurs when individuals must act in ways that conflict with their values, beliefs, and morality. It is prevalent among nursing home (NH) staff and linked to low job satisfaction, performance, high turnover intent, and poor mental health outcomes. However, predictors of moral distress have yet to be studied among certified nursing assistants (CNAs) in NHs. Method: Participants (n = 286) were predominantly White (83.6%), non-Hispanic (85.3%), cisgender women (80.1%), mean age 32.13 (SD = 13.00). Participants were recruited from NHs across Wyoming and completed surveys assessing well-being and occupational outcomes. A hierarchical multiple regression examined predictors of moral distress (ProQOL Health). Length of CNA experience was entered at Step 1, workplace factors at Step 2, and coping variables at Step 3. Results: CNA experience length predicted higher moral distress at Step 1 ($\beta = .12$, $p = .049$). Step 2 improved the model ($\Delta R2 = .30$, $p < .001$). Higher workplace violence (Workplace Violence Questionnaire) predicted greater moral distress ($\beta = .21$, $p < .001$), whereas supervisor support (Leiden Quality of Work Questionnaire) predicted lower moral distress ($\beta = –.26$, $p < .001$). Coping variables improved the model ($\Delta R2 = .08$, $p < .001$). Mindfulness (Mindful Attention Awareness Scale) was a negative predictor ($\beta = –.26$, $p < .001$), and problem-focused coping (Brief COPE) a positive predictor ($\beta = .12$, $p = .015$). Conclusion: Organizational and individual factors shape CNAs' moral distress. Workplace violence and low supervisor support were linked to greater distress, while mindfulness was protective.

Fauber, Terrin

University of Wyoming (UW)
INBRE

Chronic Stress as a Catalyst for the Progression of Alzheimer's Disease

Compared to the general public, the U.S. military veteran population has a significantly higher risk of developing Alzheimer's disease (AD) and related dementia. However, the underlying biological mechanism is largely unclear. This study aims to determine how chronic stress influences the onset and disease progression of AD pathology. The chronic social defeat stress (CSDS) paradigm is a commonly used mouse model of chronic stress, and often triggers heterogeneous responses. Some mice display social avoidance (and are classified as susceptible), while others display normal sociability (resilient). In this study, a 10-day CSDS paradigm was applied to two different transgenic AD mouse models, 3xTg-AD (promotes both Aß and pTau pathologies) and 5xFAD (promotes rapid Aß accumulation), as well as their non-carrier littermates. After multiple behavioral assessments, including the pre-stress and post-CSDS behavioral tests, the mouse brains were harvested and immunostained to assess Aß pathology and neuroinflammatory markers (IBA1 and GFAP), in the amygdala, hippocampus, and prefrontal cortex. Our preliminary results revealed that all AD model mice were resilient to chronic stress and showed unchanged sociability, while non-carriers displayed both susceptible and resilient responses. Importantly, 3xTg-AD mice with CSDS exhibited early cognitive decline compared to non-stressed 3xTg mice. Additionally, immunostaining revealed excess intracellular Aß, as well as increased neuroinflammatory markers in the amygdala and hippocampus of 3xTg-AD mice with CSDS, compared to their age-matched and non-stressed controls. This study supports chronic stress as a potent risk factor for AD, associated with the accelerated progression of AD-relevant pathologies.

Fitch, Ainsley

University of Wyoming (UW)

Behavioral syndromes and animal personality in mosquitofish (Gambusia affinis)

In many species, individual behavior is more consistent than one would expect by chance when compared to population-level variation in behavior. Many behavioral ecologists refer to this individual consistency across time as “animal personality”. When individuals display consistent correlated behaviors across time and context, these relationships are referred to as “behavioral syndromes”. Individual consistency in behavior (and correlated behaviors) may be an adaptive response to an organism's environment, or result from developmental or physiological constraints within individuals. We investigated whether pregnant female western mosquitofish (Gambusia affinis) displayed behavioral patterns that were indicative of animal personality or behavioral syndromes. We carried out repeated behavioral trials to measure boldness, risk aversiveness, and activity level. If fish in our trial display individual consistency in behavior, that would indicate evidence of animal personality in G. affinis. If fish in our trials display individual consistency in correlations between behaviors, that would indicate evidence of the presence of behavioral syndromes in G. affinis. The behaviors of the fish were then recorded using BORIS version 9.7.15 video scoring software. Currently we are finishing scoring the trials and will conduct statistical analysis on the data.

Flesvig, Abigail

University of Wyoming (UW)
INBRE

Evaluating a Role for Non-erythroid Hemoglobin in Female and Male Reproductive Tissues

Within the female and male reproductive systems, there is tight regulation on the amount of oxygen available during pregnancy and spermatogenesis, respectively. Erythroid hemoglobin is the main carrier of oxygen throughout the body and in different systems. Our lab has determined that there is another type of protein used to carry oxygen within the reproductive system, specifically to control oxygen concentrations and the metabolism of oxygen into reactive oxygen species (ROS) and reactive nitrogen species (RNS). Our hypothesis is that non-erythroid hemoglobin has important and required functions in female and male reproductive tissues. In the females, subfertility was observed in conditional knockout mice that did not have the beta subunits present. This type of hemoglobin is not found in blood cells and is therefore considered non-erythroid hemoglobin since it is localized to specific tissues. These tissues would be uterine cells for the females and the spermatogenic cells for the males. Conditional mutagenesis will be used to ablate the beta subunit genes from the germline of males to determine how the sperm are affected when there is no non-erythroid hemoglobin present. To confirm the beta subunits have been ablated from the germline in the males, our lab will conduct in situ hybridization to stain the cells that express hemoglobin beta in visual confirmation. These mice without the beta subunits will then be compared to the control mice for validation. Our lab has already confirmed, through a breeding trial done with the females, that uterine hemoglobin beta subunits are required for normal fertility and lifelong fecundity in the developing young mice. With the males, a similar breeding trial will also be conducted to determine how beta subunits affect the fertility and germline of the males. The males involved in this breeding trial will have the beta subunits conditionally ablated from sperm producing male germ cells. A histological evaluation will also be conducted from a control and hemoglobin beta conditional knockout mice to determine if non-erythroid hemoglobin is required for normal spermatogenesis and male fertility.

Forbis, Ethan

University of Wyoming (UW)
Honors College Capstone, INBRE

Refining Circadian Biomarkers: Core Temperature Logging as an Alternative to Exercise-Derived Metrics

Circadian rhythms regulate daily physiological and behavioral cycles. The suprachiasmatic nucleus (SCN) serves as the central circadian pacemaker, coordinating peripheral clocks and aligning processes such as hormone secretion, metabolism, and body temperature with environmental cues. Core body temperature (CBT) is a reliable marker of circadian rhythmicity, maintaining an approximately 24-hour cycle even without external input. Voluntary running wheel (RW) activity is also commonly used to assess circadian rhythms in rodents due to their nocturnal behavior. Exercise can function as a non-photic zeitgeber capable of shifting circadian phase.This study evaluated circadian rhythmicity using CBT and RW activity while introducing scheduled treadmill (TM) exercise as an additional zeitgeber. Male C57BL/6 mice were assigned to four groups (n = 5/group): control, RW, TM, or RW+TM. Mice were maintained on a 12:12 light–dark cycle. CBT was continuously recorded using implanted Star-Oddi data loggers, and RW activity was measured for two weeks in RW and RW+TM groups. TM exercise occurred at ZT12 (dark phase onset) for 40 minutes at ~60% intensity. Data were analyzed using ClockLab (Actimetrics) to generate actograms and periodograms, and one-way ANOVA was used for comparisons.No significant differences were found between groups for CBT period ($p = 0.8768$), CBT amplitude ($p = 0.5883$), RW period ($p = 0.0939$), RW amplitude ($p = 0.2713$), or total RW distance ($p = 0.4838$).These findings support CBT and RW activity as markers of circadian rhythmicity and highlight exercise as a potential zeitgeber, providing a basis for future studies in constant darkness and aging models.

Georges, Nick

Central Wyoming College (CWC)
INBRE, Advanced Technological Education Program

The Climate of Disease: How Milder Winters May Be Driving Lyme's Spread

This study analyzes the geographic expansion and intensification of Lyme disease across the contiguous United States from 2000 to 2023 by comparing standardized county-level incidence rates across three equal time periods (2000–2007, 2008–2015, and 2016–2023). Raw confirmed case counts from the CDC were converted to average annual incidence per 100,000 population using decennial census data as denominators, removing population bias and enabling accurate spatial comparison over time. The resulting choropleth maps reveal clear patterns of regional expansion beyond historically endemic areas in the Northeast and Upper Midwest, with notable increases in incidence emerging across the Mid-Atlantic, Southeast, and northern Great Plains. To evaluate potential environmental drivers, county-level mean winter temperature data derived from PRISM climate rasters were calculated for the same three time periods and mapped alongside Lyme incidence to assess spatial alignment between warming winter conditions and disease expansion. Change maps comparing the earliest and most recent periods illustrate that counties experiencing the greatest increases in Lyme incidence frequently correspond with areas of rising winter temperatures conditions known to support the survival and geographic spread of Ixodes tick populations. While this analysis does not establish direct causation, the spatial correspondence between climate trends and disease expansion provides compelling visual and quantitative evidence that warming winters may be a contributing factor in the northward and westward spread of Lyme disease risk across the United States.

Georges, Nick

Central Wyoming College (CWC)
INBRE, Advanced Technological Education Program

Seeing the Whole: The Overview Effect, Awe, and the Architecture of Human Perspective

Awe at Altitude: The Overview Effect as a Model for Transformative Psychological Experience
The Overview Effect a profound cognitive and emotional shift reported by astronauts upon viewing Earth from orbit represents one of the most consistently documented instances of transformative experience in the psychological literature. Characterized by a sudden dissolution of perceived boundaries between self and world, heightened prosocial orientation, and lasting changes in values and identity, astronaut accounts of the Overview Effect offer a unique opportunity to study self-transcendent experience under controlled, documented conditions. This poster synthesizes qualitative testimony from astronauts and commercial spaceflight participants across six decades of human spaceflight, identifying recurring phenomenological patterns: the perception of Earth's fragility, the irrelevance of political borders, a sense of universal interconnection, and a persistent post-flight shift in environmental and humanitarian concern. These patterns are examined through the frameworks of awe research (Keltner & Haidt, 2003), self-transcendent experience (Yaden et al., 2016), and transformative experience theory (Paul, 2014).Findings suggest the Overview Effect is not an anomalous response to novelty but a predictable psychological outcome of specific perceptual conditions that may be reproducible, at reduced magnitude, through deliberate intervention. As commercial spaceflight expands access beyond career astronauts, understanding the psychological mechanisms underlying this shift carries implications for wellbeing research, environmental psychology, and the broader study of perspective transformation. This research informs an in-development documentary series on the psychological dimensions of human spaceflight.

Glennie, Sophia

University of Wyoming (UW)
INBRE

The Role of Visual Stimulation on Axon Outgrowth Temporal Dynamics

How neurons self-assemble into circuits is a fundamental question in the field of developmental neuroscience. We study this question in the developing visual system of the Xenopus tadpole. The major component of the amphibian visual system is the retinotectal projection, the synaptic connection between the axons of retinal ganglion cells (RGCs) of the eye and postsynaptic tectal neurons of the optic tectum. It is well established that circuit formation consists of these two phases– the guidance of axons via molecular cues followed by activity-dependent refinement of the synaptic connections. We additionally now know that tectal neurons of the optic tectum display spontaneous (not driven by visual stimuli) activity before the RGC axons have reached them. This gives rise to our hypothesis that spontaneous activity in the optic tectum – and not solely molecular cues – may play a role in guiding RGC axons from the eye to the optic tectum. We test this hypothesis by exposing Xenopus tadpole embryos to the sodium channel blocker MS-222 to block neural activity and use lipophilic diI to label RGC axons. We observed significant pathfinding abnormalities, including "rogue" axons and growth cones that failed to terminate within the optic tectum or tegmentum- extending beyond their normal targets and indicating disrupted termination and target recognition. These initial findings support a role for activity-dependent signaling in early axon guidance and targeting. Reduced activity may impair growth cone responsiveness or the proper release of guidance cues. Future aims include determining specific mechanisms by which activity regulates RGC axon guidance.

Gott, Hannah Camille

University of Wyoming (UW)
Wyoming Research Scholars Program

Use of Specialized Organic Nodes for the Selective Separation of Rare Earth Elements

MXenes have proven useful in the extraction of metals, namely rare earth elements (REEs). When organic coronene nodes are attached to MXenes, there is superior absorbance, as well as the possibility for functionalization. This project explores the functionalization of these nodes. This functionalization is achieved through the synthesis of a variety of ligands, each containing variable metal-coordinating functional groups. These ligands are made into coronene nodes, attached to MXenes, and sent off for REE capture testing. We aim to find a node design that demonstrates a high affinity for a specific rare earth element, allowing for efficient extraction and selective separation of REEs.

Griner, Benjamin Charles

University of Wyoming (UW)
NASA Space Grant

Finite Element Modeling of Composite Materials and Aerostructures

Driven by their ability to revolutionize product design due to their lightweight, strong, and durable properties, composite materials have seen rapid growth in their application in various industries. In this study, the focus is to use finite element-based modeling to study the damage and failure behavior of woven composites. Woven composites exhibit complex deformation and failure mechanisms due to their nonhomogeneous nature and fiber orientation that many standard models struggle to precisely capture. By progressing a comprehensive finite element model, this research will enable us to analyze the stress, strains, deformation, and eventual failure of a composite under various loading conditions. A predictive model of a composites mechanical properties would enhance the understanding of failure mechanisms, eliminating the need for trial-and-error designs, which would enable NASA to streamline their research and development of high-performance components for next generation spacecraft and other aerospace applications. Additionally, finite element analysis was performed to evaluate pressure bulkhead designs for the University of Wyoming's King Aircraft research aircraft. Structural responses such as stress and displacements under cabin pressurization were analyzed to ensure stresses remained below yield limits. The methodology, validation process, and results were documented and submitted to the FAA.

Grzybowski, Samuel

University of Wyoming (UW)
SURE program, School Of Computing

Growth Synchrony Patterns in Rocky Mountain Pine Species

Synchrony measures the extent to which distinct populations exhibit similar behaviors, making it an important way to describe species' vulnerability to change. In 2022, Whitebark Pine (Pinus albicaulis) was designated as "threatened" under the Endangered Species Act; many pine species across the United States are similarly in decline, whether due to climate change, anthropogenic effects, or diseases. Rocky Mountain pine species are experiencing declines at highly accelerated rates compared to the rest of the United States, primarily due to the already dry climate and dependence on spring snow melts. Using synchrony calculations, we can determine the vulnerability of Rocky Mountain pine species as well as statistically determine which environmental factors most contribute to this vulnerability. An improved understanding of the drivers for synchrony can lead to better management practices and hopefully slow or stop the decline of Rocky Mountain pine species, as well as provide a framework for the rest of the United States.

Gusa, Nicholas Henry

University of Wyoming (UW)
SURE program, School Of Computing

Patterns on the Path: Uncovering Trail Use Dynamics Across Time and Space in Teton County

This project analyzes trail counter data collected in Teton County to better understand spatial and temporal patterns of outdoor recreation. Trail counters provide timestamped records of pedestrian and cyclist activity at trailheads and along paths, offering a view of how public lands are used. Using geospatial and temporal analysis techniques, this study examines trends in trail usage across seasons, days of the week, and times of day, while also identifying high-traffic trail segments.

Hall, Constance Nina-Gloria

University of Wyoming (UW)
INBRE

Effect of Lowering Core Body Temperature on Brain Structure and Function: Using Natural Torpor to Model Therapeutic Hypothermia

This study aims to determine that variation in torpor, periods of low body temperature used in hibernation, influences brain structure and function in chipmunks. The effect of which can be measured by studying overwinter torpor pattern on hippocampal cell density and overall changes in brain structure. This effect will also be seen in changes to behavior like learning and memory. By first examining chipmunk brains before torpor in comparison to the structure of the brain after torpor, we can determine the influence of low temperatures on structure. In support of this, pre-collected data shows cell loss in specific subregions of the hippocampus. To understand torpor's influence on behavior, we will run the chipmunks through spatial learning tasks before and after overwinter torpor has occurred, comparing the two scores for every subject. In regard to human health, studying the influence of low body temperature on chipmunks can serve as a model for understanding how therapeutic hypothermia can influence cognition in humans. The importance of which can be applied to the treatment of stroke and cardiac arrest.

Halley, Sophia

Central Wyoming College (CWC)
INBRE

Observations of Lead Concentration & Mental Health Disorders in the State of California

Older residences may contain traceable amounts of lead, exposure to which has been shown to cause damage to the central nervous system, and is linked to decline in cognitive and motor-functions (Ortega et al., 2021). Despite attempts to address the presence of lead in homes, consistent data which tracks the relationship between lead in homes and mental health is limited. While major events such as the Flint, Michigan water crisis may raise national awareness to lead hotspots, not much is known about other lead-affected areas. Maps and data visualization tools using geospatial approaches can help identify dangerous lead levels (Zarterian et al., 2022). Additionally, previous research has used geospatial statistical methods to compare COPD with environmental determinants (Guo et al., 2021). Our research aims to apply the same methods to explore whether or not there is a correlation between lead in residential buildings and mental distress within California. Mental distress rates were compared to lead prevalence in residential buildings at the county level by using choropleth maps created in Esri's ArcPro software. Future research will build upon this work by applying Global Moran's I to assess spatial autocorrelation and Ordinary Least Squares (OLS) regression to evaluate the strength and significance of the relationship between these variables.

Harman, Quinn

Northern Wyoming Community College, Sheridan
INBRE

How iRhom2 Regulates Inflammation in Microglia Cultures

Alzheimer's disease (AD) is a neurodegenerative disorder marked by chronic neuroinflammation that contributes to synaptic dysfunction and cognitive decline. Microglia, the resident immune cells of the brain, contribute to AD pathophysiology by promoting neuronal damage through the release of pro-inflammatory cytokines, especially tumor necrosis factor (TNF). In AD, inflammatory microglia activation is mainly triggered by the prolonged exposure to Aβ. However, microglia can adopt distinct activation patterns depending on their stimulus. In early disease, anti-inflammatory microglia support debris clearance and tissue repair. In AD, this balance is disrupted, favoring harmful pro-inflammatory signaling. We hypothesize that iRhom2 promotes a pro-inflammatory microglial phenotype by enhancing ADAM17-dependent TNF shedding, disrupting immune homeostasis, and inhibiting beneficial microglial functions. We expect that reducing iRhom2 activity will decrease microglial inflammatory signaling and enhance Aβ clearance, thereby restoring immune homeostasis. To investigate the role of iRhom2 in microglial inflammation, this study will use cultured microglial cell lines, and primary microglia from WT and iRhom2 KO mice. iRhom2 expression in WT cells/cell lines will be knocked down using siRNA. Polarization studies will be performed by treating microglia with LPS +/- IFNγ, Aβ oligomers, and IL-4, respectively. Pro- and anti-inflammatory cytokine expression will be measured using ELISA and qRT-PCR. ADAM17 activity and protein levels will be assessed using Western blot. In addition, the phagocytic activity of differentially activated microglial cultures will be examined using fluorescent Aβ oligomers and e. coli bioparticles. Uptake, microglial phenotype, and morphological features such as branch length will be measured using fluorescence microscopy.

Harper, Myles

University of Wyoming (UW)
SURE program, School Of Computing

Analysis of Tourism in Fremont County

Tourism is an important economic activity in Fremont County, Wyoming, but its effects on local communities are complex and not always fully understood. This project examines how residents perceive tourism and its impacts on their communities using survey data collected from Fremont County residents, and CBG data from the area. To better understand these perspectives, the written responses were analyzed using sentiment analysis and basic text analysis techniques to identify common themes and attitudes expressed by residents. In addition, approximate geographic location data associated with the responses was examined to explore whether perceptions of tourism vary across different parts of the county. Visualization tools were used to help display patterns in sentiment and highlight spatial trends within the dataset. The results provide insight into how residents view tourism's economic benefits, as well as concerns related to issues such as crowding, infrastructure, and changes to local culture. By combining sentiment analysis with geographic context, this project helps provide a clearer picture of how tourism is experienced by the people who live in Fremont County. These findings can help inform future discussions and decision-making related to tourism development and community planning in rural regions.

Heindl, Riley

University of Wyoming (UW)
Wyoming Research Scholars Program

Hoary Bat Habitat Selection in Wyoming During Fall Migration

Wind energy development in North America poses a threat for numerous migratory bat species. Hoary bats (Lasiurus cinereus) in particular have been heavily affected with multiple surveys revealing high mortality rates when compared to other migratory species. Presently there is notable lack of published studies describing hoary bat habitat use during migration in Wyoming, where wind energy development continues to increase. This research project aims to gather data to identify and characterize movement timing and habitat use by hoary bats during the fall migration season in Wyoming.

Hernandez, Gustavo Adolfo

University of Wyoming (UW)
NASA Space Grant, Wyoming Research Scholars Program

Tik-Tock, Exercise O'clock: Investigating the Role of Exercise in Restoring SCN Function and Circadian Health

The circadian clock regulates essential biological and physiological processes by generating endogenous ~24-hour rhythms that coordinate behavior and metabolism. The suprachiasmatic nucleus (SCN) of the hypothalamus serves as the master clock, synchronizing peripheral clocks across the body. A key pathway from neuropeptide Y (NPY)-expressing neurons in the intergeniculate leaflet to the SCN (IGL^NPY→SCN) helps drive circadian phase shifting and entrainment to behavioral cues such as voluntary wheel running (VWR), a well-established rodent model of exercise. Aging-related circadian disruption is strongly linked to metabolic, cardiovascular, and neurodegenerative disease, yet the neural mechanisms by which exercise supports circadian function remain unclear. This study tested whether late-life exercise enhances SCN activity and circadian-related neural signaling in very aged male mice. Young (~4 months; n=5) and aged (~22 months; n=9) mice received 24-hour access to a running wheel for four weeks, while age-matched controls remained sedentary (young n=5; aged n=8). Wheel-running activity was recorded using Columbus Instruments running wheels. Immunohistochemistry assessed neural activation in circadian-related SCN pathways, including NPY projections and c-FOS expression. Within-group exercise versus control differences were analyzed by ANOVA. Preliminary findings show that greater voluntary exercise is linked to stronger circadian entrainment and higher c-FOS expression, consistent with enhanced SCN activation. Although aged mice showed reduced c-FOS and fewer NPY appositions than young mice, late-life wheel running partially restored SCN neuronal activation. Ongoing analyses will further define how exercise preserves circadian function during aging.

Hicks, Dylan

UW at Casper (UW-C)
INBRE

Exploring Spatial Distribution and Habitat of Spadefoots near Casper, Wyoming

Plains Spadefoots (Spea bombifrons) have a known range over most of Natrona County and the Great Basin Spadefoot (Spea intermontana) range is known to extend into the southwest portion of the county. Despite their known presence, a significant gap exists in understanding their distribution and natural history within the region. To help address this, we conducted surveys aimed at mapping their distribution. Nocturnal call surveys and visual encounter surveys were conducted in various locations around Casper and its surrounding areas. Additionally, audio recordings were collected to supplement visual observations. Field surveys were conducted from early May through mid-July 2025, with spadefoots detected at two sites, North Platte Park and Poison Spider OHV Park, while no detections occurred at other surveyed locations. Breeding evidence, including calling adults and tadpoles, was documented, confirming successful reproduction at these sites. These findings provide updated breeding activity and distribution data, while also highlighting key environmental factors influencing spadefoot detectability in Natrona County, Wyoming.

Hineman, Drea Jayne Ortiz

University of Wyoming (UW)
NASA Space Grant

Cultivar-Dependent Responses of Lettuce to Salinity and Mycorrhizal Inoculation in Closed-Loop Space Production Systems

Due to restricted gravitational drainage under space farming conditions, water leaching is limited, which can increase root-zone salinity and impair plant growth through osmotic stress and ion toxicity. Lettuce (Lactuca sativa L.) has been grown successfully on the International Space Station; however, salinity tolerance was not a primary factor in cultivar selection for space crop production. Therefore, mitigating salinity stress is critical for future long-duration space missions. Mycorrhizal fungi (MF) have been proposed to enhance nutrient uptake and improve salinity tolerance; however, their effectiveness in lettuce under zero-discharge, space-relevant production systems remains unclear. The objective of this study was to quantify the effects of two commercially available MF inoculants, Myco Bliss® and MycoApply®, on the growth and physiology of two lettuce cultivars, 'Ruby Red' and 'Paris Island', grown with slow-release fertilizer (SRF) at rates of 15 or 23 $g \cdot L^{-1}$. We hypothesized that the two lettuce cultivars would respond differently to increased SRF rates and that MF inoculation would improve plant growth and yield compared with the non-inoculated control. Forty-eight plants of each cultivar were grown in a controlled-environment greenhouse. Plants were assigned to two SRF rates (15 or 23 $g \cdot L^{-1}$) and three MF treatments (Myco Bliss®, MycoApply®, or non-inoculated control). Plants were grown for 56 days using a pick-and-eat harvest method. Leaf relative chlorophyll content (SPAD) and cumulative fresh weight were measured to assess salinity stress and plant yield. Results showed that increasing the SRF rate reduced cumulative leaf fresh weight in both lettuce cultivars at 56 days after sowing, except for 'Paris Island' lettuce treated with Myco Bliss®. Increasing SRF rates did not affect relative leaf chlorophyll content in either cultivar at the end of the experiment. However, MF inoculation decreased SPAD in 'Paris Island' lettuce at the SRF rate of 23 $g \cdot L^{-1}$ compared with the non-inoculated control. Overall, lettuce cultivars responded differently to MF inoculation, and MF inoculation did not consistently improve salinity tolerance or plant growth under zero-discharge conditions. Future studies should evaluate a wider range of lettuce cultivars and MF strains for space crop production systems.

Hiser, Brianna

University of Wyoming (UW)
SURE program, School Of Computing

AI for Sustainability - A review of best practices

Machine learning algorithms are becoming more popular as a tool for predicting environmental conditions. While most of the models created show promising results, there is a lack of standards that prove the credibility of these models. My team has identified areas in the creation and training of the machine learning algorithms that can lead to inaccurate results and created a rubric to grade various models on how well they follow these criteria. The rubric evaluates the likelihood of data contamination that can lead to overly optimistic results. Once 20-30 articles were graded, three top performing and three low performing articles were chosen. The first two authors of all these papers that had created models were analyzed to identify if there was any correlation between the performance of the model and the experience the authors had with machine learning.

Hokanson, Ainsley

University of Wyoming (UW)
Wyoming Research Scholars Program

Drosophila Decapentaplegic GAL4/UAS Driver Expression Patterns, Impacts on Asp Mutant Brain Size

The model fruit fly Drosophila melanogaster is highly useful in analyzing target protein effects using genetic tools. Notably, the GAL4-UAS system is a powerful technique that allows for the selective expression and observation of a target gene in different tissues of the fruit fly. A particular gene of interest for our lab is the Abnormal Spindle (Asp) gene, which encodes the microcephaly-associated Asp protein. Our goal is to understand how Asp is associated with proper brain growth and development. Utilizing this GAL4-UAS system, we can determine which cell populations require Asp to function properly. Toward this goal, we developed a driver known as DPP-GAL4 and confirmed its proper recapitulation of Dpp patterns in the larval Drosophila brain utilizing fluorescent immunostaining. From there, we aimed to perform rescue experiments by expressing Asp protein variants in microcephalic Dpp tissues. To use the DPP-GAL4 driver system in rescue experiments, it is necessary to confirm that the driver line has no intrinsic rescue effect on microcephalic flies. To confirm this, we crossed the DPP-GAL4, AspDF driver line with a wild-type fly, along with a mutant AspT25 fly, which contains an Asp deletion allele. We found that the mutant background flies had an overall reduction in lobe size compared to the wild-type cross (4526μm3 vs. 6004 μm3, respectively. n = 6, 7. $P<0.005$). The rescue or lack thereof of the microcephalic phenotype will offer insight into how Dpp cell populations are involved in brain growth and development.

Hoyle, L

University of Wyoming (UW)

"A Woman's Place"- An Exploration of Women in Greek and Elizabethan Theatre

Female characters in drama often reveal how societies view power, gender, and morality, and this is especially evident in the plays of ancient Greece and the works of William Shakespeare. In many Greek tragedy plays, women such as Clytemnestra or Antigone challenge authority and social expectations, often with tragic consequences. Similarly, Shakespeare's plays feature complex female figures like Lady Macbeth and Beatrice, who navigate love, ambition, and societal limitations. Although these works were written in very different historical and cultural contexts, both Greek dramatists and Shakespeare used female characters to explore themes of power, loyalty, justice, and resistance. By examining the roles and portrayals of women in these two dramatic traditions, it becomes clear that female characters serve as powerful vehicles for questioning social norms and expressing human conflict.

Isaak, Baily

University of Wyoming (UW)
INBRE

Female Peptidylarginine Deiminase 2 and 4 Double Knockout Mice have Abnormal Estrous Cycles and Reduced Fertility

Peptidylarginine deiminases (PADs) are a family of enzymes that post-translationally convertpositively charged arginine residues into a neutrally charged citrulline, through a reaction termed citrullination. Citrullination, a novel post-translational modification, can alter target protein structure and function. Our previous work discovered that PADs are expressed in anterior pituitary gonadotrope cells, which are responsible for the production of the gonadotropins luteinizing hormone (LH) and follicle-stimulating hormone (FSH). Interestingly, male PAD2/4 double knockout (DKO) mice have delayed puberty, decreased testis size, and are subfertile as compared to wild type mice. Male PAD2/4 DKO mice also have reduced serum LH and FSH age compared to controls. However, these prior studies did not examine if reproduction is also compromised in PAD2/4 DKO female mice, which we hypothesize is reduced similar to males. To test this hypothesis, we first measured pubertal onset in female PAD2/4 DKO mice and found that it takes approximately 5 days longer to initiate puberty. Female PAD2/4 DKO mice spend significantly longer in the diestrus phase of the estrous cycle and have smaller uteri and ovaries as compared to wild type controls. In female PAD2/4 DKO mice, pituitary LHβ and FSHβ mRNA is decreased compared to controls during estrus as is serum LH and FSH. In conclusion, the decrease in LHand FSH levels and corresponding altered estrous cycles suggest that the loss of PAD2/4 inpituitary gonadotropes may contribute to the reproductive phenotype of female PAD2/4 DKO mice and the downstream effects on the female reproductive tract.

Jimenez, Jose

Casper College
INBRE

Western Tiger Salamander Surveys in the Bighorn Basin and Bighorn Mountains

Western Tiger Salamanders (Ambystoma mavortium) are the only native salamanders in Wyoming. However, there are no records of any Western Tiger Salamanders in the Bighorn Mountains. We aim to investigate the elevational distribution of Western Tiger Salamanders within the Bighorn Basin and Bighorn Mountains. We conducted 8 surveys at different elevations ranging from 4396 feet to 8638 feet from May to August 2025 using dipnets, funnel traps, and visual encounter surveys. We did not detect any Western Tiger Salamanders during our surveys, but we did capture 20 Wood Frogs (Lithobates sylvaticus), a Wandering Gartersnake (Thamnophis elegans), 3 unidentified tadpoles, and 1 unidentified metamorph at 3 different survey locations. These were captured via dipnet and hand captures. We plan to conduct more amphibian surveys in 2026 in order to better understand the distribution of Western Tiger Salamanders in the Bighorn Basin and Bighorn Mountains.

Larson, John

University of Wyoming (UW)
INBRE

Optimization and Validation of a Lipid Derivatization and Detection Method using GC-MS

Lipids provide many important functions vital to the cell, such as structure, energy storage, and cell signaling. Thus, it is necessary to gain a firm understanding of their compositions across different cell types and conditions. This research aims to develop Gas Chromatography-Mass Spectrometry (GC-MS) methods to detect lipids in biological samples. Successful completion of this proposed work will enable us to determine differentiating lipid features between biological samples. Previous studies have found that while lipids were successfully identified, high variability prevented the detection of differences in the relative abundance of lipid levels between biological samples. This project seeks to investigate each step of the GC-MS lipidomics protocol to identify potential problems in derivatization and employs GC-MS for instrumental analysis. The project strategy involves testing increasingly complex samples, starting with simple fatty acid mixtures and progressing to biological samples, including bee larvae. Collected data will also be evaluated by comparison with Liquid Chromatography-High resolution-MS and MALDI-ToF-MS analysis. Knowledge gained from these investigations will assist in the design of future lipidomics analyses of a wide range of biological samples.

Latimer, Sam

Western Wyoming Community College (WWCC)
INBRE

Moving Beyond Binary: Quantifying PopZ–Client Protein Interactions Using Image-Based Analysis

Protein–protein interactions are often characterized using binary classifications of "interaction" or "no interaction," which can obscure more subtle but biologically meaningful differences in binding strength. In Caulobacter crescentus, the Polar Organizing Protein Z (PopZ) plays a central role in organizing polar complexes through interactions with multiple client proteins. While prior work has identified key residues involved in these interactions, a quantitative framework for assessing interaction strength has been lacking. In this study, we developed a method to quantify the relative strength of PopZ-client protein interactions, enabling detection of partial loss-of-function phenotypes. Fluorescence microscopy images were collected and analyzed using NIS-Elements software to measure cellular localization patterns associated with PopZ and its client proteins. Quantitative measurements from individual cells were exported into spreadsheet format and processed using a custom Python-based analysis pipeline. This computational workflow automates data cleaning, normalization, and statistical analysis, and generates graphical outputs to visualize interaction strength across mutant variants. By moving beyond binary scoring, this approach allows for more nuanced characterization of how specific mutations affect protein interactions. Application of this method to PopZ mutants revealed a spectrum of interaction strengths, highlighting residues that contribute differentially to binding with client proteins. This quantitative framework provides a more accurate representation of molecular interactions and can be broadly applied to other systems. Overall, this work establishes a reproducible and scalable method for quantifying protein-protein interactions while integrating computational analysis into undergraduate-driven research.

Lockwood, Thomas D

University of Wyoming (UW)
INBRE

How the Brain Ages: Spatially Mapped Gene Expression Changes in a Mouse Model

Aging is a natural biological process characterized by progressive physical, cognitive, and physiological decline. Although life expectancy has increased substantially via medical advancements, chronic non-communicable diseases, such as Alzheimer's disease, are becoming a growing burden in older populations. To help address this challenge, transcriptomics offers a systems level snapshot of the proteome's functional state, revealing key cellular and cell type specific drivers of natural aging. Spatial gene expression profiling, using high resolution Visium HD technology, enables mapping of these changes within native tissue architecture. Comparison of 18 month versus 1 month old mouse hippocampal formation revealed global upregulation of genes across CA1,CA2, CA3, dentate gyrus, and subiculum subregions. Differential gene expression analysis volcano plots show a pronounced shift towards upregulated genes (log2FC > 0) in the 18 month hippocampi compared to 1 month old mice, with a subset of genes reaching statistical significance (p-adjusted < 0.05).Gene ontology analyses reveal these upregulated genes are strongly enriched for (i) biological processes involved in regulation of synapse organization, synapse structure, and synapse activity, (ii) molecular functions involved with actin binding, calmodulin binding, and phosphatase binding, and (iii) cellular components such as presynaptic, synaptic, postsynaptic, and axonal structures. These alterations suggest enhanced synaptic remodeling and cytoskeletal dynamics as enhanced features of hippocampal aging, with potential impact on neural plasticity and cognitive resilience.

Together, this technique uncovers key molecular drivers of brain aging and reveals key mechanisms underlying hippocampal plasticity and cognitive function, providing a foundation for therapeutic strategies targeting age related neurodegenerative diseases.

Mahoney, Jasmin

University of Wyoming (UW)
Honors College Capstone, INBRE, NASA Space Grant

From Hallucinations to Therapeutics: Investigating the Molecular Basis of Psychedelic Action on Sensory Processing

The powerful effects of psychedelics have long been recognized and used by humans for millennia in various cultural and ritual practices. Modern science shows the potential therapeutic benefits of psychedelics include their ability to treat neurobiological disorders through disrupting established neural connections and promoting new ones. Unfortunately, the hallucinogenic nature of psychedelics is a barrier to the clinical use of the drugs; therefore, the key to harnessing psychedelics is the development of non-hallucinogenic analogs. This requires a greater understanding of the molecular pathways that psychedelics activate. The current behavioral model for hallucinogenic-like effects in mice is the head twitch response; this model is limited by being an imperfect predictor of hallucinations in humans and not resembling human hallucinations. These problems make it necessary to find a new way to study hallucinations that is more readily connected to what humans experience, such as synesthesia, wherein one sense gives the impression of another. This project explores how psychedelics, specifically psilocybin and LSD, affect sensory processing in the brain and whether they induce synesthesia-like responses in mice. Using TRAP2 mice crossed with Ai14 reporter mice we mapped sensory cortex activation in response to sound, light, and odor to assess how psychedelic drugs alter neuronal activity across sensory regions. Using this novel approach, we hope to provide an orthogonal method for investigating psychedelic-induced hallucinations, improving our ability to uncover the molecular pathways involved in sensory perception changes, and identifying mechanisms that could support the development of safer, non-hallucinogenic psychedelic treatments.

Maurer, Ryley Matteson

University of Wyoming (UW)
NASA Space Grant, Wyoming Research Scholars Program

Effects of Insulin-Like Growth Factor-1 on Embryo Development and Differentiation Following Dissociation

Dissociation of early bovine embryos can be a useful tool for multiplying the number of embryos produced from in vitro fertilization (IVF). However, the technique can result in reduced embryo development, and alterations in allocation of cells to the inner cell mass (ICM) and trophectoderm (TE). An approach to improve the efficacy of dissociation could be to include Insulin-like growth factor-1 (IGF-1) in the post-dissociation culture medium. Prior research has documented positive effects of IGF-1 on early bovine embryo development. The objective of this study was to determine whether IGF-1 supplementation improves the development and differentiation of bovine embryos following dissociation. Embryos were produced in vitro using oocytes derived from abattoir ovaries. At 44-50 hours after IVF, embryos with approximately 8 cells were harvested and either left intact or dissociated. Dissociated blastomeres were cultured either individually or in pairs. Embryos from each group were randomly assigned to be cultured until day 7 after IVF in medium supplemented with or without IGF-1. Development to the blastocyst stage was recorded at day 7 and blastocyst stage embryos were subsequently fixed and analyzed via immunofluorescence to visualize cell allocation to ICM and TE lineages. It is anticipated that post-dissociation supplementation with IGF-1 will improve blastocyst development and total cell number, and result in embryos with a more balanced ICM and TE allocation. The findings of this work will provide insight into the role of IGF-1 in manipulation-induced stress and can further inform strategies to improve the efficiency of in vitro embryo production.

Mautz, Blake Westen

University of Wyoming (UW)
Wyoming Research Scholars Program

Stratigraphy and Depositional Environments of the Mesa Verde Group in Central Wyoming.

The Campanian Mesaverde Formation in central Wyoming has received minimal paleontological or stratigraphic investigation in comparison to neighboring regions despite containing some significant nonmarine fossil localities (Demar & Breithaupt, 2006, 2008). A total of six stratigraphic members make up the Mesaverde Formation; the Fales Sandstone, Wallace Creek Tongue, Parkman Sandstone, middle member, North Platte tongue, and Teapot Sandstone. Our study seeks to understand the depositional sequences throughout the middle to upper Campanian within the southern Wind River Basin and southwestern Powder River Basin. New marine mollusk collections from the Parkman Sandstone, North Platte tongue, and overlying Lewis Shale refine the chronostratigraphic framework using Western Interior Ammonite Biozonation (Cobban et al., 2006; Singer et al., 2023). Additional, nonmarine vertebrate and plant fossil collections from the study area hold significant promise for future paleontological investigations within the area to help fill a significant gap in fossil occurrences between northern and southern Laramidia.

McHargue, Emma

University of Wyoming (UW)

Storage of Energy Deposits in Migratory Whales

Migratory whales are amongst the largest mammals that migrate annually between their feeding and breeding grounds. Whales use a significant amount of time and energy each year to migrate. They acquire several large quantities of energy reserves and store that energy in fat depots. Their migration between feeding and breeding grounds can involve a complex internal and external process as well as species-specific environmental factors. This research addresses the question; how do migratory whales use their energetics? To conduct this research, peer-reviewed, scholarly articles were found using Google Scholar and the University of Wyoming's library search system. This research showed that there are a variety of ways that migratory whales store and use their energy budget to travel long distances between high and low latitude areas. Pregnant females use significantly more energy when carrying a calf. Lunge-feeding results in a high-cost and high-benefit foraging method that confers high energetic efficiency. Lunge-feeding is a type of filter feeding; baleen whales will propel themselves through a school of fish or krill with their mouth open. Unfortunately, studies that do involve migratory patterns and dietary strategies in baleen whales tend to be difficult because they have wide range of distribution, diving and movement patterns that limit the number of observation datasets (Blevins, 2021). Future directions, I would like to see more studies done or be able to conduct my own research on whale energetics and how they use it for migratory, reproduction, or feeding purposes. [EM1]Future direction

Meyer, Jayton T

University of Wyoming (UW)
McNair Scholars Program

Effects of Psychedelic Compounds on Alcohol Consumption and Neural Activity in Mice.

Alcohol use disorder (AUD) is a medical condition that is characterized as a pattern of alcohol use that causes negative effects on health and daily life. Psychedelics such as psilocybin and DOI (2,5-Dimethoxy-4-iodoamphetamine) could have potential to reduce ethanol (EtOH) consumption in TRP/Ai-14 (TRAP2 + Ai14) mice. Mice models will be used to test if psychedelics have an affect on alcohol consumption. They will be exposed to a psychedelic compound or a controlled substance, and EtOH consumption patterns will be measured. Brain tissue will also be analyzed to assess neuronal activities of these treatments. We hope to answer if there is a relationship between psychedelics and the reduction or elimination of alcohol consumption in mice, as well as whether there is an alteration in neuronal activity in the mice treated with the psychedelic. This study aims to provide insight on how different psychedelic compounds can affect neuronal pathways involved with AUD and potentially be used in further research.

Muller, Lizay

University of Wyoming (UW)
Wyoming Research Scholars Program

The Impact of the Microbiome on Sustainable Food Animal Production

The poultry industry is one of the fastest-growing sectors in global agriculture, where optimizing production efficiency while maintaining animal health is critical for sustainable food systems. Increasing concerns surrounding antimicrobial resistance and restrictions on antibiotic use have created a need for alternative strategies, such as probiotics, to support growth and gut health. This study evaluated the effects of dietary probiotic supplementation on growth performance, feed efficiency, and intestinal morphology in broiler chickens raised under production-like conditions. A controlled feeding trial was conducted from hatch to 34 days, with broilers assigned to either a standard control diet or a probiotic-supplemented diet. Body weight and feed intake were recorded weekly to calculate feed conversion ratio (FCR), while mortality and health indicators were monitored throughout the study. Intestinal samples were collected for histological analysis, and statistical significance was assessed using ANOVA ($p < 0.05$).Preliminary results showed that probiotic supplementation significantly improved production outcomes, including increased carcass weights ($p = 0.0097$), reduced mortality (6% vs. 10.5%), and improved feed conversion ratios (1.41 vs. 1.53). Additionally, probiotic-fed birds demonstrated enhanced intestinal morphology, suggesting improved nutrient absorption. These findings highlight the potential of probiotics as a sustainable alternative to antibiotics in poultry production, supporting improved animal health, production efficiency, and long-term food system sustainability.

Myers, Amelia

University of Wyoming (UW)
Modern Electronics and Experimental Tech; PHYS 3640

Measuring the Stars: Building a Research Grade Photometer for Under $100

Light is the key to understanding the universe in astronomy. Many disciplines utilize photometers; a device that measures the brightness of stars and nebulae. However, the commercial photometers required for this precise research often cost thousands of dollars, creating a significant financial barrier for undergraduate programs and citizen scientists. This project details the design, construction, and calibration of SPICA, a highly sensitive, research-grade stellar photometer built entirely from accessible, off-the-shelf electronic components for under $100. By pairing a silicon photodiode with a custom-built amplifier circuit and an Arduino microcontroller, the device successfully translates the faint light of distant stars into precise digital data. Critical engineering challenges, such as filtering out microscopic electrical noise and calibrating the sensor to true "zero" darkness, were resolved through custom software algorithms and strategic hardware design. The resulting instrument provides a cost-effective, open-source blueprint that empowers students and amateur astronomers everywhere to actively participate in quantitative astrophysical research.

Ossa, Tavia

University of Wyoming (UW)
Wyoming Research Scholars Program

Investigating moose movement and usage of beaver-modified habitat during megafire

Beavers (Castor canadensis) heavily modify riparian habitats by digging channels and damming streams. Previous research demonstrates that beaver-modified habitats often experience lower burn severity during wildfires, but little research has directly assessed habitat use during fire. Our research investigates moose movement and use of beaver-modified habitat during the 2020 Mullen Megafire in the Snowy Mountain Range of Southeastern Wyoming. Megafires are increasing in frequency and severity due to hotter, drier conditions and increased fuel. Yet our understanding of how animals cope with extreme disturbance remains limited because wildfire is unpredictable. In 2017, 28 moose were collared in the Snowy Range, and the Mullen Fire unexpectedly coincided with this effort, providing rare observations of animal movement and habitat use during a megafire. Our research seeks to investigate whether moose altered their movement and space use during the fire to occupy beaver-modified riparian habitats, which are known to experience lower burn severity than surrounding landscapes. By integrating GPS collar data, fire severity metrics, and spatial data describing beaver modification, we assess whether these areas were used disproportionately during active burning. Understanding whether beaver-modified habitats influence animal behavior during wildfire can inform wildlife management and help target beaver restoration in fire-prone landscapes.

Payne, Elena

University of Wyoming (UW)
INBRE

Assessing the Genetic Overlap Between Ribosome-Related Pathways and Depression

Major Depressive Disorder (MDD) is a complex psychiatric condition affecting millions globally and is often resistant to medication-based treatments. Despite its prevalence, the biological underpinnings of MDD remain poorly understood, limiting effective therapeutic developments. Recent findings suggest that ribosomal protein genes (RPGs)—essential for protein synthesis and involved in cellular stress response— may contribute to MDD pathophysiology. This project extends these findings to other RPG-related biological pathways and assess their cumulative genetic liability in MDD using polygenic risk score (PRS) analysis. PRS aggregates the effect of multiple genetic variants, weighting them based on their strength of association from genome-wide association studies (GWAS), to estimate overall risk. PRS was calculated using genome-wide association data from the Psychiatric Genomics Consortium. Understanding these differences could help identify more precise biomarkers and inform future treatments for depression.

Perin, Fatima

UW at Casper (UW-C)
INBRE

Staining Microplastic Fibers: A Preliminary Dye Comparison

Accurate identification of microplastic fibers (MFs) in environmental samples is challenging, particularly for transparent or small particles. Fluorescence staining, particularly with Nile Red, has evolved as a quick detection approach, but issues remain in terms of specificity, degradation, and appropriate, cost-effective methods. This study compared the staining efficacy of Nile Red, Rit Dye Super Pink, Rose Bengal, Methylene Blue, and Turmeric on 6 of the most abundant microfibers (cotton, rayon, acrylic, polyester, polyamide, and polypropylene).

Perkins, Campbell

University of Wyoming (UW)
INBRE

Overcoming and Exploiting Coagulation Kinetics for 3D Printing of Fibrin

Tissue engineering is a multidisciplinary field of research that combines various scientific fields in order to repair/enhance malfunctioning or injured tissue. Additive Manufacturing (3D printing) is an emerging method for fabricating complex structures by extruding material layer by layer. Fibrin, a native wound healing material, will be 3D printed using a novel process that utilizes rapid coagulation kinetics to control printing parameters. The project goal is to utilize the rapid conversion of soluble fibrinogen into fibrin to 3D print fibrin-based structures in order to study wound healing and cartilage regeneration. Fibrin is highly elastic with excellent cell adhesion, but rapid gelation and poor mechanical properties have greatly limited its use in tissue engineering. At Dr. John Oakey's lab, several technologies have been patented that allow for increased fibrinogen macromer concentration, which increases mechanical strength, and enable the production of fibrin-based constructs with far better mechanical properties than previous fibrin-based materials, allowing for fibrin to be printed directly, rather than as a component. To achieve our goal, we plan to inject the catalyzing enzyme thrombin into a concentrated solution of fibrinogen, which will rapidly convert the surrounding fibrinogen into fibrin, trapping the remaining thrombin in a diffusion-limiting cocoon of now-polymerized fibrin. Fibrin is implicated in nearly every pathology, from acne to Alzheimer's, and our novel approach to fibrin printing makes it much simpler to study the interplay of fibrin and disease states in more complex in vitro environments than what is achievable by current tools.

Peterson, Emma Ann

University of Wyoming (UW)
INBRE

Neurodegenerative Plasma Biomarkers in Association with Prospective Memory Lapses: Informing Risk for Alzheimer's Disease and Cognitive Decline

This project examined everyday prospective memory (PM) lapses, instances of forgetting that happen in daily settings (e.g., forgetting to take medication on time or attend an appointment), in older adults. Specifically, we examined older adults' PM lapses in association with certain neurodegenerative biomarkers (i.e., beta-amyloid, p-tau) that have been implicated in risk for cognitive decline and Alzheimer's disease and related dementias (ADRD). The design of this research lied primarily in secondary data analysis. We used previously unanalyzed data from the Einstein Aging Study, an ongoing longitudinal study taking place in the Bronx, NY. As part of study procedures, participants complete 14 days of cognitive assessments that include self-reported PM lapses. At the start and end of the 14-day period, participants also complete blood draws from which neurodegenerative biomarkers are quantified. This primary aim of this research was to examine the associations between PM lapses and the neurodegenerative biomarkers beta-amyloid and p-tau (independently) to see whether the combination of these measures may indicate greater risk for ADRD. A secondary aim was to examine possible gender differences in these links, as women are at a greater risk for ADRD than men. Understanding the context of these differences will be beneficial in improving early detection. By understanding if PM lapses are associated with these neurodegenerative biomarkers, early detection of ADRD can be improved, which allows for treatment to be administered earlier to preserve the cognitive abilities of individuals at risk of cognitive decline.

Pieper, Bernadette

University of Wyoming (UW)
INBRE

From Purees to Plates: Caregiver Perspectives on Transitioning to Solid Foods for Infants

Purpose: The purpose of this research study is to find and gain an understanding of parents' and caregivers' experience supporting a child with a cleft palate during the transition to solid foods. The primary outcome was involved with challenges encountered, strategies used, sources of guidance, and individuals who provided support throughout the process. Background: Children with a cleft palate will have surgery around 1 year of age to repair the hole in the roof of their mouth (Kotlarek et al., 2024). However, infants usually start transitioning from a solely liquid diet to solid foods starting at four months and continuing through 12 months of age (Norlyk, Larsen, Kronborg, 2019). While feeding children with cleft palate with special bottles is common practice, very little information is available for caregivers and healthcare providers when it comes to transitioning to solid foods. Methods: Parents and caregivers of children ages 1 to 5 years old with cleft palate were invited to participate in this study. Participants were organized into focus groups ranging from four to five participants in each group. The focus groups met over Zoom to discuss their experiences with the transition of their children to solid foods. Discussions were recorded, transcribed, and transcripts were reviewed to identify overall themes, such as strategies that worked, challenges faced, and what support and guidance given and helpful. Results: Data is being analyzed and finalized.

Powers, Cassidy

University of Wyoming (UW)
Wyoming Research Scholars Program

Design and 3D Printing of Programmable Stiffness Metamaterials for Failure Resistant Aerospace Structures

Achieving lightweight designs for aerospace components plays a critical role in modern aerospace structures. However, reducing weight often compromises static and dynamic stiffness, which are essential to structural performance. Insufficient stiffness can lead to excessive vibrations, loss of functionality, and potentially catastrophic failure under aerodynamic loading. Mechanical metamaterials offer a promising solution by enabling lightweight structures with programmable mechanical properties such as tunable stiffness. However, manufacturing these complex metamaterials presents a significant challenge. In this project, we will investigate programmable stiffness metamaterials featuring arched microstructural elements designed for impact absorption and enhanced toughness in safety-critical aerospace applications. These metamaterials exhibit progressively increasing stiffness modes that can be precisely tuned to meet specific application requirements. This ability enables control over both stiffness and dynamic behavior, allowing engineers to tailor structural response to varying loading conditions. To develop and evaluate this metamaterial, metamaterial samples will be fabricated using additive manufacturing techniques such as 3D printing. Experimental testing will then be conducted to validate the analytical models and evaluate the structural performance of the printed samples. This research will enable the fabrication of mechanical metamaterials not just for aerospace applications but for other high-performance applications such as robotics and smart structures.

Poyer, Hudson

University of Wyoming (UW)
INBRE

Beyond the Swab: Finding What Covid Tests Missed

During the early COVID-19 pandemic, many symptomatic patients tested negative for SARS-CoV-2 and were not evaluated for other respiratory pathogens due to limited testing capacity. This created a diagnostic gap and limited understanding of circulating respiratory illnesses. In collaboration with the Wyoming Public Health Laboratory (WPHL), we re-examined archived COVID-negative nasopharyngeal swabs to identify potential pathogens responsible for these unexplained illnesses. Archived viral transport media samples were thawed and processed using automated RNA and DNA extraction. Samples were analyzed using four complementary diagnostic approaches: the QIAstat-Dx Respiratory Panel, Oxford Nanopore GridION shotgun metagenomic sequencing, Illumina MiSeq shotgun sequencing, and the Illumina Respiratory Pathogen ID/AMR Panel on the NextSeq 2000. This multi-platform strategy enabled both targeted detection of known pathogens and unbiased identification of unexpected organisms.A diverse range of microbes was detected, including respiratory viruses such as SARS-CoV-2, adenovirus, and human coronavirus NL63, as well as bacteria like Moraxella catarrhalis. Opportunistic organisms such as Burkholderia cepacia complex, and Escherichia coli were identified, along with the environmental fungus Alternaria infectoria. Filtering results to organisms detected at or above 60% confidence suggested that many patients were most likely infected with a mixture of viral and bacterial pathogens missed during initial testing. Low-confidence SARS-CoV-2 detections in three samples likely reflect viral loads below early PCR detection thresholds. These findings highlight the value of retrospective sequencing and multi-platform diagnostics in identifying overlooked respiratory infections and improving preparedness for future public health events.

Qualm, Hannah

University of Wyoming (UW)
Wyoming Research Scholars Program

Meeting the demands of motherhood: behavioral state comparisons between reproductive and non-reproductive moose

In species that provide maternal care, females face the most costly and time-intensive period of reproduction immediately after giving birth. There are many demands associated with rearing young, such as maternal care, lactation, and increased vigilance. Therefore, to meet both the needs of an offspring and their own, we expect reproductive moose (Alces alces) to adjust their behavior to accommodate the demands of reproduction. However, the scale at which reproductive moose may alter their behavior compared to non-reproductive moose remains unclear. Using camera collars, we will build activity budgets to evaluate the proportion of time spent bedded, foraging, and ruminating. Subsequently, we will compare activity budgets of reproductive and non-reproductive moose to determine whether moose alter their behavior to meet the demands of motherhood. Overall, reproductive status, maternal trade-offs, and behavioral differences in female moose can contribute to a greater understanding of life history patterns and population dynamics of moose.

Rios, Liliana Mae

University of Wyoming (UW)

DIFFERENCES IN EATING DISORDER PATHOLOGY BASED ON FAD HISTORY AND MOTIVES

Food and alcohol disturbance (FAD) is the use of compensatory behaviors within a drinking episode to enhance alcohol's effects (FAD-AE) and/or for alcohol-related caloric compensation (FAD-CC). FAD is associated with greater alcohol-related consequences than alcohol use alone, especially among individuals endorsing both motives, yet it remains unclear whether there are similar differences on eating disorder (ED) pathology. This study examined whether cognitive (body dissatisfaction, cognitive restraint) and behavioral (purging, restricting, excessive exercise, binge eating, muscle building) domains of ED pathology differed between those who use alcohol only and those engaging in FAD for specific motives. Participants were 2518 (Mage=19.39; 76% female; 65.4% White non-Hispanic) undergraduates from six universities who reported past-month alcohol use. Participants were categorized into four groups: Alcohol-Only (22.6%), FAD-CC (8.1%), FAD-AE (24.1%), or FAD-Both (45.3%). ANCOVAs examined group differences in ED pathology domains, controlling for biological sex. The Alcohol-Only group reported less ED pathology than all groups but did not differ from the FAD-AE group on muscle building. The FAD-Both group reported greater body dissatisfaction, binge eating, purging, and restriction than all groups, and greater cognitive restraint, excessive exercise, and muscle building than all groups except FAD-CC. Among those reporting FAD for a single motive, the FAD-CC group reported greater cognitive restraint, restriction, excessive exercise, and muscle building than FAD-AE. Findings suggest that undergraduates engaging in FAD, especially for FAD-Both, may represent a high-risk group for experiencing ED pathology warranting tailored intervention efforts. Replication in more diverse samples is needed given the predominantly White and female sample.

Rittle, Theodore

University of Wyoming (UW)
Wyoming Research Scholars Program

Cyanobacteria Community Shifts in Wyoming Lakes

Harmful Cyanobacterial Blooms (HCBs) are increasing in prevalence worldwide, and can have negative effects on humans, ecosystems, and the health of fisheries through the release of cyanotoxins and disturbances to water chemistry and trophic systems (Paerl & Otten, 2013). Severe HCBs have been occurring in a number of Wyoming water bodies, including Boysen Reservoir and Brooks Lake near Dubois, WY. Throughout the summer and fall of 2025, we took bi-weekly water samples from lakes in central and southeast Wyoming that have been experiencing HCBs and identified the cyanobacterial taxa present. The nitrogen-fixing species Dolichospermum flos-aquae frequently dominated the cyanobacterial flora early in the season, while the non-nitrogen fixing genera Aphanizomenon, Microcystis, and/or Aphanocapsa frequently dominated later. In general, the patterns of cyanobacteria presence and dominance were complex and unpredictable, raising interesting questions for further research about what factors influence the composition of cyanobacteria communities during cyanobacteria blooms and how the composition of these blooms influences their effects on fisheries and aquatic ecosystems. Paerl, H. W., & Otten, T. G. (2013). Harmful Cyanobacterial Blooms: Causes, Consequences, and Controls. Microbial Ecology, 65(4), 995–1010. https://doi.org/10.1007/s00248-012-0159-y

Roberts, Tanner Edward

University of Wyoming (UW)
INBRE

Iron regulation of Toxoplasma gondii vaccine induced T-cell expansion Via Iron regulation of Toxoplasma gondii vaccine induced T-cell expansion

Toxoplasma gondii is an obligate intracellular protozoan parasite that infects a large portion of the global population and can cause serious disease in immunocompromised individuals. Protective immunity against T. gondii depends heavily on strong CD4+ and CD8+ T-cell responses, particularly through IFN-γ production. Because iron is required for both parasite survival and lymphocyte activation and proliferation, we investigated whether host iron availability during vaccination affects the early expansion of vaccine-induced T cells. Mice were vaccinated with the attenuated, non-replicating T. gondii vaccine strain OMPUP and treated with the iron chelator deferiprone (DFP) from day -1 through day +4 to transiently reduce iron availability during the priming and expansion phase. On day 6 post-vaccination, peritoneal exudate cells were collected and analyzed by flow cytometry using CD11a and CD49d as markers of parasite-specific CD4+ and CD8+ T cells. DFP treatment reduced the expansion of both T-cell populations compared to vaccinated vehicle-treated controls. CD4+ antigen-experienced T cells decreased from 8.9% to 2.8%, while CD8+ T cells decreased from 2.1% to 1.4%. Previous work from our lab also showed that mice vaccinated under iron-restricted conditions lost protection following lethal rechallenge. Together, these data suggest that host iron availability during the early period after vaccination is important for the expansion of protective T. gondii-specific T cells, with CD4+ T cells appearing more sensitive to iron restriction than CD8+ T cells.

Roth, Tyler Lee

University of Wyoming (UW)
INBRE, Honors College Capstone

Engineering Allogeneic Schwann Cells to Survive After Transplantation for Spinal Cord Injury

Shortly after a Spinal Cord Injury (SCI), there is a massive fault in the body that causes major degradation across an extended period following injury. This degradation expands from the area of injury and the area surrounding it. This phenomenon is called Secondary Injury. Very recently, to attempt to prevent this degradation, there has been an interest in Schwann Cells, the main glial cells of the peripheral nervous system, as they have shown many pro-regenerative benefits revolving around Secondary Injury. The purpose of this study will be to test if the cytokine Interleukin-10 (IL-10) can be added to the Schwann cells, as IL-10 has been shown to suppress the immune response, while allowing the transplanted Schwann cells to survive. We will be culturing Schwann Cells and observing their behavior when exposed to host immune cells. Specifically, we will be looking for how many host immune cells are needed to kill a single Schwann Cell and the time frame in which this occurs. If there is a significant difference in the time frame and the survival rate of Schwann cells within the IL-10-infused media, IL-10 will be shown to express an immunosuppressant effect within the Schwann cells. We will also be looking for the lowest concentration of IL-10 needed to prevent the cell killing of Schwann Cells. Successful completion of this test will show that IL-10 can give Schwann Cells the ability to express an immunosuppressant effect.

Rothfuss, Connor H

University of Wyoming (UW)

Using LLms to enhance computer vision

Historical newspapers hold a wealth of information that remains largely inaccessible in digital form. Most newspaper archives exist as scanned image files, meaning the text cannot be searched, analyzed, or built upon in any meaningful way. This project presents an automated pipeline designed to change that.The pipeline takes raw PDF scans of historical newspaper pages and processes them in three stages. First, each page is converted into a high-resolution image. Next, Tesseract OCR reads the text off the image and outputs it as a structured JSON file. Finally, a locally hosted large language model, run through Ollama, acts as a post-processing layer that reads the raw OCR text and separates it into individual articles, each saved as its own JSON file. The result is a scalable, cost-effective system for digitizing newspaper archives without relying on expensive cloud APIs. By using a local LLM for article separation rather than traditional layout-detection methods, the pipeline handles the inconsistent and complex layouts common in historical print media more effectively than rule-based approaches. The structured output is well-suited for downstream tasks like full-text search, topic modeling, and named entity recognition.

Sayer, Rachel

University of Wyoming (UW)
Historical Methods Research Paper (HIST3020)

Intentionality of Propaganda in Comic Books in World War II

This work centers around the intentional creation of propaganda within comic books during the Second World War. It explores beloved superheroes like Captain America, Superman, and Wonder Woman, and the role propaganda held within their stories. Arguing that these characters and their comics, which have become cultural tenets, were designed not only for sales but to shape readers' emotions, reinforce specific political attitudes, and prepare a generation of young Americans to stand up for the nation dutifully in this global conflict. This work places comics as valuable cultural artifacts that mirror Americans' fears, values, and fantasies during wartime. Research was conducted through archival primary sources as well as a variety of secondary literature. Ultimately, this history of intentionally produced comic book propaganda reveals the extraordinary power of visual media to construct national identity and influence public attitudes. Their simplistic narratives expose the ways propaganda can function by appealing to emotions and shaping the moral framework, embedding ideology into familiar cultural forms. While examining these materials, readers are forced to confront uncomfortable truths about how racism, patriotism, and national mythology were embedded in children under the guise of entertainment. It leads to new insights into the mechanics of propaganda, representing the importance of critical media literacy today.

Schildmeier, Sierra

University of Wyoming (UW)
McNair Scholars Program, Honors College Capstone

Survivor Expectancies for the Disclosure of Trauma and Functional Impairment: An Assessment of Moderating Factors

Discussing traumatic events with others can impact individuals' mental health in positive ways. However, negative beliefs about the consequences of sharing experiences can reduce the likelihood of speaking with others and, as a result, overall functioning. The relation between negative beliefs and post-trauma functioning may also differ across men and women and as a function of current symptoms of PTSD. For the current study, the unique and interactive effects of survivor sex, negative beliefs about sharing, and PTSD symptom severity on global functioning was examined in university students exposed to significant trauma. Overall, results found that the link between negative beliefs about sharing reduced functioning was stronger for men than for women. Associations between negative beliefs and reductions in functioning were also stronger for individuals with more, as opposed to less, severe symptoms of PTSD. Results may be used to help clinicians to identify points of potential impairment and to further refine treatments of PTSD.

Schofield, Kiara Mykelle

University of Wyoming (UW)
Wyoming Research Scholars Program

Treatment of Toxoplasma gondii targeting autophagy

Toxoplasmosis is a parasitic infection caused by Toxoplasma gondii (T. gondii) and that is estimated to infect roughly 30-50% of the global population. T. gondii is a serious infection, and can become an asymptomatic lifelong infection through cysts in the heart muscle and brain neurons. There are few treatments for a Toxoplasmosis, and none that prevent or completely clear the infection. Using alternative strategies such as metabolic pathways or organelles specific to T. gondii could be an effective route in clearing these infections. Autophagy is a prime candidate for therapeutic or regulatory interventions for toxoplasmosis, as T. gondii is suggested to utilize host autophagy machinery for proliferation. A series of assays will be performed to determine which drugs target ATG4 and ATG8 and prevent the infection of T. gondii in human cells. Some of these assays include a BRET-based ATG8 sensor and biochemical characterization of hit molecules.

Sinnott, Amanda F

University of Wyoming (UW)
INBRE

Natural Variation in Brain Size Across Wild-Type Lines of Drosophila melanogaster

Drosophila melanogaster is a widely used model organism that can be used for studying human diseases. The Drosophila Genetic Reference Panel (DGRP) is a resource for investigating natural genetic variation in wild-type lines of Drosophila because each line has a stable genotype and most have fully sequenced genomes. Many trait analyses have been conducted using these lines, but very few have studied variation in brain size. This study aims to quantify natural variation in brain sizes across wild-type lines from the DGRP using micro–computed X-ray tomography (μ-CT), as a non-invasive imaging technique. I hypothesize that there will be significant differences in brain volume across the different genetic backgrounds. Understanding the natural variation in brain size across these lines could provide data for future genotype to phenotype mapping which may contribute to understanding of genetic mechanisms involved in brain development.

Stevens, Taylor

University of Wyoming (UW)
Wyoming Research Scholars Program

Short-term high fat diets increase inflammatory markers in the brain

Obesity is a worldwide epidemic associated with many environmental factors, such as poor diets and sleep habits. These environmental factors can result in physiological changes before obesity occurs and increase the risk for cardiometabolic diseases and mental health disorders. The brain plays a critical role in these disease states, and specialized cells called glia can respond by inducing neuroinflammation and repair. Here we use a mouse model to explore the impact of a one-week acute high-fat diet (aHFD) in brain regions associated with metabolic function and cognition. Our aim is to understand the physiological consequences of environmental changes before obesity occurs. We approach this aim by examining changes in glial activation after aHFD exposure, a marker for inflammatory responses, and neural repair in the brain. We specifically target two types of glial cells called microglia and astrocytes. Both cell types help to repair neural damage in the brain. Using immunohistochemistry and fluorescent microscopy, we labeled brain regions involved in food intake and metabolic function, including the arcuate nucleus of the hypothalamus and the dorsal vagal complex. We also examined the prefrontal cortex, which is involved in cognitive function. We marked astrocytes with an antibody for GFAP and utilized an Iba-1 antibody to label microglia. Our findings lay out the groundwork for understanding how the brain responds to environmental changes before obesity occurs. We anticipate that our work will propel new avenues for early behavioral and pharmacological interventions to improve human health.

Straight, Abagail

University of Wyoming (UW)
INBRE

Mechanisms of PopZ-Mediated Client Recruitment

Several bacterial species are polarized, meaning they have specialized structures at one or both ends. Depending on the species, polarization can be critical for cell cycle regulation, chromosome segregation, motility, and even pathogenesis. PopZ is a pole-localized scaffolding protein that interacts with more than eleven known client proteins and recruits them from the cytoplasm to polar microdomains. PopZ contains a hub-like protein-binding domain, within which a small subregion of fewer than 28 amino acids appears to determine binding specificity. The goal of this project is to investigate client protein-binding specificity by identifying which amino acids in PopZ's hub domain are critical for binding to four different client proteins. Protein interactions are visualized and quantified by co-expressing PopZ and client proteins in Escherichia coli as fluorescently tagged fusion proteins. Using a library of all 560 possible point mutations within the 28-amino-acid hub region of PopZ, more than 5,200 individual colonies have been screened for loss of fluorescence colocalization with four different binding partners. Over 600 different mutants have been identified, many on repeated occasions. Their locations and identities reveal a distinct "fingerprint" of amino acid-sequence dependence within PopZ for each client protein.

Sutherburg, Korrin

University of Wyoming (UW)
SURE program, School Of Computing

Monitoring Aquifer-Bound Basin Snowpack in SE Wyoming using Multispectral Satellite Imagery

This study was performed alongside a hydrogeology study by Dr. Ye Zhang and Christopher Akuguru of the University of Wyoming which examined mountain-front stream recharge to a karst aquifer in the Denver Basin aquifer complex, the purpose of which was to identify the primary climate variable driving aquifer recharge and depletion in an area with minimal well water use. (Zhang et al, 2026). Preliminary results from time series analysis of streamflow and well sensors in Lone Tree Creek near the Belvoir Ranch area west of Cheyenne, WY suggests meltwater from snowpack in the upper Lone Tree Creek drainage basin as the primary driver of recharge within this aquifer; however, lack of access to private land within the upper LTC drainage basin prevented Dr. Zhang's team from confirming this data directly. This study uses geospatial analysis of remote sensing data obtained during the same period of time to measure presence of snow coverage within the upper LTC area. Variations in snow and ice coverage are measured using the Normalized Difference Snow and Ice Index (NDSII) calculated from publicly available multispectral satellite imagery. Multiple images are aggregated to calculate yearly snow hotspot zones and visualize the presence or absence of snow and ice within the boundaries of the upper LTC drainage basin on an annual basis. The resulting map products are shown alongside time-series data from Dr. Zhang's study showing streamflow rates for lower Lone Tree Creek and groundwater levels for the underlying aquifer to demonstrate the correlation between them.

Taylor, Kooper Lee

University of Wyoming (UW)
INBRE

Sex Differences in Alzheimer's Disease-Related Pathology and Circadian Dysfunction and the Role of Follicle Stimulating Hormone

Alzheimer's disease (AD) is a form of dementia categorized by the presence of misfoldedproteins in the form of amyloid plaques (a-beta) and tau tangles in the brain. AD is the fifth leading causeof death for people aged 65 and older in the United States, and two-thirds of AD patients are women. Thissex difference is thought to be at least partly due to the hormonal changes caused by menopause, whichnormally begins in women between the ages of 45 and 55 but can ultimately span over several years. Oneof the earliest symptoms of AD is circadian disruption, which emerges well before cognitive symptomsarise and contributes to the increased deposition of a-beta and Tau pathology. Circadian disruption in theform of sleep disturbances is one of the most reported symptoms of menopause. While the linkbetween AD and menopause is unclear, the similarity of symptoms suggests that further studies couldreveal shared mechanisms. We recently showed that an AD mouse model develops Tau pathology inlateral parabrachial (LPB) neurons of the brainstem that project to the circadian structures of thehypothalamus, at the same time that circadian dysfunction emerges. We found that both LPB Taupathology and circadian dysfunction developed much earlier in female AD model mice compared tomales. AD pathology is not seen in the canonical circadian regions of the hypothalamus in earlier Braakstages, yet it is present in the LPB as circadian dysfunction begins to arise. Our preliminary evidenceshows that gonadectomy increases LPB Tau pathology and circadian dysfunction in male and female ADmodel mice. Additionally, the gene for follicle stimulating hormone receptor (FSHR) is expressed in theLPB of wild-type (WT) mice and is upregulated in females compared to males. Follicle stimulatinghormone (FSH) levels increase following both gonadectomy and menopause, and exacerbate ADpathology and cognition decline. However, the role of FSH on circadian function and AD-relatedcircadian dysfunction is unknown. In this proposal we will use hormonal manipulations andneuroanatomical analyses to test my central hypothesis that FSH action in the LPB underlies sexdifferences in the onset of AD-related pathology and circadian dysfunction.

Turner, Therese

University of Wyoming (UW)

Growth and Defense Patterns in Endangered Whitebark Pine

Whitebark pine (Pinus albicaulis) is an endangered conifer species native to high-elevation subalpine environments. Threatened by disease, insect outbreaks, and climate change, its populations continue to decline with each passing year. Dendroecological methods, including annual ring measurements and resin duct analysis, are commonly used to reconstruct life histories and evaluate tree responses to environmental stressors. By linking environmental variability to annual growth patterns, researchers can gain a deeper understanding of the factors influencing tree performance and decline.While radial growth patterns have been suggested as indicators of a tree's condition, the role of traumatic resin ducts (TRD) and constitutive resin ducts (CRD) in reflecting individual responses to environmental stress is not well understood. In this study, we analyze annual ring width and resin duct production in deceased whitebark pine individuals to investigate how investment in defense relates to growth over time. We compare yearly CRD and TRD production to determine which is more strongly associated with periods of relatively higher growth prior to mortality.Because resin production is energetically costly, we hypothesize that increased traumatic resin duct production is negatively correlated with annual radial growth. Additionally, we evaluate the relative influence of temperature and drought stress on resin production and growth patterns. This approach allows us to assess how defense allocation and environmental stress interact to shape growth trajectories in whitebark pine prior to death.

Tzompa Martinez, Jesica

University of Wyoming (UW)
INBRE

Using Functional Analysis and Modeling to Test Proximity Labeling Candidates

Molting in nematodes, a process involving the removal of the old cuticle and the deposition of a new one, relies on fundamental cellular processes including endocytosis and exocytosis. We are interested in understanding how endocytosis and exocytosis, collectively termed membrane trafficking, are regulated. In Caenorhabditis elegans, the conserved protein kinases, NEKL-2 and NEKL-3, form two subcomplexes with their conserved ankyrin-repeat binding partners MLT-2–MLT-4 and MLT-3, respectively. We have shown that the NEKL–MLT complexes function at several steps of membrane trafficking, and their orthologs in humans perform similar cellular functions. Moreover, strong loss of NEKL or MLT functions leads to defective cuticle shedding and larval arrest. Nevertheless, how the NEKL–MLT complexes interact with surrounding proteins to regulate membrane trafficking has remained largely unclear. To identify potential direct or indirect interacting partners and target substrates of the NEKL–MLTs, we carried out proximity labeling in conjunction with mass spectrometry. Using protein modeling approaches, such as AlphaFold, we screened proteins detected by proximity labeling to identify candidates that may bind directly to the NEKLs or MLTs. Here we present findings from a functional analysis of four candidate interactors, using mutant C. elegans strains isolated through the Million Mutation Project. Using a genetic enhancer assay, we found that mutations in ZFYV-19 and GAPR-1 led to molting defects in conjunction with the partial inactivation of NEKLs or MLTs by RNAi. Our work demonstrates the value of combining proximity labeling with protein modeling and functional genetic analyses to improve our understanding of conserved mechanisms controlling membrane trafficking.

Urruttia-Orme, Hudson

University of Wyoming (UW)
Wyoming Research Scholars Program

Processing soil leaf fragments for Microscopy

Since fall 2025, I've worked with PhD student Beatrice Bugos on developing methods to clean and clear soil leaf fragments from a modern analog in Costa Rica to the Early Eocene Climatic Optimum (EECO, 51-53 Ma) Wyoming plant fossil record. Our goal is to measure the stomata of these leaf fragments from soil to assess stomatal conductance, the rate of gas exchange between the leaf and its environment, as a proxy for EECO forest succession. For this work we have been testing numerous methods for preparation of soil leaf fragments. Due to the scarcity of collected soil leaf fragments we are using local leaf soil samples from here in Laramie to test out chemical clearing strategies. Additionally, due to the foreign source of Costa Rican soil samples it necessitates strict contamination protocols to prevent the introduction of xenobiotics to local ecosystems. As a result, the first step in preparing our soil samples is to sterilize them. The sanitization step alone has required the trial and error of multiple procedures. Following soil sterilization the leaf fragments must be sorted out from the rest of the sediment in the sample. Through a series of progressively finer sieves we sort each sample into batches of differing particulate size. Each batch must then be examined under a stereo microscope to parse leaf fragments from soil. With these isolated leaf fragments we can then begin the real experimentation. We have tried differing concentrations and times soaked in solution for each of the chemicals we have used.

Veauthier, Eleanor

University of Wyoming (UW)
Wyoming Research Scholars Program

Molecular Characterization of Bladder Tumors in Aged Mice

Nocturia– waking to urinate two or more times per night– is a prevalent condition in the aging population. Building on our established aging mouse model of nocturia, we have found unidentified high-density cellular masses in aged C57BL/6J mouse bladders. This provided the opportunity to interrogate age-associated tumorigenesis. Our primary hypothesis is that age-associated circadian and mechanosensory dysregulation contributes to urothelial instability and promotes tumor formation in the aging bladder. Our secondary hypothesis is that nocturia could be an early warning sign for bladder cancer. Using multiple histological approaches, we aim to classify the tumor type and cellular composition. We have found putative lymphoma in the urothelium, as well as putative hemangioma and putative carcinoma in the detrusor. Through preliminary analysis, we have uncovered circadian and mechanosensory dysfunction within the tumors when compared with adjacent healthy tissue. Overall, we will test whether disruption of circadian and mechanosensory signaling pathways contributes to tumor susceptibility in the aging bladder. These findings may suggest nocturia as a warning sign for bladder cancer and allow for proactive treatment.

Volkmar, Aurora

University of Wyoming (UW)
Honors College Capstone

Mock Juror Perceptions of Expert Testimony Regarding a Controversial Diagnosis

There are a variety of factors that may affect juror perceptions of expert witness credibility. The presence of another expert witness can cause skepticism (Levett & Kovera, 2008). Expert witnesses have different effects on the verdict depending on which psychological diagnosis or type of expert is present. For example, cases where the defendant has psychopathy are less accepted for the insanity defense (NGRI) than other diagnoses like personality disorders (van Es et al., 2020). However, less research has examined whether the credibility of an expert witness can influence jurors' judgments in cases with other controversial diagnoses. Expert witnesses can provide context for the diagnosis, humanizing the person rather than jurors relying on stereotypes of various diagnoses. The current study will test mock jurors' ability to perceive the credibility of an expert witness with testimony regarding dissociative identity disorder and whether they can use this information to inform legal judgments (i.e., verdict, and specifically NGRI). The study will utilize a three-cell (i.e. Credible Expert vs. Less Credible Expert vs. No Expert) between-subjects design. Participants will be presented with a police report describing allegations of assault and the defendant's prior diagnosis. Then, mock jurors will be presented with testimony from an expert witness. The credible expert reports having specialized training in dissociative identity disorder, whereas the less credible expert will not have such training. Mock jurors will complete measures of verdict and verdict confidence; defendant believability, credibility, and culpability; and perceptions of the expert's credibility (Witness Credibility Scale; Brodsky et al., 2010).

Waldron, Kyra

University of Wyoming (UW)
INBRE, Wyoming Research Scholars Program

The Tardigrade Microbiome: A Novel Source of Phthalates

The novelty of natural products (NPs) discovered has decreased significantly as more are discovered. This leads to the pursuit of NP's from novel sources. Tardigrades and their microbiome provide an uninvestigated source to discover these NPs. Originally the hope of this study was to find novel antifungals. In the process of processing bacterial colonies with antifungal properties. One chemical was repeatedly found and identified using Nuclear Magnetic Resonance: Di (2-ethylhexyl) phthalate or DEHP. Prior evidence has not definitively proved DEHP as a NP. Through isotope labelling experiments we hope to find definitive evidence that bacteria produce DEHP.

Walton, Josephine Marie

University of Wyoming (UW)
NASA Space Grant, INBRE, Wyoming Research Scholars Program

Investigating the Role of the Microbiome in Desiccation Survival of Ramazzottius varieornatus

Tardigrades are microscopic animals capable of surviving complete desiccation through entry into a reversible ametabolic "tun" state, in which cellular structures are stabilized and preserved until rehydration. In desiccation-tolerant species such as Ramazzottius varieornatus, survival has been largely attributed to host-derived mechanisms, including intrinsically disordered proteins, vitrification, and protection of macromolecular integrity. While these mechanisms provide a strong foundation for understanding extremotolerance, the potential contribution of host-associated microbial communities remains unexplored. In my study, I test the hypothesis that resilience in Ramazzottius varieornatus is shaped not only by host biology, but also by interactions with microbial partners. Tardigrades are exposed to antibiotic treatments to perturb microbial communities and subjected to controlled desiccation and rehydration assays. Survival dynamics are quantified alongside DNA-based analyses of microbial load and composition, with ongoing work using qPCR and sequencing to resolve community-level changes. My preliminary results suggest that disruption of the microbiome alters survival and recovery trajectories, suggesting that microbial partners may play a functional role in stress tolerance supporting a view in which resilience arises from interactions across biological scales rather than from the host alone. By establishing the tardigrade as a system for studying host–microbe contributions to extreme stress tolerance, this work provides a framework for understanding how biological interactions influence survival under extreme conditions, with broader implications for biotechnology and human health.

Wasseen, Isabelle Dove

University of Wyoming (UW)
INBRE, Wyoming Research Scholars Program

iRhom2 Regulates Neuroinflammation-Driven Cognitive Dysfunction

Neurodegenerative diseases are a growing global health burden, with Alzheimer's disease (AD) affecting nearly 57 million people worldwide. Neuroinflammation is a key driver of disease progression, promoting neuronal dysfunction and cognitive decline. The iRhom2/ADAM17 axis regulates shedding of pro-inflammatory mediators and controls immune activation. Our previous studies identified iRhom2 as a regulator of ADAM17-dependent inflammatory signaling in the peripheral nervous system. This study examined whether iRhom2 deletion protects against neuroinflammation-associated cognitive dysfunction using an LPS model. iRhom2 knockout (KO; Rhbdf2$^{-/-}$) and wildtype C57BL/6J (WT) mice (n = 9/group) received intraperitoneal lipopolysaccharide (LPS; 0.5 mg/kg/day) for seven days. Spatial learning and memory were assessed with Barnes Maze (BM), and recognition memory with Novel Object Recognition (NOR) testing. Immunofluorescence of mouse brain tissue and human AD samples evaluated microglial activation and iRhom2 expression. Data was expressed as mean ± SEM and analyzed using an unpaired Student's t-test. During the Barnes Maze training phase, KO mice showed improved spatial learning, with reduced primary latency to locate the escape hole (116.74 ± 22.69 sec) and greater use of serial and direct search strategies, whereas WT mice relied more on random navigation. Following LPS-induced neuroinflammation, WT mice developed spatial memory impairment (59.95 ± 11.18 sec). In contrast, KO mice maintained performance during testing (57.46 ± 9.94 sec; $p = 0.042$). Recognition memory did not differ in the NOR test (WT: 0.11 ± 0.08; KO: 0.08 ± 0.07; $p = 0.2436$). Immunofluorescence demonstrated reduced LPS-induced microglial activation in KO mouse brains, while human AD hippocampal samples showed elevated iRhom2 expression co-localized with activated microglia. iRhom2 deletion preserves spatial learning during neuroinflammation and may represent a therapeutic target for neuroinflammation-driven cognitive dysfunction.

Wells, Lily Grace

University of Wyoming (UW)
INBRE

Quantifying Diffusion in PEGDA Hydrogels Using FRAP to Determine Mesh Size and Transport Properties

Designing effective tissue scaffolds means being able to control how molecules and cells move through a hydrogel. To better understand this, fluorescence recovery after photobleaching (FRAP) is used to measure how quickly molecules diffuse within poly(ethylene glycol) diacrylate (PEGDA) hydrogels and how that movement relates to the structure of the material. The hydrogels are formed in a large rectangular shape so they behave like an "infinite" slab, allowing edge effects to be ignored. A small circular area is then photobleached, and the return of fluorescence is tracked over time to observe how molecules move back into that region. From these recovery curves, diffusion coefficients are calculated and used to estimate the hydrogel's mesh size. This creates a direct link between how the gel is made, such as its crosslinking density, and how molecules can move through it. Understanding this relationship is important for predicting how nutrients, signaling molecules, and other species will travel within tissue scaffolds. This work builds a quantitative understanding of transport in PEGDA hydrogels and connects it to the development of granular hydrogel droplets modified with biotin and NeutrAvidin. These systems use strong antigen–antibody-like interactions, leveraging the nearly irreversible binding between biotin and NeutrAvidin to improve cohesion between hydrogel particles. Being able to control both the mechanical strength and transport properties of these materials is key to designing functional scaffolds. By improving our understanding of diffusion and mesh size, this research helps guide the design of hydrogels that better support cell interactions and tissue engineering applications.

Wolfley, Aaron

University of Wyoming (UW)
SURE program, School Of Computing

Machine Learning and Circuit-Theory-Inspired Heuristics for Reducing Human Impact on Migration Patterns

We develop two new algorithms for reducing human impact on animal migration patterns using tools from machine learning and electrical circuit analysis. We model human buildup such as fences, buildings, or roads as resistors in an electrical circuit, then use tools from machine learning to most effectively reduce this resistance. We also explore how our models can effectively model actual animal migration patterns.

Worcester, Carter Allan

University of Wyoming (UW)
INBRE, Honors College Capstone

Characterizing the 'Bulk and Cut' Diet: Impairment and Potential Risk Factors

Men experience societal pressures to be more "masculine" from romantic partners, media, friends, and family. Many men may internalize a body ideal that prioritizes high muscularity and low adiposity, leading to body dissatisfaction that results in disordered eating and muscle-building behaviors. The 'Bulk and Cut' is a common diet among younger men that involves periodically alternating eating between caloric surpluses and deficits to achieve desired muscularity and leanness. Cognitive flexibility, an individual's capacity to adapt to new information and consider nuances and alternate perspectives, is negatively associated with the development of eating disorders and may be a risk factor in individuals who engage in this diet. We aimed to 1) characterize associations between 'bulk and cut' dieting and psychosocial impairment and 2) investigate whether cognitive rigidity moderates these associations. We had two primary hypotheses: 1) past 100-day engagement in 'bulk and cut' dieting would be positively associated with psychosocial impairment, and 2) the association between 'bulk and cut' dieting and psychosocial impairment would be stronger among those who lower in cognitive flexibility. Men who report past-year engagement in the 'Bulk and Cut' diet (N=222) will complete an online self-administered neurocognitive task and self-report measures of muscularity-oriented eating, cognitive flexibility, clinical perfectionism, and psychosocial impairment. Further, we developed a novel measure to assess engagement with the 'bulk and cut' diet over the past 100 days, and will gather unique, preliminary data on the mechanics and details of the 'bulk and cut' diet that will help characterize it for future research.

Ziegler, Rece Daniel

University of Wyoming (UW)
Cobre Grant

Running Against Time: Exercise and Circadian Regulation in Aging

Circadian clocks regulate essential biological and physiological processes through endogenous ~24-hour rhythms that coordinate behavior, metabolism, and cellular function. The central clock in the suprachiasmatic nucleus (SCN) of the hypothalamus serves as the master pacemaker, synchronizing peripheral clocks and maintaining internal timing. Disruption of circadian rhythms is associated with metabolic, cardiovascular, and neurodegenerative diseases, and rhythms weaken with aging due to reduced SCN signaling. Beginning in middle age, this decline results in a shortened circadian period, or phase advance, shifting timing by ~30 minutes per decade. Although aerobic exercise provides neuroprotective and metabolic benefits, its effects on circadian function are not fully understood. This study examined how late-life exercise influences voluntary wheel-running behavior and circadian rhythmicity in aged male mice. Young (3~4 months, n=5) and aged (~22-24 months, n=9) mice were given continuous access to running wheels for four weeks. Activity was recorded and analyzed in 15-minute intervals. Circadian rhythmicity was assessed by fitting activity data to a 24-hour sine wave to determine rhythm phase and entrainment. A two-way repeated-measures ANOVA evaluated effects of age and time. Wheel-running activity differed significantly by age ($p=0.0001$), with young mice more active than aged mice. Activity varied across weeks ($p=0.0061$), peaking in week two for both groups. Aged mice showed reduced rhythm power (0.1-0.2) indicating lower amplitude than young mice (0.3-0.4). These findings suggest that voluntary exercise can modulate circadian rhythms even in advanced age, supporting its potential to improve circadian health during aging.

Group Poster Presentations

Charles, Penelope; Copp, Hunter

Northern Wyoming Community College, Sheridan
INBRE

Microflora of a Hydroponics System

We have been performing an observational study over the microbiome of hydroponic systems. The intent is to determine a base line of bacterial diversity associated with a hydroponics system. This information is important for understanding how to optimize the symbiosis between plants and prokaryotes within a new structure. For this study we used two separate nutrient film technique units (NFTs), one ran without any plants as a control, and one planted with Brassica oleracea var. Sabellica(kale). Samples of the water, mesh hold, kale roots, and peat moss plugs were taken over a two month period at four time points. We isolated the samples of DNA with a DNeasy Powerlyzer kit and then sequenced the DNA with a Oxford Nanopore MinION sequencer to find the taxonomical information on the most prevalent species. The data was analyzed using Kraken and Minimap applications. This process was repeated on an established system located at a local business called Papa Joe's Produce. Most reads came from samples that had plant roots, the most notable being samples RS1(barcode 6), RS2(barcode 7), and RS3(barcode 8), barcode 7 having the most reads overall. The taxa with the most reads was from the genus Tibeticola. These results match with what was predicted to occur. Going forward, they can be utilized in future experiments as a standard to compare back to. This allows for any future studies to have more confidence when searching for patterns or significant change to the biome in association with a hydroponic system.

Colbert, Brayden; Lawson, Aubreyel

Laramie County Community College (LCCC)
INBRE

Mandibles and Morphology: Tracing Evolution in the Prometopiinae

Coleoptera (Insecta) are well known for their diversity. Prometopiinae is a relatively newly recognized subfamily in the Nitidulidae and as such is understudied compared to the other subfamilies (Cline et al. 2014). Prometopiine beetles are found mainly in the Palearctic region and are known to feed on fungi, sap flows, and detritus. Mandibles are the primary tool beetles use for foraging, grasping, and breaking down food for ingestion. How mandibles are used varies greatly from species to species as do the structural traits of the mandibles. For example, some beetles have specialized mandibles modified for their specific diets; others have horn-like mandibles which are used for fighting rivals or digging. This study explores the variable structure of mandibles found in different prometopiine genera. For this study, 52 specimens were photographed in dorsal and frontal habitus, and the mandibles of the beetles were measured and analyzed for differences. Several mandibular traits were also observed including the number of teeth, curvature, touching or not touching, and shape. This study supports the variation hypothesized to exist across Prometopiinae and opens the door to further research focusing on ecology and evolution of feeding behaviors in this understudied group.

Dandridge, Katie; Horsen, Kayla

Northwest College (NWC)
INBRE

LPA risk allele associations to coronary artery disease in a heterogenous cohort

Coronary artery disease is the leading cause of death in the United States. Over one hundred loci in the human genome have been confidently associated with coronary artery disease via genome-wide association studies. However, many of these studies have been performed in ancestrally and socioeconomically homogenous populations, especially cohorts of European ancestry. Thus, it is unclear to what extent these published loci can be used to predict disease risk in ancestrally and racially heterogenous populations across different environments in the US. We therefore explore the association strength between previously reported coronary artery disease-associated risk alleles at the LPA locus and disease status across various races within a cohort of participants who contributed to the All of Us dataset. Previous research has indicated that coronary artery disease risk conferred by LPA is not strongly modified by environmental factors, so allele frequency differences across populations or effect size variation should be studied further in multi-ancestry populations.

Dechert, William J; Mohaimenul Islam Tareq, Md

University of Wyoming (UW)
INBRE

Targeting Lipid Droplet-Induced Inflammation in Metabolic Disease

Lipid droplets (LDs), once marginalized as passive storage units, are now recognized as dynamic organelles central to cellular signaling and metabolic homeostasis. This review explores the molecular mechanisms by which LD dysfunction drives systemic inflammation, transitioning from a homeostatic energy reservoir to a pro-inflammatory platform. The life cycle of an LD begins with biogenesis in the endoplasmic reticulum (ER), but chronic nutrient surplus leads to pathological hypertrophy. Driven by CIDE-mediated fusion and governed by the internal pressure differentials described by the Laplace Equation, these oversized droplets lose membrane integrity and "leak" contents into the cytosol.Stressed LDs subsequently interact with the NLRP3 inflammasome—the cell's metabolic "smoke detector"—and facilitate the synthesis of bioactive eicosanoids, initiating a "slow burn" of chronic, low-grade inflammation. This mechanism serves as a primary engine for Type 2 Diabetes, Non-Alcoholic Fatty Liver Disease (NAFLD), and atherosclerosis. Furthermore, the discovery of Lipid Droplet Accumulating Microglia (LDAM) indicates that these metabolic processes may underpin the neuroinflammatory drivers of Alzheimer's Disease. By targeting the biophysical and enzymatic regulators of LD dynamics—specifically through CIDE inhibition, ATGL modulation, and enhanced lipophagy—therapeutic interventions may successfully decouple metabolic stress from chronic inflammatory damage, offering a novel paradigm for treating multi-organ metabolic disorders.

Delphi-Shepard, Alexander; Wedemeyer, Camella; Henschel, Noah

Laramie County Community College (LCCC)
INBRE

Cooking for Bugs: Evaluating Selenium Metabolism and Lethality in Tenebrio molitor Under Varying Selenium Treatments

Anthropogenic activities can increase the availability of selenium in environments. This increase has the potential to cause selenium toxicity in plants and animals through trophic movement. Selenium toxicity has two common forms in animals. Chronic selenosis includes symptoms such as weight loss, heart mass reduction, and anemia. Acute selenosis symptoms include dementia, balance issues, and vision loss. While much is known about the risks of selenium toxicity in agricultural animals and plants, little research has examined its effects on insects. A 7-day trial was conducted to study the toxicity of selenium in mealworms (Tenebrio molitor, Linnaeus 1758). Mealworms were given a 24-hour selenium diet consisting of one of four different combinations of forms and concentrations of selenium: one of selenate at 25 ppm and 100 ppm, and the other with selenocysteine at 25 ppm and 100 ppm. After 24 hours, the selenium food was removed, and the mealworms were provided a non-selenium diet for the remainder of the trial. On day 7, the number of fatalities was recorded, and all mealworms were frozen. All mealworms were dried at 79°C for 1 hour, then acid-digested with concentrated nitric acid before analysis using X-ray fluorescence to determine selenium concentrations. Selenium measurements showed a range of 14 ppm to 471 ppm for selenate treatments and a range of 4 ppm to 49 ppm for selenocysteine treatments. Selenium was also present in the control treatment. Concentrations were lower than anticipated, creating several new avenues to explore to better understand selenium metabolism in insects.

Denevan, Zoey; Knudson, James; Joy, Ethan; Rogers, Amber; Hertling, Nick; Rivas, Samantha; Compton, Harrison; DesRosier, Roger; Rozmetova, Tamara

Northwest College (NWC)
INBRE

Scent of Science - The Sequel: The Antimicrobial Properties of Wyoming's Native Plants

Wyoming hosts diverse sagebrush (Artemisia) and conifer species, including Juniperus and pines, yet their bactericidal properties are largely unexplored. We evaluated antimicrobial effects of extracts from several Artemisia species (A.a nova, A. frigida, A. tridentata vaseyana, A. tridentata tridentata, A. tridentata wyomingensis, A. cana), and juniper species (J. osteosperma, J. horizontalis, J. scopulorum). Additionally, we studied lodgepole and limber pine (Pinus contorta and P. flexilis, respectively), Engelmann spruce (Picea engelmannii), tumbleweed (Salsola tragus) and fetid marigold (Dyssodia papposa). We also utilized various plant parts, including the flowers, arils, berries, leaves, and stems, from different plant species. Extracts were tested using the Kirby-Bauer method on Staphylococcus aureus, Escherichia coli, and Pseudomonas aeruginosa. Results suggest potential for these plants as antimicrobial agents, with A. nova and A. tridentata vaseyana showing strong activity, particularly against S. aureus and P. aeruginosa. Among conifers, J. scopulorum, especially berries, exhibited the strongest effect against S. aureus. A. nova by far outperformed other plants leading us to examine extraction methods best suited for this species. Not all plants showed antimicrobial properties. These findings also highlight potential for further ethnobotanical research into their traditional uses.

Frick, Kaidyn; Graham, Riley; Hernandez, Lizeth

UW at Casper (UW-C)
INBRE

Polar organizing protein Z (PopZ) interaction with its binding partner ChpT

Intrinsically disordered proteins (IDPs) do not possess a rigid three dimensional structure. Instead, due to increased backbone flexibility, they adopt multiple conformational states. The Polar Organizing Protein Z (PopZ) is an IDP found in Caulobacter crescentus and it plays a crucial role in bacterial cellular function. In Caulobacter crescentus, the PopZ protein self-assembles into large structures that span the width of the cell poles. At least ten different proteins are known to interact directly with a highly conserved, partially helical 26 amino acid domain in PopZ's N-terminus. In this study a genetic screen for identifying amino acid sequence features within PopZ which are responsible for interactions with ChpT was developed. A mutant library which included all possible point mutations across PopZ's N-terminal hub domain was constructed. Escherichia coli cells containing a GFP-ChpT plasmids were transformed with a mutated mCherry-PopZ plasmids. Two plasmid co-expression allowed for protein-protein interaction observation using fluorescence microscopy. So far the library screening identified 12 loss-of-function mutants.

Harper, Mary; Hurst, Caitlin; Ryan, Clarissa; Hauck, Hunter; Nez, Mackenzie; Crawford, Douglas

Central Wyoming College (CWC)
INBRE

Potential Effects of Wildfire and Artemisia tridentata Smoke on Drosophila melanogaster Mortality

Drosophila Smoke from wildfires is almost consistently present in much of the western United States during wildfire season, exposing populations to particulate matter derived largely from burning trees and Artemisia tridentata (big sagebrush). Drosophila melanogaster was used as a model subject to assess the toxicological effects of these smoke sources because of the similarities between their respiratory system and that of humans. Mortality was measured in flies exposed independently to smoke from Artemisia tridentata and wood fires via an inhalation chamber and compared to mortality in controls that were unexposed. Our research suggests that the mortality of D. melanogaster is increased with exposure to both types of smoke and increases proportionally with length of exposure and concentration of particulate matter. There is also a trend that exposure to smoke may decrease the rate of reproduction and frequency necrophagy. Further investigation is required to confirm these findings. In addition, a more accurate method of measuring the amount of 1st and 2nd instar larvae is needed to definitively determine reproduction rates of D. melanogaster.

Horsen, Kayla; Rozmetova, Tamara; Denevan, Zoey; Knudson, James; Curry, Paul; Rivas, Samantha; Joy, Ethan; Dandridge, Katelyn; Rogers, Amber; Hertling, Nick; Compton, Harrison

Northwest College (NWC)
INBRE

Fungi to the Rescue- Can diverse fungal communities degrade plastic/polymer pollution?

Microplastics are small pieces of plastic that are less than 5mm in diameter and pollute the environment. Many single-use plastics are being thrown out with little to no thought about the potential environmental impacts. Furthermore, macroplastics and other polymers like agricultural tires and polypropylene twine also remain in the environment for decades. In recent years, studies have shown that fungi may be able to decompose these plastics leading us to characterize fungal communities naturally inhabiting these pollutants. Through rearing on saboraud dextrose agar and tomato juice agar, we investigated fungal growth. Futhermore, via extraction of fungal DNA found on tires and polypropylene twine, we amplified on ITS4-Fun and 5.8S-Fun primer pairs. Assessing reads through the QIIME2 pipeline we will assess if any fungi OTU present may employ metabolic pathways known to degrade plastics and, if so, they could potentially serve as a more efficient, "nature-friendly" way of recycling.

Jarlinski, Jennifer; Kessler, Ash

Central Wyoming College (CWC)
INBRE, NASA Space Grant

In Suspension: Monitoring atmospheric deposition of Microplastics in the Greater Yellowstone Ecosystem

It is now widely understood that microplastic (MP) pollution is ubiquitous across all environmental compartments, from rural to more densely populated areas. Studies have shown a direct correlation between population and MP pollution. While Wyoming is considered to be the least densely populated state in the lower 48, approximately 4.76 million people traveled through the Greater Yellowstone Ecosystem (GYE) in 2025. Recognized as one of the largest intact ecosystems in the world, however little is known about MP pollution and the potential impacts within the ecosystem. This project builds upon a variety of past sampling efforts that include surface snow and water samples collected from the Town of Jackson and surrounding areas as far as the Wind River Mountains. In addition to water samples, atmospheric deposition samples were collected in the Town of Jackson, WY. Passive samples using stainless steel buckets were collected over a six day period every other week. Samples were processed using a 30% hydrogen peroxide digest followed by density separation (K_2CO_3, density 1.50g/L). Preliminary results show all samples contained microplastics, primarily in the form of microfibers. As the toll of population growth and heavy tourism continue to increase, understanding and addressing microplastic pollution is vital to maintaining the health of the Greater Yellowstone Ecosystem.

Jolovich, TeAnna; Lane, Josh; Simpson, Dillon

Eastern Wyoming College (EWC)
INBRE

Denitrifying Microbes Play a Key Role in Nitrogen Cycling in Drylands

The living component of soil consists of communities of microbes including algae, bacteria, archaea, fungi; with bacteria, algae and fungi playing keyroles in ecosystem health and nitrogen cycling potential. A key factor for microbe survival is water availability, which is strongly influenced by temperature and light intensity. Denitrification occurs, in large part, by the action of bacteria and fungi insoils where water is either abundant, or occurs in pulses creating anaerobic conditions. In anaerobic respiration, bacteria use nitrate as a substitute for oxygen. Nitrate (NO3-) is used as the terminal electron acceptor in anaerobic conditions and is converted via denitrification to nitrogen gas (N2) or nitrous oxide (N2O) and re-enters the atmosphere. Nitrous oxide is of concern as a greenhouse gas due to its heat-trapping capability as well as its potential to degrade the ozone layer. Our objectives are 1) to evaluate the influence of temperature, light intensity, and water depletion on soil bacterial, algal and fungal biomass, and 2) to determine the presence of denitrifying microbes. Controlled modifications of temperature, light intensity, and soil moisture conditions in growth chambers were used to test the hypothesis that modified levels of temperature, light intensity, and moisture result in changes in DNA quantities (affecting key genes and biomarkers) ultimately affecting microbial composition. Soil samples from the field were transferred to growth pots and manipulated in terms of their moisture levels by adding water to the pots at 50and 100 percent saturation. Soil samples were stored at -20o C until DNA extraction using a Nucleospin® Soil DNA Extraction Kit according to the manufacturer's protocol. DNA concentration was determined using a NanoDrop One® UV-VISSpectrophotometer. PCR was used to determine the presence or absence of fungi(ITS gene), algae (18S gene), bacteria (16S gene) nitrite reducing (nirK/S gene),and nitrous oxide reducing (nosZ gene) microbes. Preliminary results indicate a high frequency of fungi (ITS), bacteria (16S), and nitrite reducing (nirK/S) genes suggesting environmental influences may have an impact on soil microbial ecology, and denitrification potential.

Knudson, Jimmy; Rodgers, Amber

Northwest College (NWC)
INBRE

Wyoming WNV

James Knudson Northwest College INBRE (BIOL-2465-01) Eric Atkinson Abstract West Nile Virus heavily impacts modern bird and human populations despite not much being known about it. Through collaboration with classmate Amber Rodgers and my advisor, Eric Atkinson, and participating in his PhD research, we intend work together to analyze various bird blood and saliva samples potentially containing various traces of the pathogen to draw conclusions about West Nile Virus. This includes its preferred host, bird antibody production, and WNV in relation to birds native to the US, and more specifically, Wyoming. West Nile Virus arrived in the U.S. in 1999 and has since impacted populations of birds, horses, and humans. It has a four-stage microbial cycle during inoculation and relies on vectors like Culex spp. mosquitoes and migratory birds to spread. Because of its recent development and spread in the U.S., researchers have, in the past, questioned and waved aside the possibility that birds native to the states can create antibodies in response to West Nile whatsoever. New evidence suggests the contrary: that not only can birds from antibiotic defenses, but that doing so may change n and furthermore, generational lineages. To contribute to this research, we will be using various lab equipment, like ELISA, to test the samples for viremia concentration and antibody presence. By making progress in discovering the basic properties of West Nile Virus and bird antibody production, flaviviruses may be better understood, including its impact on varying species of birds.

Lindsey, Xander; Friel, Zachary

University of Wyoming (UW)

Psychedelics without Hallucinations: Dissecting Psilocybin and Lisuride Brain Circuits

Psychedelic compounds such as psilocybin have demonstrated therapeutic potential for psychiatric disorders such as depression and addiction, largely through the activation of the serotonin (5-HT) 2A Receptor (5-HT2AR). Despite this, psychedelic compounds have hallucinogenic side effects that limit their clinical applicability. Therefore, it is a major goal in psychedelic therapeutic research to determine whether the therapeutic benefits of psilocybin and other psychedelics can be separated from their unwanted hallucinogenic side effects. Interestingly, some compounds, such as lisuride, activate the 5-HT2AR without producing hallucinations. This project seeks to determine whether the neural and behavioral effects of 5-HT2AR activation can be distinguished between hallucinogenic and non-hallucinogenic compounds. Using TRAP2;Ai14 mice, we will compare psilocybin and lisuride by quantifying the rodent Head Twitch Response (HTR), the gold standard behavioral proxy for hallucination activity. We will also identify the brain regions activated during these drug responses using whole-brain imaging via iDISCO+ tissue clearing, where images are taken of labeled neurons using fluorescent microscopy. We hypothesize that psilocybin will produce a robust increase in HTR events and distinct patterns of neuronal activation in sensory cortices of the brain, whereas lisuride and control will produce little to no HTR with divergent neural activation patterns. This work will contribute to the development of safer psychedelic-inspired therapies that retain therapeutic benefits while minimizing adverse effects.

Lucero, Sophia; Schwarting, Sierra

Laramie County Community College (LCCC)
INBRE

Got Milk? How estrogen affects PAD2-Mediated Citrullination in Gene Regulation

Many mothers encounter challenges initiating or maintaining breastfeeding, reflecting gaps in understanding of the biological mechanisms controlling lactation. Lactation is triggered in the anterior pituitary gland by prolactin secretion from lactotrope cells, regulated by hormones such as estrogen, progesterone, oxytocin, insulin, and glucocorticoids. New evidence suggests that the molecular mechanisms, especially peptidyl arginine deminase (PAD)- mediated protein citrullination, may help translate these hormonal signals into transcriptional activation of lactation genes through chromatin remodeling. This study investigates the relationship between estrogen signaling and PAD2-mediated gene regulation within the pituitary gland. Recombinant PAD2 plasmids were constructed through DNA digestions, ligation, sequence verification, and endotoxin-free purification in preparation for cell transfection into rat pituitary tumor cells to perform hormone treatment. We purified plasmids pEZX-GA01 (370 ng/µl), pEZX-GA03 (338 ng/µl), and GAPDH-PF02 (249 ng/µl), and plasmids maintained correct sequences. Single digestions of plasmid pEZX-GA01 using enzymes BglII and HindIII showed effective linearization, and double digestion showed appropriate large and small fragments. After gel extraction of the double digestion product, cut plasmid concentrations were between 20 ng/µl to 32 ng/µl. We hypothesize that estrogen treatment will increase PAD2 promoter activity, thus increasing citrullination and epigenetic remodeling in the pituitary. The plasmids will be transfected into a rat pituitary tumor cell line and treated with 17β-estradiol. Then cells will be examined with a Gaussia Luciferase assay and a Secreted Alkaline Phosphatase assay to determine promoter activity. These studies will provide insights into the molecular regulation of lactation and contribute to future research to treat lactation deficiency.

Martin, Ivan Russell; Halladay, Jasmine

University of Wyoming (UW)
Wyoming Research Scholars Program

Evaluating Hand Gesture Recognition with Kinetic Skin Sensors and Machine Learning

Kinetic Skin 2.0 is a thin adhesive patch much like a temporary tattoo that employs resistive sensing, via carbon paper or conductive ink. Allowing detection of changes in the bend of the patch. They can be worn on joints to track movement in the body. Virtual and Augmented environments both depend on input devices. The more natural and natural the input device the more immersive and user-friendly the experience tends to be. Many devices such as the Meta Quest 3 or Apple Vision Pro rely on hand gesture recognition (HGR). We wanted to see how well Kinetic Skin 2.0, paired with machine learning, could distinguish between different hand gestures. We collected pilot data to evaluate the accuracy of Kinetic Skin sensors fitted to 3 fingers, thumb, pointer and middle. We trained a machine learning algorithm to distinguish between gestures, using a random forest model. From this data we were able to determine that Kinetic Skin sensors are sensitive enough to distinguish between small variations in finger position. Such as between fully bent and only half bent finger positions. Currently we are working on real time gesture detection for virtual reality environments.

O'Connor, Paige; Zick, Abigale; Vichosky, Eilee; Robinson-Kim, Abigail; Rios, Liliana; Petrey, Anna; Winterlind, Emma; Berry, Katherine

University of Wyoming (UW)

Do Facets of Impulsivity Moderate the Relation Between Pregaming Motives and Alcohol Consequences?

Pregaming is common among undergraduates and associated with alcohol-related consequences. Social pregaming motives (i.e., reasons for pregaming) have been linked to greater alcohol-related harm; however, little research has examined factors that may influence the strength of this association. Thus, the present study examined whether facets of impulsivity (i.e., positive urgency and sensation seeking) moderate the relation between social pregaming motives (i.e., intimate pursuit and interpersonal enhancement) and alcohol-related negative consequences. Undergraduates (N=1124; Mage =19.36, 69.3% White, 74.6% female) from six U.S.universities who reported past-month pregaming completed measures of impulsivity, pregaming motives, and alcohol-related negative consequences. Regression analyses indicated that both interpersonal enhancement and intimate pursuit motives were positively associated with alcohol-related consequences. Positive urgency moderated the relation between intimate pursuit motives and alcohol-related consequences, such that individuals endorsing high levels of intimate pursuit motives and positive urgency experienced the greatest alcohol-related consequences. Positive urgency did not moderate the relation between interpersonal enhancement motives and alcohol-related consequences, and sensation seeking did not have any interactive effects with either pregaming motive. Findings suggest that undergraduates who pregame to pursue dating or sexual partners and who act impulsively in response to positive emotions may be particularly vulnerable to experiencing alcohol-related harms. Pregaming for intimate pursuit reasons may involve heightened positive emotions (e.g., excitement, arousal) that make it more difficult for individuals high in positive urgency to regulate, thereby increasing risky drinking and subsequent alcohol-related consequences. These students may benefit from interventions promoting adaptive strategies (e.g., mindfulness) for regulating positive emotions when pregaming.

Semon, Breelyn; Jamali, Jazmin

Western Wyoming Community College (WWCC)
INBRE

Defining the N-Terminal Determinants of PopZ-Client Protein Interactions in C. crescentus

Despite being among the simplest living organisms, bacteria possess complex cellular architectures with highly localized molecular features. This is particularly evident in the alphaproteobacterium Caulobacter crescentus, where the cell poles host multiprotein complexes that regulate polar subcellular organization. A central scaffold in this process is the Polar Organizing Protein Z (PopZ), which forms polar assemblies that recruit numerous client proteins.Previous work has shown that PopZ interacts with more than ten client proteins and these interactions are mediated through the N-terminal region of the protein, specifically the first 24 amino acids. However, it remains unclear whether PopZ engages all client proteins through a common binding mechanism or through residue-specific interactions.To address this question, we generated a PopZ mutant library containing substitutions at each of the first 24 amino acid positions. These mutants were systematically screened for loss of interaction with the client proteins ChpT and RcdA, alongside additional evaluation against ParB. Across three collaborating laboratories, nearly twenty undergraduate researchers participated in the screening process.Collectively, over 300 mutant PopZ sequences were generated and evaluated, establishing a robust and reproducible workflow for large-scale mutational analysis. Comparison of mutation frequencies across the tested client proteins revealed specific imporant residues within the N-terminal region. These results suggest that PopZ may utilize partially distinct residue-level interactions to engage different client proteins. This work provides new insight into the molecular determinants governing PopZ-mediated polar organization in C. crescentus and demonstrates the effectiveness of collaborative, undergraduate-driven research in addressing fundamental questions in bacterial cell biology.

Tyndall, Jalon R; McKinley, Jack; Spiegelberg, Isaiah; Kinney, Justin; Guadagno, Carmela

University of Wyoming (UW)

Expiriments with Cotton and Lettuce in Controlled Environment Agriculture

We describe recent activity we have been doing in the greenhouse, working with multiple plant species in a variety of conditions. See what kinds of data we are collecting and our methodology.

Vichosky, Eilee; Petrey, Anna; Winterlind, Emma

University of Wyoming (UW)

Examining Group Differences in Cannabis Expectancies Among College Students with Diverse Racial Identities

Cannabis expectancies, or beliefs about the effects of cannabis, are often socially learned. Therefore, expectancies are likely influenced by race and associated cultural differences in cannabis acceptance, criminalization, and sociocultural consequences. Despite these differences, cannabis expectancies have not been investigated in the context of race. The present study investigated how positive and negative cannabis expectancies vary by racial identity. College students (N=4375, Mage=19.34, 62.1% White, 75.8% female) from six U.S. universities reported on their racial identity, frequency of past-month cannabis use, and cannabis expectancies. Analyses of covariance identified mean group differences in positive and negative cannabis expectancies across racial identities, controlling for past-month cannabis use. Post-hoc analyses showed that the endorsement of positive cannabis expectancies was higher among Black students than Hispanic students. The endorsement of negative cannabis expectancies was higher among Asian students than Hispanic students and higher among Hispanic students than White students. The elevated endorsement of positive expectancies among Black students compared to Hispanic students may reflect differences in cannabis accessibility or sociocultural acceptability. The higher endorsement of negative expectancies among Asian relative to Hispanic students and Hispanic relative to White students may be due to differential rates of cannabis criminalization and cannabis acceptance across racial groups. By better understanding cannabis expectancies in different racial groups, treatment and prevention can be improved by tailoring messaging to be more culturally relevant. However, more research is needed to understand the relations between racial identity, cannabis expectancies, and other potentially relevant factors such as frequency of use.

Weader, William; Sundquist, Caleb; Barela, Elizabeth

UW at Casper (UW-C)
INBRE

Study of Age- and Tissue-Specific Patterns of Peptidylarginine Deiminase 2 Production in Female Mice

Post-translational modifications (PTMs) are critical for proper protein function. Among these, citrullination, which is the enzymatic conversion of positively charged arginine into neutral citrullines by a family of calcium-dependent peptidylarginine deiminase enzymes (PADs), remains the most obscure. The different PAD enzyme isoforms are characterized by tissue-specific expression patterns in animals. PAD2 is sharply positively regulated by estrogen in female mice reproductive tissues (uterus and ovaries). PAD2 is also the prevalent isoform in cardiac myocytes. There, PAD2 production-hence myocardial protein citrullination-declines in aging female hearts, independently of estrogen, hinting at more complicated regulation mechanisms. Such findings raised the question of PAD2 production patterns (hence citrullination patterns) throughout the body of aging female mice. Hence, the goal of this current investigation is to characterize PAD2 enzyme production patterns quantitatively in various non-reproductive tissues in aging female mice. Murine tissues were collected from young adult and older female mice. These were each successively processed to isolate their protein fractions. Murine protein samples were analyzed through SDS-PAGE followed by Western blot analysis using a PADI2-specific antibody. Preliminary results hint to age-and tissue-specific PAD2 production trends that may help shed some light on PAD2 regulation mechanisms. This study contributes to a larger effort to identify the mechanisms of citrullination regulation in the hearts of aging females and relate these to the events implicated in female-specific cardiac failure.

Wijesena, Amali; Fiore, Danica

University of Wyoming (UW)

Rock On: an analysis of lithic debitage from early Central Alaskan hunter-gatherer groups

This project focused on understanding the nomadic hunter-gatherers of Alaska through analysis of lithic material from a multicomponent site. The site featured material ranging from 13,500 yrs ago to 12,800 yrs ago and was accessed through the permission of B. Bachner. This was achieved by conducting a typological analysis of debitage recovered from the site. There was also a high volume of bone, especially bird bone, found at the site associated with bird bone tool making and bird hunting. The recovered lithic material was analyzed in two stages, the first focused on identifying flakes and the second on type of flake and material type. We looked into the length of stay of people who utilized the site based on the stage and amount of core preparation and decortication found as well as the variety in material. This research tells us more about the lifestyles of first Americans through the changes in mobility reflected through materials.

Willson, Bridget; Downey, Marianna; Sensiba, Harper

Central Wyoming College (CWC)
NASA Space Grant, INBRE

Analyzing MeteoTracker Technology in Wyoming's Wind River Range

Accurately collecting and distributing weather data is essential to better understand climate patterns and for general public and environmental health. Certain areas of the United States have limited accurate and real-time weather data available as the Wilderness Act of 1964 prohibits the establishment of permanent weather stations in federal wilderness areas. The purpose of this research was to test the durability and accuracy of Iotopon's low-cost mobile weather stations, Meteotrackers (MT), within a wilderness area. Two MTs were carried on foot by Willson, Downey, and Sensiba through a span of 100 miles in the Bridger and Popo Agie Wildernesses of Wyoming's Wind River Range in September of 2025. Further analyses with RStudio compared the MT datasets both to each other and to NOAA forecasts to analyze the MT reliability. Esri tools were used to share and visualize the data. The analyses suggested systemic error, and so it was concluded that the MeteoTrackers may be adequate for individual use, but require calibrational corrections before being considered for widespread data sharing or scientific use.