CSU PUEBLO

Spring Student Research Symposium

Friday, April 17, 2026

8:30a.m. – 2:30 p.m.

Oral & Poster Presentations

LINC in the LARC

THANK YOU!

Dear Symposium Attendee,

Welcome to the 12th annual Celebration of Research, Scholarship, and Creative Activities at CSU Pueblo! It is an honor to continue celebrating the incredible work of our students and the dedication of our faculty mentors who guide them through their academic and creative endeavors.

This event showcases the diverse and innovative projects that allow our students to apply classroom learning in meaningful ways while sharing their passion and knowledge with the campus and broader community. Experiential learning remains at the heart of our mission, as we strive to develop student-centered strategies that align with the evolving needs of our region. Today, we recognize and celebrate student achievements while also highlighting the invaluable mentorship our faculty provide. Their commitment to fostering creativity, intellectual growth, and professional skills exemplifies CSU Pueblo's guiding principles of building knowledge, empowering students, transforming learning, and developing people.

As you explore the Symposium, you will witness firsthand the remarkable talent and dedication of our students. Their work is a testament to their hard work, curiosity, and perseverance, as well as to the support and guidance of our outstanding faculty members.

While we eagerly anticipate participation numbers for this year, we know that our students and faculty will once again bring an inspiring array of presentations representing all of CSU Pueblo's schools and colleges. Congratulations to all students for their commitment to research and creative expression, and to the faculty mentors who embody the teacher-scholar model that defines the exceptional education at CSU Pueblo.

On behalf of the College and School deans and Academic Affairs leadership, I extend my gratitude to all participants for their dedication and enthusiasm. I hope you find this year's event both rewarding and inspiring. Enjoy the Symposium!

Best Wishes,
Gail Mackin, Ph.D.
Provost and Executive Vice President for Academic Affairs
Colorado State University Pueblo

Complete List of Presenters with scheduled times can be found here:

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POSTERS

College of Science, Technology, Engineering and Mathematics

8:30 AM - 10:30 AM

Title: Hybrid Physics-Transformer Surrogate Modeling for Train System Dynamics

Authors: George James

Faculty Mentors: Trung Duong

Associations: Engineering, MAPS

Abstract:

This thesis presents a hybrid physics-transformer surrogate modeling framework for train system dynamics. The framework combines reduced-order physics models with transformer-based neural networks to enable efficient probabilistic forecasting of energy consumption, arrival times, and safety-critical outputs such as coupler forces. The approach addresses the computational limitations of high-fidelity simulation while maintaining physical plausibility and

providing calibrated uncertainty estimates. Validation demonstrates improved accuracy and calibration compared to physics-only baselines across diverse route profiles, consist configurations, and control strategies.

Title: Neural Service Scheduler via Attention Based Route Construction
Authors: George James
Faculty Mentors: Dr. Himadri Gupta
Associations: Engineering
Abstract:
Service businesses must schedule recurring site visits as well as sudden emergency jobs across a weekly planning horizon while adhering to operational constraints, such as customer time windows, technician availability and skill, and travel time. Schedules are often constructed arbitrarily by supervisors, leading to under-optimized and wasteful service routes. This project seeks to solve this problem by presenting a neural service scheduler which optimizes routes under an attention mechanism. The research incorporates two distinct neural layers with a deterministic feasibility layer. An assignment network utilizes a transformer encoder A(ji) to map a set of jobs J into a route R. Then, a route sequencing network takes the assigned jobs and computes a tuned route in a finer-grained subproblem, maintaining a simulation state which contributes to further model refinement. An ordered route is output and passes through a feasibility layer which determines if the route violates spatiotemporal or logical constraints. Training data is obtained from a local water treatment service provider and stored in a custom research database. This project aims to produce a reliable tool for streamlining service industry scheduling with respect to realistic constraints.

Title: Rooftop Solar Experiences and the Energy Transition
Authors: Virginia Miller, Gianna Modock
Faculty Mentors: Michael D. Briscoe
Associations: Sociology, Wildlife and Natural Resources
Abstract:
Pueblo is a community undergoing an energy transition. While questions persist about how to transition away from the Comanche 3 coal power plant, individual households have already begun this transition by installing their own rooftop solar photovoltaic systems. However, like the broader energy transition, these household experiences vary – some people enjoy their rooftop solar systems and others experience myriad problems. Regression analysis shows that increased negative experiences with rooftop solar are associated with lower support for the

renewable energy transition in Colorado. Improving the experience with home rooftop solar is important not just for homeowners but for society more broadly.

Title: Effect of Cannabidiol on Intracellular Calcium in SH-SY5Y Neuroblastoma Cells

Authors: Brandon Blanchard, Lauren Olivares, Alexandria Sanchez, Andrew Kottwitz

Faculty Mentors: Jeffrey Smith, PhD.

Associations: Cannabis Biology and Chemistry, Molecular Biology

Abstract:

In this study, our aim was to determine the effect of Cannabidiol (CBD) on intracellular calcium ($[Ca^{2+}]_i$) homeostasis in cultured neurons. This is important since neuronal calcium homeostasis is foundational to the mechanisms behind a wide variety of neural functions relevant to both health and disease including neurotransmission, cell migration, differentiation, survival and biochemical signaling. Previous research has demonstrated CBD-dependent inhibition of a variety of ion channels and elevation of cytosolic calcium, the latter of which appears to involve roles for both transmembrane calcium fluxes as well as the release of calcium from intracellular storage organelles, however, discreet mechanisms have not been well elucidated. Therefore, we employed dynamic cytosolic calcium imaging of living SH-SY5Y cells, a human-derived neuroblastoma cell line commonly used as a model for neuronal function and differentiation, to evaluate the effect of acute application of CBD on the elevation of $[Ca^{2+}]$i elicited by application of elevated extracellular K^+ $[K^+]_o$, a stimulus that depolarizes the membrane potential sufficient to open voltage gated ion channels. CBD elicited a dose dependent inhibition of the $[K^+]_o$-dependent $[Ca^{2+}]_i$ response and a rise in $[Ca^{2+}]_i$ at elevated doses. This is interesting because it supports a direct role for CBD in influencing a fundamental effector of calcium homeostasis in human neurons and has strong implications for understanding how CBD can affect basic neuronal functions as well as higher order processes such as behaviors including basic cognition, emotional processing, and learning and memory.

This study has led to a better understanding of CBD's role in calcium homeostasis, but the question still remains of the exact pathway and receptors causing this effect. Next trials will be conducted with nickel and cadmium to test different voltage dependent calcium channels and determine which ones are being used in the response. Whole cell patch clamping will be used to further corroborate data. A multi-drug study will also be performed to determine if activation of CB1 receptor will have a synergistic modulatory effect with CBD, and if this is dose or application order dependent.

Title: Probing e-h Pair Trapping Dynamics in Mn2+-Doped Cs4CdBi2C12 via Host and Activator-Dependent Quantum Yield Analysis

Authors: Cole Cwiklinski, Alice BlackBear, Max Wallace

Faculty Mentors: Maxwell Wallace

Associations: Chemistry, MAPS, Discovery Scholar

Abstract:

This study investigates the host-to-activator energy transfer efficiencies within the vacancy-ordered perovskite system $Cs_4Cd_{1-x}Mn_xBi_2Cl_{12}$. Structural characterization via Powder X-ray Diffraction and Scanning Electron Microscopy with Energy Dispersive Spectroscopy has been conducted to confirm phase purity and verify the elemental composition of the synthesized materials. Preliminary photoluminescence excitation and emission spectra have been collected, and an integrating sphere is being utilized to determine the absolute photoluminescence quantum yield under both direct activator and indirect host excitation. By comparing these efficiency values, we aim to estimate the energy migration losses via the relative electron-hole (e-h) pair trapping rate constants for the Mn^{2+} activators. Establishing this ratio between host-excited and direct-excited quantum yields provides a quantitative measure of the trapping efficiency within the $[BiCl_6]^{3-}$ and $[Cd/MnCl_6]^{4-}$ octahedral network, offering a critical look at how vacancy-ordered architecture influences the competition between radiative capture and non-radiative relaxation.

Title: Flashlight Engraving System

Authors: Timothy Penn, Pedro Arrieta

Faculty Mentors: Dr. Nebojsa Jaksic

Associations: Mathematics, Mechatronics, MAPS

Abstract:

This project aims to develop a flashlight engraving system that concentrates light to a sufficiently small focal point to burn designs into materials such as paper, wood, and plastic. To characterize the optical and thermal requirements of such a system, a high intensity flashlight advertised for its ability to ignite materials was acquired. Ongoing experiments examine which materials can be burned and how burn time varies with surface properties; for example, white paper resists ignition due to its high reflectivity, whereas black paper burns almost immediately. In parallel, we are designing a custom engraving platform that positions the flashlight at its optimal focal

distance and moves along two axes using two linear actuators controlled by NEMA 17 stepper motors. This can then be programmed to produce a controlled burn for any desired pattern. Future work will aim to replace the flashlight with highly focused sunlight by integrating lenses capable of concentrating solar energy to the required intensity.

Title: A Proof-of-Concept Digital Twin for A Real Drilling Operation

Authors: Dominic Ayala, Gabriel Ayala, Connor Jankowsky

Faculty Mentors: Himadri Sen Gupta and Leonardo Bedoya-Valencia

Associations: Industrial Engineering, MAPS, Discovery Scholar

Abstract:

This research presents a proof-of-concept to demonstrate the implementation of the digital twin technology in a real drilling operation. This proof-of-concept digital twin is intended to enhance monitoring and maintenance through real-time and bidirectional communication between the digital twin and its corresponding physical twin. The integrated approach combines a physical twin based on a milling machine performing a drilling operation with its corresponding digital twin modeled in SIMIO, a discrete-event simulation software package. Initially, synthetic data will be fed allowing the digital twin to accurately mirror key operational parameters such as speed of the drilling operation, its processing time, its temperature, and quality of the part once the drilling operation is finished. It is expected that this proof-of-concept will confirm that such a modular digital twin approach can improve real-time simulation, defective detection, and operational efficiency in manufacturing operations.

Title: Electrospun Fibers Produced from Cellulose Extracted from Hemp Biomass

Authors: Megan Dickinson

Faculty Mentors: Dr. Richard Farrer

Associations: Chemistry, MAPS

Abstract:

The work presented is in response to the increased interest in hemp and in the use of biomass remaining after the cultivation and processing of cannabis for oils and/or THC. In 2018, hemp became a legal agricultural commodity through the enactment of that year's Farm Bill. Hemp is a

species of cannabis that contains less that 0.3% THC. The legalization of hemp has seen a rise in all things associated with it including the cannabinoids that can be extracted from the plants. The purpose of this work is to determine processes and methods that allow hemp plant material or biomass (material remaining after the extraction of oils and/or cannabinoids) to be used in the creation of electrospun fibers. Specific interest is to determine if the entirety of the plant can be used to improve the fiscal outcome associated with the cultivation of cannabis (either as hemp or as cannabis grown for THC). This specific work is interested in the processes that allow for the creation of electrospun cellulose fibers from materials extracted from cannabis plants. Each step associated with one path, from plant to electrospun cellulose fibers, is relayed in the presented work.

Title: Predictive Modeling of Food Supply Chain Disruptions and Access Vulnerability After Hurricane Harvey (2017)

Authors: Charles Oyewumi

Faculty Mentors: Dr. Gupta Himadri

Associations: Industrial Engineering

Abstract:

Natural hazards significantly disrupt critical infrastructure systems, including food supply chains that support community access to essential goods. Following Hurricane Harvey in 2017, food retailers and aid providers across Southeast Texas experienced varying levels of infrastructure damage, workforce disruption, and operational challenges. While prior studies have largely focused on descriptive assessments of these impacts, there remains a need for predictive models that can identify key drivers of disruption.

This study applies predictive analytics to survey data from 468 food suppliers to model the likelihood of operational disruption. A structured analytical workflow was implemented, including exploratory data analysis (EDA), feature engineering, data preparation, and logistic regression modeling. Key predictors such as flood exposure, transportation accessibility, and supply chain stress were evaluated for their influence on store closure.

Results indicate that both environmental factors, particularly flood intensity, and operational constraints, such as supply issues, are significant predictors of disruption. Model performance, evaluated using confusion matrices and ROC-AUC, demonstrates that the proposed framework provides meaningful predictive capability despite class imbalance and missing data challenges.

Overall, this study highlights the value of predictive modeling in disaster preparedness and resilience planning. The findings provide insights that can support data-driven decision-making for improving the robustness of food distribution systems under extreme weather conditions.

Title: A Severity-Stratified Spatiotemporal Framework for Identifying Road Traffic Crash Hotspots in Colorado

Authors: Hannah Grossman

Faculty Mentors: Dr. Md Islam, Saqib Gulzar

Associations: Civil Engineering, MAPS

Abstract:

Road traffic crash hotspot identification is a foundational step in evidence-based highway safety management; however, existing studies rarely account for how crash severity, road functional class, and temporal patterns jointly shape the spatial distribution of risk. This study presents a comprehensive geospatial analysis of 6,173 crash records recorded on the Colorado state highway network between 2021 and 2024. Kernel Density Estimation (KDE) and Ordinary Kriging (OK) are applied to generate continuous crash risk surfaces across five injury severity levels: no injury, possible injury, non-incapacitating injury, incapacitating injury, and fatal injury, and three road hierarchy classes: interstate highways, state highways, and city/county roads. Method performance is evaluated using the Prediction Accuracy Index (PAI). A formal temporal analysis employs the Temporal Risk Index (TRI) and the global Moran's I statistic to characterize the space–time structure of crash risk. Contributing factors are examined through Welch's t-tests on speed excess and Pearson chi-square tests of road-type–severity independence. Results show that Kriging achieves higher PAI scores for large-sample severity groups (PAI up to 9.19, compared with 4.72 for KDE), whereas KDE outperforms Kriging for sparse fatal-crash datasets (PAI 2.73, compared with 1.00 for Kriging), indicating that method selection should be conditioned on crash severity and sample size. Crash counts are significantly clustered spatially (Moran's $I = 0.352$, $z = 35.59$, $p < 0.001$). The Denver–Front Range corridor and the I-70 mountain corridor emerge as persistent, cross-severity primary hotspot zones. Colorado exhibits a winter-dominant seasonality pattern (TRI for January = 1.157) distinct from flat-terrain states, with a weekday concentration (TRI for Wednesday = 1.307) reflecting commercial freight traffic patterns. Fatal crashes are associated with significantly greater speed excess than non-fatal events ($t = 5.216$, $p < 0.001$), and state highways carry a fatal crash rate 1.74 times that of interstates. These findings provide actionable, factor-specific guidance for state agencies such as Colorado Department of Transportation (CDOT) resource allocation and contribute a

transferable analytical framework applicable to state transportation agencies managing diverse, topographically complex road networks.

Title: Distributionally Robust Operating Room Scheduling Under Surge Uncertainty

Authors: Cristopher Flores, Laura Patterson, Daniel Royer, Erika Skoglund, Himadri Sen Gupta

Faculty Mentors: Dr. Leonardo Bedoya-Valencia, Dr. Himadri Sen Gupta

Associations: Industrial Engineering, Mathematics, MAPS, Discovery Scholar

Abstract:

Operating room (OR) scheduling optimization has traditionally focused on maximizing efficiency under normal conditions. However, healthcare systems increasingly face surge capacity challenges from mass casualty events, pandemics, and staffing shortages, rendering efficiency-focused schedules fragile. This paper develops a distributionally robust optimization (DRO) framework that explicitly balances efficiency against resilience in OR scheduling with post-anesthesia care unit (PACU) constraints. We construct a parametric digital twin using published clinical data from Fairley et al. (2019) and evaluate scheduling performance across normal operations and five disruption scenarios. Our computational experiments compare a deterministic baseline against DRO schedulers with varying risk aversion levels ($\lambda \in \{0.3,0.5,0.7\}$) and a two-stage stochastic programming approach. Results demonstrate that while $\lambda = 0.3$ maximizes raw resilience, the robust-DRO approach with $\lambda = 0.7$ offers the optimal managerial trade-off. It reduces PACU hold times by 16.3% under disruption and generates the highest net benefit ($12,775) during surges, all for a modest 10.1% operational premium (Price of Robustness). These findings provide hospital administrators with quantitative guidance for transitioning from “just-in-time” efficiency to “just-in-case” resilience in surgical scheduling.

Title: Electrophilic Fluorinations of Phenolic Compounds

Authors: Bennett Baskerville

Faculty Mentors: Melvin Druelinger

Associations: Chemistry, MAPS

Abstract:

Fluorine is a versatile atom, and fluorinated compounds have uses in water treatment, pharmaceuticals, and compounds like Teflon and more. Phenols are a common class of compounds often found in nature and often used in synthesis studies. For the purposes of this research, a sequence of phenolic compounds were fluorinated via F-TEDA, a potent electrophilic fluorinating agent. Phenol, when fluorinated under MW conditions in acetonitrile, indicates the presence of 3 major products. The major product under RT conditions was the para product. The optimal reaction conditions for 4-tert-butylphenol were determined to be via MW methods, with greater product formation in acetonitrile. When 4-methylphenol is fluorinated, data indicates that lower product formation occurs in acetonitrile compared to water. Early data for 2,4-dimethylphenol suggests that although mono-fluorination primarily occurs, various oxidative and aromatic products form in different amounts depending on whether water or acetonitrile is the solvent. Products were determined using NMR (^{1}H, ^{19}F) spectra, and mass spectrometry.

Title: Temperature Dependent Growth, Viability, and BKA analysis of Pasteurella testudinis, a Microbe of Mojave Desert Tortoises

Authors: Christopher Hall, Mariah Painter, Fran Sandmeier

Faculty Mentors: Dr. Franziska Sandmeier

Associations: Biology, NSF RUI grant

Abstract:

Pasteurella testudinis is a bacterium that was initially isolated from the upper respiratory tract of the Mojave desert tortoise (*Gopherus agassizii*). We quantified temperature dependent growth of *P. testudinis* across seven temperatures; 13, 17.5, 21, 26.5, 31, 35.5, and 40°C at different concentrations. We also quantified viability when cultures were plated at maximum growth for each temperature. We performed bacterial killing assays across this same range of temperatures with whole blood as well as isolated blood plasma from Mojave desert tortoises. We found variation in temperature dependent growth as well as in viability of bacterial cultures. Temperature variation had no significant effect on killing proportion of *P. testudinis* in the assays using whole blood compared to BKAs with whole blood and *Escherichia coli.*

Title: SMN4 Mutations effect on Cajal Body Function

Authors: Willow Stephenson

Faculty Mentors: Mario Izaguirre Sierra

Associations: Biology, Discovery Scholar

Abstract:

The *SURVIAL MOTOR NEURON* (SMN) gene encodes a protein essential for motor neuron health and when mutations occur within this gene, it leads to spinal muscular atrophy (SMA). To explore this, my lab studies the interaction between SMN mutations and a non-membrane bound nuclear organelle, the Cajal body (CB) The function of CBs in the nucleus is not fully understood, but it is known that they play a key role in the biogenesis of small ribonucleoproteins (snRNPs). SMN is localized in the CB under normal conditions, therefore my goal is to explore the impact of mutations of the SMN gene on the function/structure of CB. Over the last two semesters, I have learned the basics of molecular biology and genetics, as well as common plant husbandry techniques in order to study the *smn-4* mutation in *Arabidopsis thaliana*. The second component of my project will involve cloning and generating a variety of vectors which will be used to further explore the effects of the *smn-4* mutation in the moss *Physcomitrium*.

Title: Effects of Cannabidiol (CBD) on the health and gut microbiome of Manduca sexta

Authors: Shannon Robinson

Faculty Mentors: Dr. Amaya Garcia-Costas

Associations: Biology

Abstract:

Insects have a gut microbiome that interacts with their host and plays a key role in digestion and detoxification. We are investigating the detoxifying role of transient microbiomes, given their short residence time in the gut. To do this, we will test a plant toxin, cannabidiol (CBD), on tobacco hornworms, a common pests and model organism due to its short life cycle. CBD (a secondary metabolite) is found in Cannabis sativa. Previous research has shown that after being exposed to CBD, tobacco hornworms have an increased chance of death and bacteria experience antimicrobial conditions. Given the information above, I hypothesize that Manduca sexta's gut microbiome plays a role in the detoxification of CBD impacting their health and viability while increasing CBD resistance in the remaining decreased population. To investigate these potential roles of the gut microbiome we are examining the health of the caterpillars, their microbial community composition and functionality changes in the gut of tobacco hornworms when exposed to CBD. Our results show that the presence or lack of a microbiome doesn't impact the health of the caterpillar, but the vehicle alone increases the maturation rate of the caterpillars. In addition, CBD statically impacted the bacterial composition while not impacting the relative

abundance, species richness and a IC50 for 11 isolates from the treatments ranged from 62.5 µg/ml, and 4 mg/ml However, when comparing the bacterial microbiomes between the frass and the food there are statically significant differences in the bacterial composition, species richness and evenness.

Title: BODY CONDITION AND BD (BATRACHOCHYTRIUM DENDROBATIDIS) OF FOUR SOUTHEAST COLORADO AMPHIBIAN SPECIES

Authors: William Holubek, Haliegh Worthy, Seth Bozzi, Lee Bartosz, Adam Mitchell, Dr. Daryl R. Trumbo

Faculty Mentors: Dr. Daryl Trumbo

Associations: Department of Biology, Colorado State University Pueblo, MAPS

Abstract:

In the broad climatic conditions of Southeast Colorado's high-elevation semiarid-grasslands, amphibians with higher body fat-to-length ratios may have higher survival than those with lower body fat stores. Higher body fat is crucial for amphibian survival during periods of dormancy in extreme cold and dry seasons, and for providing the energy required to reproduce in spring and summer. Another concern is the presence of Batrachochytrium dendrobatidis (Bd), a fungus and disease pathogen linked to amphibian declines across Colorado, particularly in colder, high-elevation areas. Since little is known about Bd in dry, southeastern Colorado, we selected sample sites in this region based on proximity to water and previously observed presences from surveys conducted across 2023-2025. Individuals were located by sound and eyeshine at night and captured with dipnets or by hand. Body conditions were measured in the field, including snout-urostyle lengths (SUL) using flexible measuring tapes and mass using handheld spring scales. Individuals were swabbed for Bd spores on their bodies' ventral surfaces (ventral patch, feet, and inner thighs; 5-10 swabs per body surface). Field-sampled individuals were released unharmed at the site of capture. Bd swabs were labeled and stored in a -20°C freezer for later DNA extractions and qPCR in the lab. Body condition data and Bd samples were collected from 4 total sites in Southeast Colorado in 2025, including 24 individuals across 4 amphibian species (American bullfrog, Woodhouse's toad, Plains leopard frog, and Boreal chorus frog). Preliminary qPCRs revealed the presence of Bd in Southeast Colorado, particularly in frogs that spend the majority of their time near water (e.g., Family Ranidae), as well as amphibians living near urbanized areas.

Title: Understanding disulfide bond rearrangement by the molecular chaperone DBF

Authors: Alicia Ortega, Brithany Garces, Darian Frazier

Faculty Mentors: Dr. Cassidy Dobson

Associations: Biology, Department of Chemistry, MAPS

Abstract:

Protein misfolding and aggregation are key parts of the development of numerous diseases, including cataracts, Alzheimer's disease, and amyotrophic lateral sclerosis (ALS), which are often driven by improper formation of intermolecular disulfide bonds. γ-crystallin proteins, the leading cause of cataract formation, are also susceptible to intermolecular disulfide bond formation. We are interested in the ability of a molecular chaperone known as Disulfide Bond Forming Enzymes (DBF) can rearrange disulfide connectivity in γ-S crystallin and γ-D crystallin. While the chaperoning properties of DBF are known it is unclear the mechanism in which DBF operates or if it can prevent the formation of improper disulfide connectivity. Currently, we have shown that γ-S has the propensity to make disulfide-mediated aggregates under physiological conditions as well as in the presence of oxidizing agents and we are investigating the changes in aggregation propensity in the presence of DBF. Additionally, to address the mechanism of DBF activity we are using lysozyme as a model system due to its disulfide bond content and established activity assay. We aim to investigate whether DBF can prevent or reverse disulfide-mediated aggregation of γ-crystallin proteins by combining protein aggregation studies with DBF activity assays and monitoring it under physiological conditions, with the goal of better understanding how protein behaves and identifying potential strategies to mitigate disulfide mediated aggregation diseases.

Title: Effects of a Hempseed Enriched Diet on Hematocrit, Red Blood Cell Count, and Platelet Count in the Apc $^{Min/+}$ Mouse

Authors: Maddie McCain, Sandra Bandimere

Faculty Mentors: Annette Gabaldon

Associations: Department of Biology, Colorado State University Pueblo, MAPS

Abstract:

The Apc $^{min/+}$ mouse, a pre-clinical animal model for colorectal cancer, demonstrates high platelet counts and evidence of anemia to show cancer progression. Our objective is to perform a manual complete blood count and hematocrit analysis to determine platelet status and the level of

anemia reached by cachectic mice at the end of study. Female Apc $^{min/+}$ mice (n=24) were sorted into three diet groups (n=8 mice each) and fed either a control diet (AIN-93G) or a hempseed supplemented (HS) diet of 5% HS or 15% HS (*w/w*). Blood samples were collected at the end of the study. Samples were prepared using a basic blood smear technique and stained with Wright Giemsa Stain. The remaining sample was loaded into hematocrit tubes and centrifuged at 12,000 RPM for two minutes. We predicted that the manual complete blood count and hematocrit would show high counts of white blood cells and platelets to signify underlying inflammation and cancer progression, low red blood cell count to signify anemia, and low hematocrit, also to signify anemia. All blood cell types were analyzed during the complete blood count process, which was performed using a Zeiss compound light microscope on the 100x objective using basic veterinary techniques for blood smear analysis. Preliminary results indicate that anemia, measured by hematocrit, was not influenced by the HS diet. Blood smear analysis is in progress.

Title: Synthesis of hydrazides with potential antimicrobial and Baeyer-Villiger-like activity

Authors: Elise Pasquin, Gianna Nardini

Faculty Mentors: Dr. David Dillon

Associations: Biology, SEED Grant

Abstract:

Previously, we observed mild antibacterial activity of a member of the benzohydrazide class of compounds. We are now investigating new benzohydrazides and sulfonohydrazides for enhanced bioactivity. For this study, N'-phenyl-ptoluenesulfonylhydrazide, 3-nitrobenzohydrazide, and 4-nitrobenzohydrazide were synthesized by known procedures. Each compound was evaluated for bioactivity against gram-negative and gram-positive bacteria using the Kirby-Bauer disk diffusion method across a range of concentrations. The bacterial species tested were Escherichia coli (gramnegative) and Staphylococcus aureus (gram-positive). In a non-biological parallel study, each hydrazide was tested for Baeyer-Villiger-like insertion of N-R (R = phenyl or hydrogen) with suitable ketones, such as acetophenone.

Title: Impact of Dietary Hemp Seed on Tibia Bone Mineral Density in Growing Female C57BL/6 Mice

Authors: Anastasia Valdez

Faculty Mentors: Dr. Annette Gabaldon

Associations: Biology, MAPS

Abstract:

C57BL/6 mice are a widely used inbred model in biomedical research due to their well-characterized physiology and responsiveness to dietary interventions. Nutritional factors play a critical role in bone health, influencing bone mineral density (BMD) and bone mineral content (BMC), which are key indicators of bone strength and fracture risk. Hemp seeds are a nutrient-rich food source containing essential fatty acids, protein, and minerals that may contribute to improved bone health; however, their effects on skeletal integrity remain underexplored. Female C57BL/6 mice (5 weeks of age) were assigned to three dietary groups (n = 8 per group): a control diet, a 5% hemp seed-supplemented diet, and a 15% hemp seed-supplemented diet. Mice were maintained on their respective diets until 25 weeks of age. Bone mineral density and bone mineral content were measured using dual-energy X-ray absorptiometry (DXA) at four-week intervals. Whole-body DXA scans were acquired, and the tibia was designated as the region of interest, with consistent positioning maintained across all scans. Results indicated a significant increase in both BMD and BMC over time, demonstrating a clear age-related effect on bone development. However, no significant differences were observed between dietary groups, suggesting that hemp seed supplementation at 5% and 15% did not significantly alter bone mineral density or content under the conditions tested. In conclusion, while normal skeletal development was observed with age, dietary hemp seed supplementation did not significantly impact bone mineral outcomes in C57BL/6 mice. Future studies will incorporate mechanical testing, such as three-point bending, to further evaluate the effects of hemp seed diets on bone strength beyond mineral composition.

Title: The Utilization of Non-xylitol Chewing Gum to Identify and Investigate Oral Bacteria and Oral Bacteriophage

Authors: Athena Lopez

Faculty Mentors: Dr. Amaya Garcia Costas

Associations: Biology, Discovery Scholar

Abstract:

Dental caries is a common oral disease that results from bacteria like Streptococcus mutans. This microbe and others, can build biofilms within the oral cavity that can resist conventional antimicrobial treatments. Rural populations such as Southeastern Colorado experience disproportionately higher rates of untreated dental caries and reduced access to dental care, indicating the need for more accessible strategies. This project investigates the utilization of oral

samples, using collected chewing gum from adults living in the rural areas of Southeastern Colorado as a source of finding phage associated antibacterial activity against Streptococcus mutans. With foundational work completed, including the Kuali Institutional Review Board application, CITI Biosafety Training, consent materials, and preparation of growth media. The upcoming procedures will involve standardized collection of samples and evaluation of antibacterial or lytic activity compared to controls. These findings may support future development of phage based therapies especially in rural or underserved communities.

Title: Investigating the Role of Cajal Bodies in Arabidopsis Defense Responses Through SMN-5 Mutant Characterization
Authors: Ryan Espinoza
Faculty Mentors: Mario Izaguirre-Sierra
Associations: Biology, MAPS
Abstract:
The primary goal of this project is to utilize the genetic tools made available in the model plant Arabidopsis thaliana to investigate the role of Cajal bodies (CBs) in plant defense responses. Specifically, we are characterizing five mutants on the Survival of Motor Neuron (smn) gene which is involved in CB formation. CBs are biomolecular condensates involved in processing different types of RNA. Our research focuses on understanding how alterations in CBs influence defense pathways, particularly MAMP-triggered immunity (MTI) upon flagellin (flg22) treatment, using Arabidopsis lines including the flagellin-insensitive fls2 mutant as a negative control. Specifically, we are exploring the role of smn-5 in systemic acquired resistance (SAR) and its impact on susceptibility or resistance to biotic stressors. Preliminary data indicates that proper CB formation is essential for an effective defense response in A. thaliana.Preliminary data suggests CBs have significance in coordinating defense mechanisms within Arabidopsis.

Title: Exploring the mechanisms of UV-B resistance in aerobiome isolates

Authors: Margot Thomas-Gatel, Adam Gillison, Sei Park, Emily Kraus, Kenneth F. Reardon, Mark Hernandez

Faculty Mentors: Dr. Amaya Garcia Costas

Associations: Colorado State University Pueblo – Biology Department, BROADN, CU Boulder

Abstract:

The aerobiome is one of the least studied microbiomes on Earth, partly because obtaining reliable samples is difficult. It can be a source for many extremophiles, bacteria that endure extreme conditions (e.g. UV radiation, desiccation) whose survival mechanisms have many promising applications. UVR is a major environmental stressor for aerobiome bacteria, often

resulting in many types of damage at the cellular level, inducing molecular stress response mechanisms. Moreover, UVR generates Reactive Oxygen Species which additionally disrupt cellular processes and further damages cellular components. Here we present the mechanistic analysis of six highly UV-B resistant aerobiome isolates. To determine whether increased ROS dissipation is a UV-B resistance mechanism used by these isolates, we subjected them to ROS stress at two different life stages: exponential growth and stationary phase. They were exposed to increasing concentrations of ROS generating chemicals: menadione and hydrogen peroxide. Multiple growth characteristics were determined under each condition. The isolates did not show increased tolerance to ROS during exponential growth, however, results were different during stationary phase, showing an increased resistance to hydrogen peroxide exclusively. These results could suggest that the UV-B resistance of these strains is likely derived from a different mechanism, such as enhanced DNA repair, or that stationary phase is a more likely growth stage of microbes in the aerobiome. Additionally, we present genomic and proteomic analyses of the isolates, to reveal additional mechanisms of UV resistance. Genomic analysis revealed the presence of genes known for UV resistance in other radiation resistant bacteria. Preliminary proteomic analysis showed that a 30 minute exposure to UV-B radiation resulted in differential regulation of proteins in Bacillus altitudinis CSUP1. Results from the analysis of three other isolates are still awaited for.

Title: Overexpression and Purification of the ParB-like Nuclease from Bacteriophage Prairie

Authors: Maia Rice

Faculty Mentors: Dr. Amaya Garcia Costas

Associations: Biology, SEED Grant

Abstract:

Bacteriophages, also known as phages, are viruses that infect bacteria. They are the most abundant biological entity on Earth and have become attractive research targets for various applications in the food industry, water treatment, and phage therapy against antibiotic resistant pathogens. Genomic analyses have shown that many of the open reading frames in phage genomes have a poorly-characterized or even unknown function. We have identified one such gene in the Actinophage Prairie that codes for a ParB-like nuclease domain protein. Genes coding for homologous ParB-like nuclease proteins are also found in other phages and in various bacterial species. The overall goal of this project is to determine the potential function of this unknown phage protein. We hypothesize that the ParB-like nuclease in phage Prairie has a similar mechanism and regulatory function to a ParB-like nuclease in the bacterium Myxococcus xanthus. We have used bioinformatic analyses such as AlphaFold3 to show that the structure of

this unknown phage protein is remarkably similar to ParB and to ParB-like nuclease domain protein found in M. xanthus, which have been shown to be DNA-binding CTP-dependent proteins. We have cloned the parB-like gene from Prairie and from a related phage, Ottawa, and are currently using IPTG induction to overexpress those. We will use gravity flow chromatography to purify the corresponding protein. After purification, we intend to perform DNA-binding and catalytic activity assays to elucidate its function. To this end, we are using bioinformatics to evaluate representative oligonucleotides for this DNA-binding capability in silico. i Research in fundamental phage biology such as investigating protein function is crucial to understanding these viruses in order to better use them in industry and health.

Title: Impacts of Climate Change on Arrival Time and Species Distribution of Migratory Songbirds

Authors: Abigail Hite

Faculty Mentors: Claire Ramos

Associations: Wildlife and Natural Resources, Biology, MAPS

Abstract:

Over the past half century, North American bird species have faced severe population declines, with a net loss approaching three billion individuals. This is equal to almost a third of bird abundance in 1970. These declines are especially drastic in migratory species. One of the major threats that avian species face is climate change. Climate change impacts avian species in numerous ways, including altering habitat, limiting resources, disrupting migration, shifting ranges, and reducing food availability. This study aims to utilize the past 60 years of United States Geological Survey Bird Banding Lab data from Colorado to determine whether trends in arrival time, peak migration, and species distribution of migratory songbirds are present. Public historical weather data will then be quantified and utilized to determine whether annual weather pattern changes, such as temperature, precipitation, and frequency of severe storms, are responsible for these trends. This relationship will be explored and compared for various migratory species belonging to frugivore, insectivore, and granivore diet guilds. I hypothesize that annual weather pattern changes will impact arrival time, peak migration, and species distribution of migratory songbirds and these impacts will vary depending on species diet guilds. A possible trend in species shifting their ranges upward in elevation in response to warming temperatures will be explored. This data can help us further understand the specific impacts of climate change on migratory species and potentially provide insights into which species are the most vulnerable. A better understanding of these impacts can help inform wildlife conservation and management practices in order to combat the impacts of changing climatic conditions on avian species.

Title: Testing UV Resistance of Bacillus Parents Used in Protoplast Fusion

Authors: Alissa Egle, Jan Leach

Faculty Mentors: Dr. Amaya Garcia

Associations: Department of Biology, Colorado State University Pueblo, College of Agricultural Sciences, Colorado State University, Fort Collins, MAPS, Chemistry

Abstract:

Eukaryotic cellular meiotic reproduction is highly understood and documented; however, the equivalent prokaryotic mechanism of recombination is not. To gain more insight on prokaryotic gene exchange, two strains of Bacillus subtilis were conjoined via the removal of their cell wall and chemically fused with enzymes, a process known as protoplast fusion. The fusion of the two Bacillus parent strains, RONN-1 and NCIB, has generated a library of 'offspring' strains with mosaic-like genome combinations. This library can be assayed to understand the genotypic requirements of specific traits. Here, we have tested the Bacillus parents' resistance to menadione and hydrogen peroxide (H2O2). Thus far, neither of the Bacillus parents—RONN or NCIB—have demonstrated resistance to menadione under exponential growth conditions. The hydrogen peroxide assay is ongoing. Next steps include ROS resistance assays during the stationary phase and to test each of the parental strains for their UV-B resistance in a qualitative spot test assay.

Title: A Proactive and Adaptive Elderly Care Framework

Authors: Gavin Grant, Mary Anciso-Chavez

Faculty Mentors: Zhidong Su

Associations: Mechatronics Engineering

Abstract:

Many older adults face challenges such as memory decline, reduced mobility, and difficulty managing daily tasks. Despite these challenges, most older adults prefer to age at home, though many lack adequate personal care support. Companion robots can assist with daily tasks through conversational companionship, monitoring, and cognitive assessment. However, their current capabilities are typically limited to the home, leaving them unaware of users' activities outside the home. With declining memory and cognitive ability, some older adults may struggle to remember key information from conversations with doctors, friends, or caregivers. To address

this problem, we propose an intelligent elderly care framework that integrates a companion robot, a mobile device, and large language models to provide both proactive and adaptive assistance. The mobile device extends the sensing range of the companion robot by sharing transcripts of out-of-home conversations between older adults and third parties. By combining information from these conversations with in-home observations of activities of daily living, the system can proactively identify potential support needs and deliver timely assistance before problems escalate. In addition, through a user feedback mechanism, the framework adaptively refines its support strategies over time to better match each individual's needs and preferences. To the best of our knowledge, this is the first work to combine a mobile device, a companion robot, and large language models to support both proactive and adaptive assistance for older adults aging at home. Preliminary tests conducted with simulated older adults and doctors show that the proposed framework provides proactive and adaptive assistance with increasing accuracy across multiple generations of testing, suggesting strong promise for future elderly care applications.

Title: Fluoroamidation of Cyclohexenes

Authors: Isabella Hewitt

Faculty Mentors: Dr. Melvin Druelinger

Associations: Department of Chemistry, Colorado State University Pueblo, MAPS

Abstract:

Given the unique properties of organofluorine compounds, we have a continuing interest in fluorinating alkenes and a special interest in alkenes similar to limonene, a structural component of the CBD molecule. Selectfluor™ (FTEDA-BF_4) was used as the electrophilic fluorinating agent for reactions with cyclohexene models for limonene fluorination chemistry. Reactions were carried out in dry acetonitrile under differing reaction conditions, including microwave chemistry. The major products are fluoroamides which result from the initially formed fluorocarbocations being trapped by the acetonitrile solvent molecules via a Ritter-type reaction. Subsequent hydrolysis leads to the amide products.

Title: Selective Cannabinoid Green Extraction Using Modified Aqueous Solvents

Authors: Jorge Lopez

Faculty Mentors: Chad Kinney

Associations: Chemistry

Abstract:

Cannabis sativa produces biologically active cannabinoids that are widely used in medical and commercial products. Many conventional extraction methods rely on organic solvents that present environmental and safety concerns. This research investigates a greener alternative using alkaline aqueous solutions to extract cannabinoids from hemp biomass. Hemp being used in this study consists of preserved fresh biomass which predominantly contains acidic cannabinoid cannabidiolic acid (CBDA) and other minor neutral cannabinoids (and their acidic counterparts) such as cannabidiol (CBD), cannabinol (CBN), cannabigerol (CBG), cannabichromene (CBC), tetrahydrocannabivarin (THCV) and cannabidivarin (CBDV). Cannabinoids such as CBDA, the most abundant cannabinoid in the hemp being used in this study, become more water soluble at high pH as they are ionized; allowing cannabinoids to be extracted using basic water-based solutions. Hemp samples were extracted using aqueous sodium hydroxide and buffered (phosphate or carbonate) solutions across pH 10 to 13.5 and analyzed by HPLC. Extraction efficiencies were compared with the United Nations Office on Drugs and Crime (UNODC) reference extraction method. Buffered systems produced higher recoveries than unbuffered NaOH solutions and in some cases approached the efficiency of the UNODC method. The highest recovery occurred using a phosphate buffer at pH 13.5, yielding the equivalent of **6.05 ± s % CBDA by weight**, which compares well to the recovery of CBDA (Avg ± s %) using the UNODC method. Buffered systems maintained alkaline conditions during extraction, while NaOH solutions showed substantial pH decreases, suggesting buffered systems may allow higher solid to liquid loading. Initial isolation of cannabinoids from the benchtop extraction produced an average of **64.6% CBDA recovery** from the alkaline aqueous extracts. . This suggests the buffered alkaline solutions may be an effective approach isolate cannabinoids from fresh biomass efficiently. Future work will refine the benchtop extraction and isolation methodology, evaluate cannabinoid separation using thin layer chromatography/flash chromatography, and complete method transfer and optimization to pressurized liquid extraction (PLE) using a Dionex ASE-100 system. Temperature experiments from 30 to 80 °C showed minimal pH change in carbonate buffers with increased temperatures, while greater decreases were observed in NaOH solutions of the same pH. This is important when considering method transfer to PLE, which operates at high pressure and can be operated at high temperatures.

10:30 AM - 12:30 PM

Title: Protein SUMOylation in the Arabidopsis Cell Nucleus

Authors: Tyler Thomas

Faculty Mentors: Mario Izaguirre

Associations: Chemistry, Biology, MAPS, Discovery Scholar

Abstract:

Our research focuses on the study of cell nucleus using *Arabidopsis thaliana* as a model organism. We are using a molecular genetics approach to understand how the machinery inside the nucleus reacts to development and environmental stress. Within the nucleus there are structures that take part in the modification of different types of ribonucleoproteins (RNPs) and non-coding RNAs. One of these structures is the Cajal Body (CB). Preliminary data shows that the structure of CBs is affected by post-translational modifications of its protein components. My research focuses on the Small Ubiquitin-Like Modifier (SUMO) which is known to be enriched in the nucleus and CBs. SUMO is a small protein that covalently attaches itself to other proteins, modifying their function. Before SUMO can attach to any target protein, it must be matured by SUMO proteases (ULP1) called Ubiquitin-Like Proteases (ULPs). After SUMO undergoes maturation, it can now be attached to proteins in a process called SUMOylation. Likewise, ULPs are also involved in the deSUMOylating of proteins by cutting SUMO off target proteins (ULP2). POLY CAJAL BODY (PCB) is a SUMO ULP1 protease. Mutations in the *PCB* gene cause disruption in the CB structure (many CBs) due to the lack of SUMO maturation. Our preliminary data suggest that mutations on the *SUMO* gene will phenocopy the poly Cajal body mutant. Additionally, in Humans and in *Drosophila*, it has been shown that mutations in the *SMN* gene disrupt CB structure, similar to mutations in the *Arabidopsis PCB* gene. I will use genetics, antibiotic selection, and *in vivo* fluorescent microscopy to characterize the role of SUMO in the formation and maintenance of the CB in plants. Altogether, our research will further the understanding of the basic biology of SUMO and its role in the cell nucleus.

Title: Potential of a Hempseed-enriched Diet to Reduce Intestinal Inflammation and Maintain Crypt-Villi Structural capacity for Nutrient Absorption in the APCMin/+ Mouse

Authors: William Fikan

Faculty Mentors: Dr. Annette Gabaldon

Associations: Biology, MAPS

Abstract:

Colorectal cancer remains a leading cause of cancer-related mortality, with familial adenomatous polyposis (FAP) representing a high-risk genetic condition driven by mutations in the APC gene. The mouse model recapitulates key features of FAP, including intestinal polyp formation and

compromised epithelial integrity. Emerging evidence suggests that dietary interventions rich in anti-inflammatory compounds may mitigate intestinal pathology. Hempseed, a nutrient-dense food source, contains bioactive components such as gamma-linolenic acid, lignanamides, and pythol that exhibit anti-inflammatory properties. This study investigates the potential of a hempseed-enriched diet to preserve intestinal structure and reduce inflammation in mice. We hypothesize that dietary hempseed supplementation will maintain crypt–villus architecture, enhance barrier function, and attenuate inflammatory responses. To test this, small intestinal tissues will be analyzed using histological and immunohistochemical approaches. Structural integrity will be assessed by measuring villus height, crypt depth, and villus density in H&E-stained Swiss-rolled sections.

Title: Data-Driven Prioritization for Post-Disaster Food Access

Authors: Kai Pankoski, Himadri Sen Gupta, Penelope Alvarez-Zapien, Ammon Cash, Leonardo Bedoya-Valencia

Faculty Mentors: Dr. Himadri Sen Gupta

Associations: Industrial Engineering, MAPS

Abstract:

Post-disaster food access depends in part on how quickly retailers restore operations, operating hours, and availability of staple items, yet support capacity is limited and prioritization decisions can generate uneven benefits across communities. This study develops a predictive–prescriptive optimization framework to prioritize retailer support using a retailer survey dataset collected after Hurricane Harvey. The framework models three store-level dimensions of restoration: days closed, days operating at reduced hours after reopening, and days without dairy or bread after reopening. In the predictive stage, we estimate weighted surrogate models that map observed disruption conditions (e.g., utility service interruptions, limited road access, staffing constraints, supply issues, and damage indicators) to each restoration dimension. In the prescriptive stage, we embed these surrogates in a mixed-integer linear program that allocates a limited number of support actions across retailers to minimize weighted system-wide disruption. Support actions are represented as transparent counterfactual improvements to measurable disruption variables, enabling auditable benefit calculations without requiring external data. Fairness is incorporated through group-based protection constraints for low-access retailers (identified using a food desert tract indicator), including minimum improvement guarantees and disparity bounds on post-policy outcomes. We evaluate efficiency–fairness trade-offs by sweeping fairness parameters and conduct sensitivity analyses over capacity limits and assumed action effect sizes. The resulting framework yields an interpretable prioritization policy that quantifies how limited

support can be deployed to accelerate multi-dimensional food access restoration while controlling distributional imbalances.

Title: Association between heterophil to lymphocyte ratios and body condition in Yellow Warblers (Setophaga petechia) & Wilson's Warblers (Cardellina pusilla)

Authors: Mikayla Kolln, Alexis Fuller, Viridiana Martinez, Dr. Claire Ramos

Faculty Mentors: Dr. Claire Ramos

Associations: Biology, MAPS

Abstract:

Migration is one of the most important life history stages for many species of birds worldwide. Every year, birds travel hundreds of miles each day to reach their breeding and wintering grounds. This is a very stressful event that can affect fitness and body condition. Body condition is used to estimate the energy stores of an animal. Birds with more energy stores and therefore better body condition are assumed to have increased fitness especially during challenging life phases such as migration. Birds in poor body condition may experience greater stress during migration. One way to measure stress in birds is to measure the amount of heterophils to lymphocytes in the blood. During stressful events, the birds' stress response releases an increased amount of heterophils into the bloodstream. In this study, we investigated heterophil to lymphocyte (H:L) ratios of Yellow Warblers (Setophaga petechia) and Wilson's Warblers (Cardellina pusilla) during fall 2024 migration in Fountain, Colorado. While studies have investigated the adrenocortical response to migration, few studies have investigated stress using H:L ratios or investigated the impacts of body condition on stress in Yellow Warblers or Wilson's Warblers. Forty-six Yellow Warblers and forty-eight Wilson's Warblers were captured via mist net and blood samples were collected to create blood smears that were stained with Wright Giemsa. Mass, fat score, and muscle mass were recorded to assess body condition and H:L ratios were obtained from a white blood cell count. Here, we intend to identify a possible relationship between H:L ratios and body index, as well as compare any trends among the focal species. Understanding this relationship could create an additional measure of avian health during migration.

Title: The Identification of Burrows and Box Turtle Surveys in Pueblo and Fountain, Colorado

Authors: Elizabeth Harberts, Daniela Ramirez, Cameron Muransky, Michael Stevens, Rylee Conklin, Christopher Hall, and Dr. Franziska Sandmeier

Faculty Mentors: Dr. Franziska Sandmeier

Associations: Biology

Abstract:

Our goal was to quantify the presence/absence of ornate box turtles *(Terrapene ornata ornata)* in Pueblo Co., CO, during the summer of 2025. These small turtles thrive in grassland areas with sandy soil and are partially fossorial. We were able to survey areas south of Pueblo, Lake Pueblo State Park, the Pueblo Chemical Depot/Pueblo Plex, Thatcher Ranch, and Chico Basin Ranch. In addition to quantifying live box turtles, we also focused on identifying signs of turtle activity, such as distinctive burrows, tracks, and carcasses. In particular, we hypothesized that turtle burrows could be used as a proxy for the presence of live turtles. Turtle burrows have a dome shape with a flat bottom and were identified from past research that showed that turtles use both self-made burrows and those of other animals as refuges. Active turtle burrows can by identified by turtle tracks inside the burrow as well as by the correct shape and an absence of debris/cobwebs/etc. We used a Spearman's correlation to test whether the number of clear turtle burrows predicted the number of live turtles found on walking transects. We did find a significant relationship between these measures of turtles-presence. We suggest that the presence of turtle burrows can be used in other surveys - especially in regions with sandy soils.

Title: Photochemical dehydroxymethylative functionalization of homobenzylic alcohols

Authors: Jessica Spangler, Mark North, Gideon Butler, Heather Stinson, Isabella A. Mobley, Samuel N. Gockel.

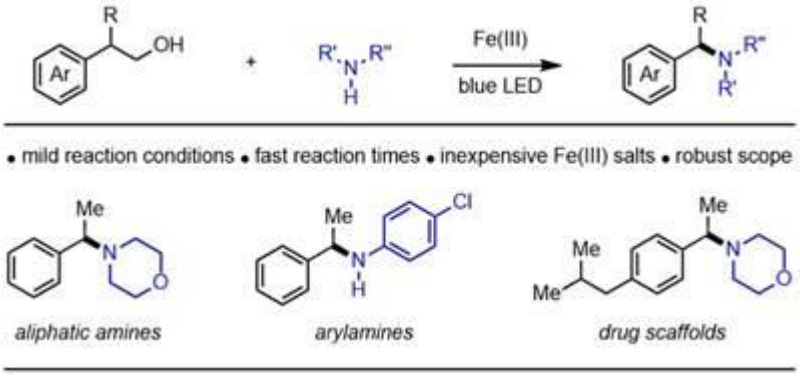
Faculty Mentors: Dr. Samuel Gockel

Associations: Biology, Chemistry, MAPS

Abstract:

We wish to report a photochemical dehydroxymethylative amination of feedstock homobenzylic alcohols to access valuable benzylic amine products. Benzylic amines are common molecular scaffolds in bioactive molecules such as antidepressants, analgesics, and anticancer agents. This makes efficient routes to these structures highly desirable. Conventional syntheses often require multistep sequences or prefunctionalized substrates, whereas our approach enables direct C–C bond activation under mild, visible-light conditions. The reaction proceeds through a β-scission event that generates a carbon-centered radical, which subsequently undergoes a chlorination-amination sequence to yield the desired product. This strategy exploits light as a clean reagent to

achieve selective transformations while minimizing harsh conditions and waste. Preliminary studies demonstrate broad substrate tolerance, accommodating diverse functional groups and both sterically and electronically distinct environments. Ongoing work seeks to expand substrate scope and elucidate mechanistic details, including the nature of key radical intermediates. Together, these studies establish a novel, sustainable platform for the construction of complex benzylic amines from simple alcohol precursors, advancing the growing field of photochemical C–C bond activation and offering new opportunities for the streamlined synthesis of pharmaceutically relevant amines.



Title: Body Condition in Juvenile vs. Adult Wilson's Warblers During Fall Migration

Authors: Serenity Debrunner, Ryeton McMahan, Lee Bartosz, Claire Ramos

Faculty Mentors: Dr. Claire Ramos

Associations: Biology**,** Psychology, Wildlife & Natural Resources, MAPS

Abstract:

Migration is one of the most physiologically intensive activities that birds must do each year. To survive flying over such long distances, migratory birds must be in peak physical condition. Signs of a healthy bird well-prepared for migration are high muscle mass, large fat stores, and a high weight-to-tarsus-length ratio (a comparable measurement to BMI in humans). Older, more experienced birds may be able to maintain better condition during migration because they have previous experience with the migratory route and potential stopover sites where more resources can be gained. One common migratory bird species along the Central Flyway which CSU Pueblo surveys is the Wilson's Warbler (*Cardellina pusilla*). In this study we compared the condition of juvenile and adult Wilson's Warblers during their fall migration through southern Colorado. We used mist nets to capture Wilson's Warblers and visually determined their age and fat scores and

measured their tarsus length, weight, and muscle mass. Body condition data were collected from 471 juvenile and 212 adult Wilson's Warblers during fall migration from 2021 to 2025. Two-sample t-tests were used to compare the average fat scores, muscle masses, and weight-over-tarsus measurements of juveniles and adults. Results reveal each measurement was significantly different between age groups. Adults had higher average fat scores, muscle mass, and weight-over-tarsus ratios. This aligns with our prediction that adults who have prior experience with migration fare better during their journey reflected in their higher body condition.

Title: The cloning and determination of the mycobacterium phage sheen

Authors: Daniela Ramirez , Josiah Hazard , and Dr. Amaya Costas Garcia

Faculty Mentors: Dr. Amaya Acosta Garcia

Associations: Department of Biology, Colorado State University Pueblo

Abstract:

A mycobacteriophage is a virus that infects and replicates within bacteria, killing them. In this investigation, we aimed to determine whether the genes of the mycobacterium phage Sheen could be cloned. The purpose of cloning the sheen gene is to determine whether each gene is toxic to the host, that is, to assess cytotoxicity. We used genes 14, 33, 56, 57, and 77 and performed polymerase chain reaction to amplify the target genes, followed by gel electrophoresis to verify the sizes of the amplified products. After DNA purification, isothermal assembly was performed to incorporate the cloned genes into the pExtra vector, followed by transformation of the assembly into competent bacterial cells. The next approach we are using is to inoculate a culture with positive clones to obtain large quantities of plasmid DNA to use in the cytotoxicity assays. It's important to test these genes because identifying which phage genes are toxic to bacteria helps reveal their biological function and supports the development of phage-based therapies.

Title: Method Modification for Growth for Physcomitrium patens and Optimizing RNA Extraction

Authors: Tianna Maes, Anthony Molina, Mario Sierra-Izaguirre, James S. Carsella

Faculty Mentors: James S. Carsella

Associations: Department of Biology, Colorado State University - Pueblo, Department of Chemistry, Colorado State University - Pueblo , MAPS

Abstract:

Previous studies in Fountain Creek have demonstrated seasonal variation in selenium uptake by the aquatic bryophyte *Hygrohypnum ochraceum*. The goal of this project is to develop a simplified, controlled laboratory system to test plausible factors influencing this seasonal uptake. To achieve this, we are using *Physcomitrium patens* as a surrogate species due to its fully annotated genome and its successful long-term cultivation under laboratory conditions. This work focuses on optimizing growth conditions and establishing axenic cultures suitable for downstream molecular analyses. Selection plates using KNOP medium were employed to isolate fungus-free plants, and liquid cultures were initiated to enhance biomass production while maintaining sterility. In parallel, BCD medium, a more complete growth medium, is being used to approximate nutrient conditions relevant to Fountain Creek exposures rather than to replicate creek water chemistry directly. In addition to media optimization, we are developing reliable methods for extracting high-quality mRNA from *P. patens*. RNA extraction from bryophytes is challenging due to the presence of polyphenols, polysaccharides, and other secondary metabolites that interfere with nucleic acid purity. Three commercial plant RNA extraction kits are currently being evaluated and modified to identify a protocol suitable for downstream RNA sequencing. Initial extractions following manufacturer protocols resulted in low A260/230 ratios and potentially inflated RNA concentration measurements, likely due to guanidine salts and other co-purified contaminants. Method modifications included additional wash steps to reduce carryover contamination and syringe-needle homogenization to improve cell lysis. These refinements aim to produce clean, high-quality RNA suitable for transcriptomic analysis.

Title: Investigating the Anti-cancerous and Antioxidant Potential of Curcumin Extract from Turmeric (Curcuma longa)

Authors: Xelzin Becerril-Hernández,

Faculty Mentors: Annette Gabaldon

Associations: Biology, Chemistry, Spanish, MAPS

Abstract:

Cell culture techniques allow cells to be grown in a controlled laboratory setting, making it possible to study how they behave, test potential treatments, and support medical research. In this project, the Saos-2 cell line, a type of bone cancer cell, is used to investigate whether natural compounds may have therapeutic effects. The natural compound studied comes from turmeric, a plant widely used in traditional medicine. Its main active component, Curcumin, is known for its anti-inflammatory and antioxidant properties. Curcumin is extracted from turmeric powder using Soxhlet extraction, a method that continuously separates compounds from solid materials using a

solvent. Once extracted, the curcumin is applied to the cancer cells at different concentrations to evaluate its effects. The purpose of this study is to determine whether curcumin can reduce cancer cell growth and decrease cellular stress. This project aims to contribute to a broader understanding of how natural compounds may be used in future cancer research and treatment development.

Title: Tumor Counting Methods in the Apc Min/+ Mouse: A Colorectal Cancer Animal Model

Authors: Sandra Bandimere, Cynthia A. Blanton, David L. Dillon, and Annette M. Gabaldón

Faculty Mentors: Annette Gabaldon

Associations: Colorado State University-Pueblo, Departments of Biology and Chemistry, and 3Nutrition and Dietetic Programs, Idaho State University Pocatello

Abstract:

Our objective was to develop a tumor analysis method for our current research with the Apc $^{min/+}$ mouse, a commonly used animal model for colorectal cancer. Adenomas (tumors) located in the epithelial wall of the small intestine lead to nutrient malabsorption and gut barrier disruption enabling infiltration of lipopolysaccharides into the bloodstream leading to a cascade of systemic events. Intestinal mesenteric tissue was carefully removed from both the small and large intestines. The small intestine was bisected into three equal sections to represent the duodenum (proximal), jejunum (mid), and ileum (distal), and each was subsequently subdivided into two sections. The colon remained as one sample. Shorter segments were necessary to reduce resistance created during perfusion of the intestines with Bouin's using a 20-gauge needle. Bouin's fixative is commonly used in histology for the preservation of delicate tissues. For each segment, a longitudinal incision was made along the mesenteric line, and the proximal end was marked with a small nick. Samples were gently rinsed with phosphate buffered saline (PBS) to remove any debris and placed in 10% neutral buffered formalin (NBF) for 24 hours. For tumor analysis, each section was individually placed onto a heavyweight card that was pre-labeled with animal ID and intestinal location (proximal 1 & 2, mid 1 & 2, distal 1 & 2, and colon). A researcher blinded to the treatment groups counted tumors under the Olympus SZ2-ILST stereo dissecting scope. Markings were etched onto the card with a thin pencil line indicating tumor locations which were verified by a second researcher. Electronic digital calipers (Fisher Scientific) were used to measure the diameter of each individual tumor which were approximately spherical in shape. Adenomas were present in all regions of the small intestine in these relative abundances: proximal (27.8%), mid (34.7%), and distal (36.8%). Tumor sizes of <1 mm and 2-3 mm were predominant, with fewer in the 1-2 mm, 3-4 mm, and > 4 mm size bins, in all mice (P=0.0001). Our protocols proved

to be an effective tool for visualizing the number and size of adenomas for tumor burden assessment when compared to other studies in the literature.

Title: Determining Lysogenic Capability of FH Cluster Bacteriophage: Lilmac

Authors: Latiana Archuleta, Travis Paddock

Faculty Mentors: Dr. Amaya Costas Garcia

Associations: Biochemistry, Pre med, Discovery Scholar

Abstract:

Bacteriophages are viruses that only infect bacteria. It has two infectious cycles: lytic and lysogenic. In the **lytic cycle**, the phage injects its genome into the cytoplasm, hijacking the host's machinery and replicating phage until cell lysis. In the **lysogenic cycle**, the phage injects its DNA into the bacterial genome and lies dormant unless reactivated. The host then replicates both bacterial and phage DNA. Bacteriophages are grouped into clusters based on genome organization. The FH cluster infects only Arthrobacter globiformis, but the type of infectious cycle is unknown. FH phage form turbid plaques, which is representative of lysogeny, but lack the integrase enzyme which incorporates the phage DNA into the host genome. This suggests that, if the FH cluster is temperate (lysogenic), they may persist as extrachromosomal. We investigated if the three FH cluster bacteriophage – Lilmac, Klevey, and Prairie – were able to form lysogens. A phage-seeded plate, patch assay, liquid-phage release assay, and a superinfection immunity assay were conducted to verify lysogens. Determining lysogenic capbility is crucial to understanding phage-aided treatments because temperate phage can increase antibiotic resistance and virulence. Three candidate lysogens were generated for Lilmac; none for Klevey and Prairie. The super immunity assay indicated that one candidate was not lysogenic, and the remaining candidates had unexpected results. Neither had immunity to Klevey, yet both were immune to Ottawa from the FM cluster with one being immune to Lilmac. Patterns do not confirm lysogeny but perhaps other phage resistance means. Further experimentation may include PCR testing for lysogen verification and checking for extrachromosomal DNA.

Title: Investigating the Synteny Between the Gene Coding for ParB-like Nuclease in Multiple Clusters of Phage Genomes with a Gene of Unknown Function Immediately in Front of it

Authors: Sean Farley

Faculty Mentors: Dr. Amaya Garcia-Costas

Associations: Biology, MAPS

Abstract:

Bacteriophages are viruses that infect and kill specific bacterial cells. Due to the phages' abilities to cull the bacterial population, the possibility of using these bacteriophages as a means of treatment for antibiotic resistant bacterial infections is being studied. To that end, it is necessary to gain a better understanding of these phages and how they work. In this project, we investigate the synteny between the gene coding for ParB-like nuclease in multiple clusters of phage genomes with a gene of unknown function immediately in front of it. Moreover, we ask if there is any interaction between the proteins produced by the two genes. The hypothesis for this study is that there is an interaction between the two proteins due to the conserved linkage in the genomes. In order to test this hypothesis, it is necessary to clone both genes for a bacterial 2-hybrid assay. Cloning is accomplished by growing E. coli cells with the desired plasmid included in order to produce more of the desired plasmid. Once that is accomplished, the genes of interest are amplified through PCR in order to be cloned and make copies of the desired genes. The research is now at the point where the proper annealing temperature has been determined, and the PCR can begin in earnest to prepare for the next stage of cloning.

Title: Does canopy cover affect invasive flower abundance in Pinyon-Juniper woodlands?

Authors: Dylan Smart, Robert Koches, Eliza Cash, Jake Powers, David McNitt

Faculty Mentors: Dr. Claire Ramos

Associations: Biology, Wildlife and Natural Resources

Abstract:

The thinning of trees from forested habitats is a common land management technique, performed to reduce resource competition between trees and to mitigate fire risk. This treatment results in decreased canopy cover and an increase in light reaching the understory which grants flowering plants access to energy previously blocked by the canopy. Light availability has been shown to have a strong effect on understory species richness in temperate forests. However, disturbance from thinning can also lead to favorable conditions for invasive species to thrive along with native species. This study specifically investigates the link between canopy cover and the number of native and invasive flowers present in managed Pinyon Juniper woodlands in Southern Colorado. As seen in other systems, we predicted that reduced canopy cover from tree

thinning in Pinyon Juniper woodlands in southern Colorado would result in a larger number of flowering plants in treated areas but would also increase the number of invasive flowers. Our surveys took place in Pinyon Juniper woodlands located in Fremont County, Colorado. One-hectare plots were established in areas where trees had been thinned and nearby untreated areas. Each plot was broken into four 8-meter circular subplots. We determined the canopy cover by taking measurements using a spherical densiometer facing in each cardinal direction at the center of each subplot. Each flowering stem in the subplot was counted manually. We used Spearman rank correlation to investigate the relationship between canopy cover and the total number of flowering stems and invasive stems. We found a negative correlation between canopy cover and flowering stem abundance and also invasive plants. This supports the idea that less canopy cover leads to more flowering stems but also appears to increase the abundance of invasives. Additional research is needed to determine if the benefits of increasing flowering plants, which contribute to biodiversity, soil health, and provide necessary resources for many animals including pollinators, birds, and grazing mammals, outweighs the cost of introducing invasives to the system.

Title: A Low-Cost Open-Source Intelligent Mobile Companion Robotic Platform for Elderly Care

Authors: Juan Flores, Gabriel Johns-Flores

Faculty Mentors: Zhidong Su

Associations: Mechatronics Engineering, MAPS

Abstract:

Many older adults face challenges such as memory decline, reduced mobility, and difficulty managing daily tasks. Despite these challenges, most older adults prefer to age at home, although many lack personal care support. Companion robots can help by providing companionship, monitoring and cognitive assessment to assist them. However, existing elderly-care companion robots either have limited capabilities or are too expensive for the average person. The goal of this project is to create a low-cost, open-source intelligent mobile companion robotic platform that can perform elderly-care tasks and be extended to meet more specific needs, such as pet care and childcare. The platform allows for future developments to flourish by allowing others to utilize the basis we have created and help create a community of advanced systems. With our current design, we have created a robotic platform using commonly attainable parts and tools, custom-designed 3D models, and AI models, and an inhouse AI camera system. The robot has the capabilities to analyze local and remote environments, distinguish between objects, and communicate with integrated devices and personnel. By utilizing artificial intelligence, it can

adapt to specific situations in a more nuanced way once given the necessary software and hardware to conduct such tasks.

Title: Time Dependent B1 Lymphocyte Phagocytic Activity and Signaling In Mojave Desert Tortoises

Authors: Aiden Masek, Rylee Conklin

Faculty Mentors: Dr. Franziska Sandmeier

Associations: Biology, Wildlife Biology

Abstract:

Many ectothermic vertebrates (e.g., fishes, amphibians, and reptiles) are experiencing emerging diseases with enigmatic dynamics - partially due to our lack of understanding of their immune responses. All ectothermic vertebrates studied to date possess B1 lymphocytes in their peripheral blood that are capable of phagocytosis, in the absence of inflammatory processes mediated by other white blood cells. However, the rate at which they can kill microbes - such as potential pathogens - is largely unknown. In our study organism, the Mojave desert tortoise (Gopherus agassizii), these cells function best at cool temperatures and are upregulated in the winter - suggesting that they help reduce infections during times of the year when other immune functions are downregulated. In this study we used fluorescent beads that change color in the acidic environment inside a phagocytic cell as a proxy for microbial killing by B1 lymphocytes. We hypothesized that B1 lymphocytes would show a time dependent change in phagocytic killing, visible as differential acidification of beads across time. We quantified acidification of beads at 4, 24 and 48 hours after exposure to cultures of purified B1 lymphocytes. There was a significant increase in acidification of beads at later time points, indicating that these cells are slow but capable of microbial killing. We suggest that the function of these cells may be important in regulating chronic infections of ectothermic vertebrates. Future research should take this relatively novel immune function into consideration for both treatment of individuals and modelling of wildlife diseases.

Title: CSU Pueblo Lower Limb Robotic Exoskeleton — Current Developments

Authors: Samuel Alamos, Pedro Arrieta, Tim Penn, and Nebojsa Jaksic, Ph.D.

Faculty Mentors: Dr. Nebojsa Jaksic

Associations: School of Engineering, Department of Mathematics and Physics, MAPS

Abstract:

Through augmentation or rehabilitation exoskeleton technology aids and creates new mobility options for individuals who have been injured, for individuals who are disabled, and for the elderly. Previous research has focused on creating exosuits that enhance the user's ability to walk. However, enhancing the user's ability to stand up and sit down is often overlooked. The goal of this work is to design an exoskeleton that reaches the required torque for the sit-to-stand motion. For this exoskeleton, an actuator with a geared belt pulley system is designed. For one leg, two identical copies of the actuator are produced (one for the hip joint and one for the knee joint) with an aluminum bar connecting both (meaning a full exosuit has four identical copies of the actuator). Each actuator utilizes two optical encoders with 2000 lines that are connected to one controller. A Jetson Nano AI-enabled microcontroller is used to run the actuators. With this design, a peak torque output of 170 Nm at 100% motor torque is calculated, which is above the 120 Nm of torque exerted by a 100 kg person as they stand up. The motor torque can be adjusted to lower the peak torque output, which is necessary for rehabilitation; as the user regains strength, they need to rely less on the actuator. The thigh-knee part of one exoskeleton leg is currently constructed. With one thigh-knee system manufactured, the current goal is to make the exoskeleton wearable in preparation for physical testing. A belt with straps and rigid braces is currently in use, but further development is required to ensure a stable system.

Title: Smegmatis Sadness: Sheen Gene Cytotoxicity Assay

Authors: Alexandria Sanchez, Kristen Chase

Faculty Mentors: Dr. Amaya Garcia Costas

Associations: Biology

Abstract:

Bacteriophages are viruses that infect and replicate inside bacteria, killing the host in the process. The bacteriophage Sheen has a small but unexplored genome. Using a combination of bioinformatics and a cytotoxicity assay, the goal of this research is to determine which genes in Sheen are cytotoxic to its host, Mycobacterium smegmatis. Coding genes from Sheen were analyzed through Alphafold to get a predicted protein structure, helping to identify codependent genes and allowing for prediction of protein function based off of the structures generated by the sequence. Snapgene was also used to map out the plasmid with the gene inserts. The genes assessed in this study include genes 17, 21, 29, 32, 70, and 85. Individual Sheen genes were

cloned, integrated into a plasmid, and subsequently transformed into competent bacteria. In order to clone the gene, each gene was isolated and copied using a PCR and integrated into a pExTra plasmid via isothermal assembly. These plasmids were then chemically transformed into E. coli and will be electrically transformed into M. smegmatis, with each colony being checked by PCR for successful integration of the gene. From there, cytotoxicity will be determined by activating the plasmid, leading to overexpression of the gene in the host. Cytotoxic genes would disrupt bacterial growth, creating a visible decrease in either size of colonies or size of individual bacteria when compared to controls. Identifying cytotoxic genes is important as these traits can be used to prevent growth of bacteria without harming human health.

Title: Techniques to quantify bactericidal abilities of blood plasma in Gopherus agassizii

Authors: Paige Stephens, Courtney Davis, Maxwell Soell

Faculty Mentors: Dr. Franziska Sandmeier

Associations: Wildlife and Natural Resources, Discovery Scholar

Abstract:

In this study, we set out to test the accuracy of two common techniques used to quantify bactericidal killing abilities of the plasma of vertebrate animals. We used blood plasma collected from captive Gopherus agassizii, commonly known as the Mojave Desert Tortoises. We performed bacterial killing assays using E. coli and blood plasma samples from 19 captive tortoises, reading the turbidity of the samples at 300 nm and 600 nm, and performing colony counts to quantify colony-forming units (CFUs). Both these techniques use calculations that compare the amount of bacteria that grows in culture with or without immune components (natural antibodies, complement, and other antimicrobial proteins) present in the plasma. We compared bacteria-killing ability calculated by these different techniques via Spearman's correlations and agreement statistics. There was not a significant correlation or agreement between bacteria-killing ability of plasma between techniques that used the turbidity vs the CFU-based technique. We do not recommend measuring bactericidal activity by means of a sample's turbidity, as the results were do not correspond to assessments based on quantifying viable bacteria.

Title: Mutagenic Effects of Saccharomyces Cerevisiae (JAY2087) When Exposed to Pueblo Colorado Superfund Site Leachates

Authors: Kristina Kizewski and Jim Carsella, Moussa Diawara, Amaya Garcia-Costas, Claire Varian-Ramos

Faculty Mentors: Jim Carsella & Dr. Amaya Costas

Associations: Biology, Chemistry, MAPS

Abstract:

From the 1820s to 1921, before a great flood, there were 6 operational smelters in Pueblo Colorado. The main smelter of environmental concern is the Colorado Smelter, which processed precious metals like gold and silver, but left a lead contaminated area of 64.75 km^2. In 2014, the EPA designated this area a superfund site. There was growing concern about increasing cancer risk regarding individuals living near or around the site. To test this concern, a model organism *Saccharomyces cerevisiae* (JAY2087) was used to conduct a toxicity study. This yeast strain contains a cassette of four genes, each susceptible to different types of mutations, allowing for sensitive detection of mutagenic effects. This toxicity experiment aimed at determining the lowest concentration of leachate, to inhibit the growth of the yeast without completely stopping growth. After concentration for the toxicity assays were determined, mutagenicity assays were conducted to observe which mutations are present when exposed to the leachate. Four different mutations were observed in parallel: Copy Number Variation (CNV) amplifications, CNV deletions, forward mutations, and reverse point mutations which correspond to reporter genes: SFA1-V208I and CUP1 genes, URA3 gene, CAN1 gene, and trp-289 allele respectively. The leachate concentration used for mutagenicity assays from the toxicity assays was 80-100%, along with a positive control of Methyl Methane-Sulfonate (MMS) and a negative control of normal YPD media. It is hypothesized that increasing leachate concentration will result in a higher frequency of mutations within the yeast gene cassette.

Title: Optimizing Phytohormone Formulations for Callus-Derived Whole Plant Regeneration from Meristematic Tissue in Cannabis sativa

Authors: Dakota Matznick, Kianu Flores, Nicholas Goffar, Sang-Hyuck Park

Faculty Mentors: Dr. Sang Hyuck Park

Associations: Environmental Biology, Cannabis Biology Chemistry, MAPS

Abstract:

Cannabis sativa L. is increasingly propagated via tissue culture to enable rapid clonal multiplication and maintain genetic fidelity. This study optimized callus induction from blended apical meristem tissue using Driver and Kuniyuki Walnut (DKW) basal medium supplemented with auxin treatments, including BB medium containing naphthaleneacetic acid (NAA) and 4-chloro-indole-3-acetic acid (4-Cl-IAA). Cultures were initially incubated in darkness for 10 days,

followed by a 16 h light / 8 h dark photoperiod, resulting in visible callus formation and continued proliferation. Root development was observed 23 days post-transfer on 4-Cl-IAA–containing media, indicating early organogenic differentiation. Shoot regeneration was not observed, suggesting that auxin-dominated media favored rooting over shoot induction. Future studies will focus on optimizing auxin-to-cytokinin ratios and comparing BB versus 4-Cl-IAA media to promote shoot organogenesis and reproducible whole-plant regeneration for micropropagation and genetic research.

Title: Impact of Wind Speed and Direction on Departure Time of Migratory Songbirds in Southern Colorado

Authors: Kieran Doolittle, Claire W. Varian-Ramos

Faculty Mentors: Claire Ramos

Associations: Wildlife and Natural Resources, MAPS

Abstract:

Migration is a critical time for many species of birds and stopover sites are vital resting and refueling areas commonly utilized for physiological restoration. Birds must analyze environmental conditions to minimize their migratory time, energy expenditure, and risk, once departed, influencing how long they will stay at a site. In this study, we investigated whether wind speed and direction impacted the stopover duration of five species of migratory birds in southern Colorado. We predict that birds will choose supportive tailwinds upon departure instead of competing headwinds. In spring and fall migratory seasons of 2024 and 2025, we tracked Swainson's Thrushes, Hermit Thrushes, Western Tanagers, Green-tailed Towhees, and Gray Catbirds using radiotelemetry to determine the duration of their stay. We also utilized weather data from Fort Carson to determine the meteorological conditions they departed in. The birds were captured between sunrise and 10am with mist nets at Clear Springs Ranch near Fountain, Colorado. CTT hybrid tags were deployed on individuals and we used on-site automated telemetry nodes to determine when tagged birds had departed from the capture site. Continual migratory progress was also monitored via the MOTUS network to investigate bird's migration progress for the remainder of the season after departure from the site. A paired t-test was used to initially analyze differences in weather conditions between the day-before and day-of departure. Preliminary results point towards a lack of correlation between stopover duration and wind direction and speed. Further statistical analysis is needed to compare all days a bird was present at our site to the day a bird departed. Results give insight into what conditions birds prefer to migrate through in different migration seasons and how a changing climate could impact their migratory success.

Title: Migration Routes of Wilson's Warblers: A Telemetry Study

Authors: Vanessa Galvan, Claire Ramos

Faculty Mentors: Claire Ramos

Associations: Biology, MAPS

Abstract:

Birds make the most dangerous journey of their annual life cycle every year, migrating during fall and spring. Detailed mapping of migratory routes has only been possible in recent years with the advent of telemetry tags that allow the tracking of individual birds. Migratory routes have been studied in larger birds, revealing that they are incredibly faithful to their routes. Until this year, telemetry tags were too large to be carried by small birds. Recent development of a 0.2 g telemetry tag will allow researchers to track smaller understudied species like the Wilson Warbler. Over the last 50 years, Wilson Warbler populations have declined 50%. We investigated the movement patterns of Wilson Warblers during migration through southern Colorado using Cellular Tracking Technologies BluMorpho telemetry tags to determine whether migratory patterns influenced migration timing, body condition, and stopover duration. These solar-powered tags can be detected by cell phone and Motus towers, which send the data to a server. Individuals were captured via mist nets, and standard body condition measurements were taken. Those weighing over 6 grams were fitted with a tag using a leg-loop harness. This research will aid bird conservation by using telemetry data technology to determine whether Wilson Warbler populations are affected by climate change.

Title: Exploring Thermochromism in Iron-Based Halide Compounds: Structure, Stability, and Optical Tuning

Authors: Kurt Butler, Alice BlackBear, Max Wallace

Faculty Mentors: Maxwell Wallace

Associations: Chemistry, MAPS

Abstract:

Color-tunable materials with temperature-responsive optical properties have potential applications in smart coatings, sensors, and adaptive displays. Organic pigments offer a variety of colors but can be less stable than inorganic pigments over time. This study aims to investigate

the synthesis and applications of iron-based inorganic pigments, with a focus on thermochromic halide compounds. Orange-yellow and orange-red phases of Rb2FeCl5·H2O and Cs2FeCl5·H2O were synthesized using solution-based precipitation techniques. Their structural and optical properties were characterized using powder x-ray diffraction and diffuse reflectance spectroscopy to evaluate their structure and color properties with temperature dependence. These compounds offer a low-cost alternative to rare and/or toxic elements traditionally used in inorganic pigments. Ongoing work includes the synthesis of additional analogs such as (NH4)2FeCl5·H2O, K2FeCl5·H2O, and their non-hydrated variants to better understand structure-property relationships and possibly expand the compositional range of functional inorganic pigments.

Title: Investigating the Chromatic and Structural Effects of Transition Metal Doping in Cs4MnSb2Cl12 Vacancy Ordered Perovskites

Authors: Isadora Clark, Alice BlackBear, Max Wallace

Faculty Mentors: Maxwell Wallace

Associations: Chemistry, MAPS

Abstract:

Inorganic pigments provide superior stability over organic analogues, yet the historical reliance on toxic lead-based compounds has necessitated the search for less toxic alternatives. Manganese-based systems have emerged as a viable non-toxic platform, where color properties are finely tuned via transition metal doping into the crystal lattice. This ongoing study explores the synthesis of $Cs_4Mn_{1-x}M_xSb_2Cl_{12}$ (M = Cu, Co; x = 0, 0.01-0.10) via solvent precipitation. Elemental, structural, and optical characterization is being conducted through energy-dispersive X-ray spectroscopy, powder X-ray diffraction, and diffuse reflectance spectroscopy. Furthermore, we are currently performing temperature-varying measurements to resolve how thermal expansion and lattice strain influence the material's structure and resultant color. Preliminary results suggest that dopant identity, concentration, and thermal environment all play critical roles in defining the electronic transitions of the system; further data collection is underway to map these correlations.

Title: Spinal Muscular Atrophy: Mutations in the Survival Motor Neuron gene and its effect on biomolecular condensates

Authors: Ashley Archuletta

Faculty Mentors: Dr. Mario Izaguirre Sierra

Associations: Cannabis Biology and Chemistry: Analytical, MAPS

Abstract:

Spinal Muscular Atrophy (SMA) is a genetic neuromuscular disease that causes muscle weakness, respiratory distress, and death by the age of three in 80% of children. In humans, SMA is the result of a mutation in the *Survival Motor Neuron 1* (*SMN1*) gene, which causes a mutation in the SMN protein. *SMN* is important for producing spliceosomal small nuclear ribonucleoproteins (snRNPs), responsible for cell function and survival in motor neurons. The biomolecular condensates focused on in this study are known as Cajal bodies (CB), which is where the SMN protein localizes. Plants surprisingly encode a single copy of the *SMN1* gene yet entirely lack muscles and brains. The goal of this research is to use the model plant *Arabidopsis thaliana* to study the effect of the *SMN1* mutation in the structure and function of CB's. Thus, I will be analyzing the *in vivo* localization of the SMN protein in an array of genetic backgrounds and analyzing the consequences of the lack of *SMN* in the formation of CB. Thus, I will be identifying mutant plants by genotyping and performing *in vivo* fluorescent microscopy looking at the CB marker, Coilin-YFP. With this research, we hope to further understand the basic biology of SMA, aid in patient quality of living, and prevent future casualties.

Title: In Search of Cytotoxic Genes in Phage Sheen Genome

Authors: Sateva Johnson, Victor Carrigan

Faculty Mentors: Dr. Amaya Garcia Costas

Associations: Biology

Abstract:

Bacteriophages are a type of virus that specialize in infecting bacteria cells. When a bacteriophage comes into contact with a bacterium, it injects its genetic material (DNA or RNA) into the host bacteria which will then be used to direct the assembly of new phage particles. Once the phages are ready, the host bacteria undergoes lysis, thus releasing newly constructed bacteriophages. The goal of this research was to identify cytotoxic genes from bacteriophage Sheen. Six genes from bacteriophage Sheen genome were selected to investigate their function. These genes were amplified with PCR, assembled with vector pExTra utilizing isothermal assembly, and transformed into competent E. coli cells via heat shock for cloning and verification. After clone verification, the recombinant plasmid was purified to perform cytotoxic

assays in the bacteriophage's original host, M. smegmatis. Transformation of pure recombinant plasmids into M. smegmatis cells required electroporation. Then, a 10-fold serial dilution of three positive colonies were compared on plates containing anhydrotetracycline as the inducer. By overexpressing the genes in the host cell, this can help determine if cytotoxic functions are present when monitoring growth inhibition. Identifying cytotoxic phage genes will help us better understand bacteriophages and discover uses for phage therapy.

Title: The effect of SMN mutations during the immune response in Arabidopsis thaliana

Authors: Shannon Ganoe

Faculty Mentors: Dr. Mario Izaguirre-Sierra

Associations: Biology, MAPS

Abstract:

Spinal muscular atrophy (SMA) is a lethal autosomal recessive disease characterized by the degeneration of spinal motor neurons. The mutations associated with SMA in humans occur on the survival motor neuron (SMN) genes 1 and 2. In the model plant Arabidopsis thaliana, similar mutations of SMN homologs are not lethal. Previously, a transcriptomic analysis was performed comparing expression patterns of wild-type vs SMN mutant plants, and several were dysregulated, some of which are involved in stress responses like pathogen attack. A main function of SMN is the biogenesis of spliceosome components; however, the role SMN plays in immune system function and regulation is poorly understood. Based on previous findings, we hypothesize that the defense response in SMN mutants will be elevated compared to that of the wild-type. The main goal of my project is to test this by taking advantage of the powerful genetic tools available in Arabidopsis and to understand the role(s) of SMN during defense response by testing how the Pathogenesis-response 1 (PR1) gene is dysregulated in SMN mutants. We compared PR1-triggered defense responses when exposed to salicylic acid (SA) in mutant and wild-type plants using three methods; PR1-GUS reporter gene observation, a bacterial infiltration assay, and RT-PCR.

Title: Foundations for Cannabidiol Fluorination: Model Studies in Phenolic and Allylic Systems

Authors: Chaylen Richards

Faculty Mentors: Dr. Mel Druelinger

Associations: Cannabis Biology and Chemistry, MAPS

Abstract:

Abstract: Electrophilic fluorination of phenolic substrates provides a useful approach for investigating reactivity in cannabidiol-relevant structural motifs, because model substrates can reveal how phenolic functionality and nearby unsaturation influence fluorination behavior. In this preliminary study, phenol, eugenol, and olivetol were examined as model substrates for reaction with F-TEDA (SelectfluorTM) in order to evaluate substrate-dependent reactivity, solvent effects, and heating mode under mild fluorination conditions. Phenol was selected as a minimal phenolic substrate, eugenol as a more structurally informative model containing both an activated aromatic ring and an allylic alkene, and olivetol as a substrate more closely related to the aromatic core of cannabidiol. Together, these substrates permitted comparison of fluorination behavior across phenolic systems of increasing structural relevance to cannabidiol. Reactions were conducted using 1.1 equiv of F-TEDA relative to substrate under reflux and microwave-assisted conditions. Phenol was treated in dry acetonitrile under 24 h reflux and under microwave heating at 100 °C for 20 min. Eugenol was treated under microwave heating at 100 °C for 40 min in dry acetonitrile and in water, and complementary 24 h reflux reactions. Reflux reactions were performed in 10 mL of solvent, whereas microwave reactions were performed in 7 mL. Reaction mixtures were analyzed by GC-MS, ^{1}H-NMR, and ^{19}F-NMR to assess conversion, product distribution, and fluorination pattern. Preliminary results will be discussed during the presentation.

School of Nursing

12:30 PM - 2:30 PM

Title: Seconds Saves Lives: The Impact of Early Sepsis Intervention on Mortality Outcomes

Authors: Isabel Burgess, Julia Carter, Maddison Dozier, Claire Eikens, and Felicia Langfels

Faculty Mentors: Dr. Heather Brown

Associations: Nursing

Abstract:

Purpose: This study aims to determine whether completing the Sepsis Six protocol within one hour reduces mortality compared to delayed or incomplete adherence in hospitalized adults with sepsis. **Background & Significance:** Sepsis is a leading cause of mortality among hospitalized adults, often progressing rapidly to organ failure or death if not promptly recognized and treated. Early identification and timely intervention significantly reduce mortality, particularly through the Sepsis Six Protocol, which includes blood cultures, antibiotics, high-flow oxygen, intravenous fluids, serum lactate measurement, and hourly urine output monitoring. Despite established guidelines, adherence to sepsis protocols remains inconsistent due to high patient

acuity and challenges in early recognition. Nurses are often the first to detect sepsis and initiate interventions. Improving protocol adherence enhances treatment timeliness and patient outcomes. **Methods:** This is a translational research study utilizing literature review design. All authors hold current certifications for the Collaborative Institutional Training Initiative's (CITI) online training for "Biomedical Research: Basic Course on Research Ethics". This study does not include human subjects and is exempt from IRB approval. **Findings:** Upon literature review, some studies demonstrated statistically significant improvements with early treatment measures and reductions in mortally when sepsis bundles were completed in a timely manner. Some studies found no significant differences in mortality outcomes and attribute a more significant role to early intervention and clinical management. **Conclusion:** The overall evidence demonstrates that structured sepsis protocols improve compliance with evidence-based treatment for improved mortality rates. Current and future nursing practices can benefit from early, protocol-driven nursing actions—such as the Sepsis Six — as critical interventions to promote physiologic adaptation and reduce mortality.

Keywords: sepsis, Sepsis Six protocol, sepsis bundle, early sepsis intervention, and sepsis protocol adherence

Title: Preservation of Mobility: Postoperative Ambulation Within 24 Hours of Surgery

Authors: Darryl Spade, Molly Gomez, Max Hillebrand, Benjamin Alter

Faculty Mentors: Heather Brown

Associations: Nursing

Abstract:

Purpose: The purpose of this translational research study analyzes how early postoperative ambulation, within the first 24 hours of the procedure, can affect patient outcomes, length of stay, and recovery. **Background and Significance:** Previous studies have highlighted that beginning ambulatory exercises as soon as possible after major surgery is correlated with more favorable outcomes and recovery processes. Nurses play a major role in ensuring the postoperative patient is up and moving, but the timing is important. If nurses allow patients to stay on bedrest for too long, this immobility can lead to adverse effects and a longer recovery. **Methods:** This is a translational research study utilizing a literature review design. All authors hold current certifications for the Collaborative Institutional Training Initiative's (CITI) online training for "Biomedical Research: Basic Course on Research Ethics". This study does not include human subjects and is exempt from IRB approval. **Findings:** All but one of the analyzed studies found significant ($p < 0.05$) correlation between postoperative ambulation within 24 hours and decreased length of stay, as well as increased mobility during the broader recovery

process post-discharge. **Conclusion:** Early ambulation was found to be associated with decreased risk of complications and length of stay, and increased future mobility. Limitations of the studies reviewed included small sample sizes and differences in timing emphasis between studies. Future research is indicated on the shortest possible amount of time between procedure and ambulation to maximize patient outcomes. Ambulation within at least 24 hours post procedure has shown to be effective in preservation of mobility and should be considered standard nursing practice.

Keywords: early ambulation, postoperative complications, length of stay, mobility, recovery, ambulatory capacity

Title: Enhancing Mental Health Literacy Among Middle School Teachers in Rural Southern Colorado

Authors: Oluwatoyin Akinlade

Faculty Mentors: Dr. Itambo Jacqueline

Associations: Nursing, Discovery Scholar

Abstract:

This manuscript represents the culmination of a Doctor of Nursing Practice (DNP) quality improvement project titled "Enhancing Mental Health Literacy Among Middle School Teachers in Rural Southern Colorado," completed by Oluwatoyin Akinlade. The primary aim of this project was to evaluate the impact of Mental Health First Aid (MHFA) training on improving mental health literacy among middle school teachers in a rural Southern Colorado setting. Adolescent mental health concerns continue to significantly impact student well-being, academic performance, and school engagement, particularly in rural communities where access to specialized mental health services remains limited. In such settings, teachers often serve as the first point of contact for identifying early signs of psychological distress. However, many educators report limited training in recognizing mental health concerns and utilizing appropriate referral pathways. A pre- and post-intervention quality improvement design was utilized to assess changes in teachers' knowledge of early warning signs of student mental health concerns and their use of established referral pathways to school-based mental health services. Data were collected using structured preand post-training surveys to measure mental health literacy, alongside analysis of referral patterns to the school mental health counselor. Additionally, qualitative feedback from participants was examined to identify perceived barriers and opportunities for strengthening school-based mental health support. Following implementation of the MHFA training, findings demonstrated improved teacher knowledge in recognizing mental

health concerns and increased utilization of appropriate referral pathways. These results support the integration of mental health literacy training into professional development programs for educators, promoting early identification and timely intervention for students experiencing mental health challenges in rural school communities. Keywords: Mental Health First Aid, mental health literacy, middle school teachers, rural schools, quality improvement, professional development, adolescent mental health, school-based mental health.

Title: Standing Strong or Strained? A One-Year Comparative Study of Back Pain Among Hospital Healthcare Workers

Authors: Kimie La, Jasmine Pham, Oliver Lumapat, Thompson Rivera, Luisa Morrow

Faculty Mentors: Dr. Heather Brown

Associations: Nursing

Abstract:

Purpose: The purpose of this translational research study is to compare the incidence of lower back pain between healthcare workers and non-healthcare workers, with a focus on identifying specific physical and psychosocial risk factors in nursing. **Background & Significance:** Lower back pain is a prevalent occupational health issue in nursing due to physical demands such as lifting, repositioning patients, and prolonged standing. Despite existing interventions, nurses continue to experience high rates of musculoskeletal injuries that impact well-being, job performance, and patient care quality, highlighting the need for more effective prevention strategies to support nurse safety and workforce sustainability. **Methods:** This is a translational research study utilizing a literature review design. All authors hold current certifications for the Collaborative Institutional Training Initiative's (CITI) online training for "Biomedical Research: Basic Course on Research Ethics." This study does not include human subjects and is exempt from IRB approval. **Findings:** Lower back pain (LBP) is highly prevalent among nurses, with rates up to 77.9% annually and affecting over half of healthcare workers. Manual patient handling is the primary risk factor, alongside heavy lifting, repetitive movements, prolonged standing, and poor ergonomics, while cumulative work exposure increases risk over time, and additional factors including age, body mass index, work hours, staffing levels, equipment availability, and psychosocial factors such as stress and job dissatisfaction, further contribute, with validated tools demonstrating varying levels of pain severity and functional impairment, confirming LBP as a multifactorial condition influenced by physical and workplace determinants. **Conclusion:** These findings demonstrate that lower back pain remains a significant and preventable occupational hazard in nursing, and interventions including safe patient handling, ergonomic improvements, adequate staffing, and support for nurse well-being

are essential to reduce injury risk, sustain the workforce, and ensure safe, high-quality patient care.

Keywords: healthcare professionals, lower back pain, manual patient handling

Title: Growth and Phenotypic Analysis of Cajal Body Structure in Arabidopsis thaliana

Authors: Jewelianah Bell

Faculty Mentors: Dr. Mario Izaguirre

Associations: Department of Biology, Colorado State University Pueblo, National Science Foundation under Award No. 2122717, Pueblo CO, Discovery Scholar

Abstract:

Inside of the cell nucleus, its composition consists of small and distinct non-membranous structures and sub compartments know as nuclear bodies. In 1903, Spanish Scientist Santiago Ramon y Cajal observed 'nucleolar accessory bodies' with a high affinity for silver staining. Named 'Cajal Bodies' (CB), they remain mysterious in their full functional capabilities but are known for their association with metabolism and formation of small nuclear ribonucleoproteins (snRNP). These structures can be found and identified in the cells of some plants, insects, and vertebrates. The chosen plant of study, *Arabidopsis thaliana,* is advantageous in research of Cajal Bodies. This plant has a full genome sequence and relatively short life cycle, meaning a full generation can be cycled, crossed and propagated in a quick timeline. Not only that but this plant has a similar gene amount as humans, can be crossed and mutated, and its basic biology is similar to that of animals. Knowing this, I will be studying the physical differences and presence of CB mutated plants in the growth comparison of tcab 1-2 and tcab 1-1 to wild type plants within *Arabidopsis thaliana.* Phenotypic traits such as leaf structure and meristem growth allow for analysis of mutated plants. If a phenotypic identification can be found that links to mutated individuals, there can be an increased rate of genetic crossing and analysis. Understanding the functions and structures of Cajal Bodies could be helpful in potential treatments of the protein deficient, inherited neuromuscular disease, spinal muscular atrophy, which has been found to have a CB component.

Title: Suicide Prevention Through Identification of At-Risk Youths

Authors: Kimberly Chacon

Faculty Mentors: Dr. Pamela Love

Associations: DNP - Population Health

Abstract:

Suicide is a leading cause of death among adolescents, particularly in rural areas where factors such as socioeconomic status, race and ethnicity, and limited access to mental health resources increase vulnerability. This Doctor of Nursing Practice (DNP) project aimed to implement and evaluate the effectiveness of the Columbia Suicide Severity Rating Scale (C-SSRS) as a standardized screening tool for early identification of suicide risk among middle school students in rural southern Colorado. Using a quantitative, quasi-experimental design, two middle school counselors received standardized training and screened students over a six-week period. Pre- and post-intervention data demonstrated a clinically and statistically significant increase in the number of screenings, supporting the feasibility and impact of routine suicide risk assessment in this setting. Though no students were identified as at risk during the project, the initiative established a sustainable screening process and enhanced opportunities for early intervention. The project was guided by the Health Belief Model and the Plan-Do-Study-Act (PDSA) framework, and adhered to ethical standards including IRB/QI approval and protection of confidentiality. These findings highlight the importance of ongoing, evidence-based suicide prevention efforts in rural schools and provide a model for future practice and policy.

Title: Measuring Impact of Family-to-Family Information Centers on Caregiver Stress Using Evidence-Based Tool

Authors: Shayla Fekety

Faculty Mentors: Dr. Hedy Gerber

Associations: Nursing

Abstract:

Background

Caregivers of children and youth with special health care needs (CYSHCN) experience significantly elevated stress levels compared to the general population, with high caregiver stress strongly associated with unmet supportive care needs. Given that caregiver burden and stress have been linked to adverse mental health outcomes, including heightened anxiety and depression, evaluation of peer support networks such as Family-to-Family (F2F) Information Centers is critical for improving family outcomes and informing continued federal funding through Title V block grants.

Purpose and Methods

The purpose of this quantitative investigation was to determine to what extent family navigator services provided by Colorado's F2F Information Center impact caregiver stress levels among parents and caregivers of CYSHCN through administration of the Kingston Caregiver Stress Scale in a pre-post intervention design over eight weeks. Two research questions guided this inquiry: how unmet support needs impact caregiver stress in Colorado caregivers of CYSHCN, and whether family navigator support from the F2F decreases caregiver stress.

Results

Analysis of data from nine caregivers revealed considerable baseline heterogeneity in stress profiles, with feelings of being overwhelmed and financial difficulties representing the most prominent stressors. Contrary to hypothesized outcomes, Wilcoxon signed-rank testing demonstrated statistically significant increases in total caregiver stress scores from pre-intervention to post-intervention assessments. Item-level analyses indicated no significant stress reduction across individual KCSS domains, though financial stress approached marginal significance.

Conclusion

Family navigator services provided by the F2F do not appear to significantly decrease caregiver stress and may increase caregiver stress, at least temporarily. Future research is needed.

Keywords: children and youth with special health care needs (CYSHCN); caregiver stress; peer support; Family-to-Family (F2F) Information Centers

Title: Pressure Injury Prevention: A Nurse-Led Protocol

Authors: Shayden Fenn, Travis Wood, Kia Comstock, Karissa Steiner, Sophia Rinn

Faculty Mentors: Heather Brown

Associations: Nursing

Abstract:

Purpose; The purpose of this translational research study is to determine whether a nurse-led pressure injury prevention program reduces the incidence and severity of pressure injuries in high-risk hospitalized adult patients through structured interventions such as repositioning, skin assessments, pressure-relieving devices, and patient education. **Background & Significance;** Pressure injuries remain a significant concern in acute care settings and are key indicators of nursing care quality. These largely preventable conditions can lead to severe complications such as infection, sepsis, increased length of stay, and higher healthcare costs. Despite existing prevention strategies, inconsistent implementation and adherence continue to contribute to their prevalence, highlighting a need for effective, nurse-driven approaches to improve patient outcomes. **Methods;** This is a translational research study utilizing a literature review design. All authors hold current certifications for the Collaborative Institutional Training Initiative's (CITI) online training for "Biomedical Research: Basic Course on Research Ethics." This study does not include human subjects and is exempt from IRB approval. **Findings;** The literature demonstrates that nurse-led interventions, including prevention bundles, mobilization protocols, and staff education, are associated with reductions in pressure injury incidence and improved outcomes. Evidence from systematic reviews and meta-analyses supports the effectiveness of structured prevention programs while quasi-experimental and cohort studies highlight improved protocol adherence and patient outcomes. Variability in implementation, sample sizes, and study design contribute to mixed statistical significance across findings. **Conclusion;** Nurse-led pressure injury prevention programs improve patient safety and outcomes in acute care settings. Increased emphasis on staff education, protocol adherence, and organizational support is essential to enhance effectiveness and promote consistent, evidence-based practice. **Keywords;** Pressure injuries, nurse-led protocols, prevention bundles, skin integrity, hospital-acquired conditions.

Title: Cultural Competency Training in Nursing

Authors: Daisy Jacquez Trillo, James Cardinal, and Sagar Pant

Faculty Mentors: Heather Brown

Associations: Nursing

Abstract:

Purpose: The purpose of this translational research study is to evaluate whether the implementation of cultural competency training for nurses, compared to standard nursing practice, leads to improved patients' satisfaction among adults from diverse cultural backgrounds in acute care settings within six months. Background & Significance: Hospitals treat patients of various cultures, and these variations may influence the level of patient knowledge about their care and satisfaction. Most nurses lack official training on cultural differences, and this may result in miscommunication or decreased patient satisfaction. Research indicates that patients

feel more appreciated and attended to when nurses participate in cultural competency training. This is important for nursing because it helps nurses provide better care, improves patient satisfaction, and can guide hospitals on how to train their staff. Methods: This is a translational research study utilizing literature review design. All authors hold current certifications for the Collaborative Institutional Training Initiative's (CITI) online training for "Biomedical Research: Basic Course on Research Ethics." This study does not include human subjects and is exempt from IRB approval. Findings: The results suggest that training in cultural competence, along with the practical experience with different populations, results in enhanced healthcare delivery, higher patient trust, satisfaction, and improved health outcomes. Conclusion: Based on the evidence presented within this study, cultural competency training among nurses had a positive impact on improving patient satisfaction. It is recommended that cultural competence training is given not only to healthcare professionals but also policymakers, educators, and organizations committed to promoting equity and inclusivity in healthcare.

Keywords: The keywords used were cultural competency training, transcultural nursing, patient satisfaction, health equity, minority patients, diverse populations, and acute care settings.

College of Humanities, Arts, and Social Sciences

12:30 PM – 2:30 PM

Title: The Power of Churches and Other Faith Organizations in the BLM Movement

Authors: Tiffani Wilbur

Faculty Mentors: Dr. Heidi Reynolds-Stenson

Associations: Sociology, Discovery Scholar

Abstract:

Previous research has documented the importance of churches and other faith-based organizations for the emergence and success of social movements. For example, the US Civil Rights movement of the 1960s gained strength by harnessing the existing networks, leadership, community, and resources, such as physical meeting spaces and monetary funds in Black churches. With the help of churches, the movement gained momentum, legitimacy, and

ultimately became an undeniable force for legal and social change. More recently, some have argued that faith organizations are not as central in the BLM Movement as they were during the Civil Rights Movement. Using data from 3,300 BLM protests across 475 US cities, from 2014 to 2020, and nearly 1,600 organizations identified as present at these protests, we describe the faith-based organizations involved in the BLM movement, how their involvement changed over time, and their enduring power to create local policy change.

Title: GenAI Use Among Undergraduate Students

Authors: ShellyAnn Green, Aline Gutierrez

Faculty Mentors: Dr. Carla Zimmerman Larson

Associations: Psychology

Abstract:

Generative AI (genAI) programs, such as ChatGPT or Microsoft CoPilot, are increasing in popularity among students, in schools, and in workplaces at a rapid pace. The purpose of this research is to examine how common genAI use is among undergraduate students and the rates of genAI usage among different populations of students. Participants were recruited using the SONA Research Participation pool, which consists of students in 100 level psychology and political science classes. Participants completed a questionnaire that included questions related to genAI use and time spent in student-athletics, employment, caregiving, and volunteering. We analyze the frequency of genAI use in general and compare the frequency of genAI use in different student populations (i.e., student athletes, employed students). This research is important to determine who uses genAI so that we can understand why students use it and how they use it.

Title: Fun and Flourishing: How Playing Impacts Well Being in Emerging Adults

Authors: Lluvia Alvarado, Lauren Michel-Budge, Joy Lopez, Regan Rodriguez

Faculty Mentors: Dr. Elby Beddes and Dr. Karen Yescavage

Associations: Psychology, Discovery Scholar

Abstract:

Engaging in playful activities is often an essential part of many people's lives and is an important element of well-being for many people. Although play is typically researched in relation to children, in our study we are investigating how being playful can impact adults. Engaging in play as a college student can come in many forms, such as video games, board games, playing with pets, or engaging in activities like reading or arts and crafts. These forms of play may be an important factor in positive well-being, as many students experience positive emotions, social connections, engagement, and accomplishment exercise during playful activities. In this quantitative study, we are investigating the correlation between playfulness and wellbeing in college students. Well-being is measured through the Flourishing scale (Deiner et al., 2009) while play is measured through the Adult Playfulness Trait Scale (Shen et al., 2022). Our research participants include students from introductory psychology courses, as well as participants from the general student population who have heard about our study through fliers. We have been conducting data through an online correlational survey and expect to complete an analysis of our preliminary data in late March. We hypothesis that students with higher levels of play will have higher scores for wellbeing. These results will help us to have a greater understanding of the impact of play on wellbeing in college students. This understanding could help guide programs that promote play as a tool to improve mental health and personal growth.

Title: Playtime Isn't Over: Qualitative Research on the Importance of Play in Emerging Adults

Authors: Joy Lopez, Regan Rodriguez, Lluvia Alvarado, Lauren Michel Budge

Faculty Mentors: Dr. Elby Beddes

Associations: Psychology, Discovery Scholar

Abstract:

Encouraging play as a standard and a beneficial part of adulthood can reduce stigma around leisure and creativity, allowing for personal agency in the face of adversity. In this qualitative study, we examine how college students perceive and experience play in the context of academic pressure, socio-political uncertainty, and limited control over institutional requirements. While play is often seen as optional or childish in higher education, it may help students maintain agency, resilience, and meaning when facing restrictions. In this research, we explore how emerging adults enrolled in college define play, how they engage in it, and whether they feel they need "permission" to do so. Understanding the importance of play can guide community programs, education, and workplace wellness efforts, promoting play throughout life. We used semi-structured interviews to examine what play means to college students, how they engage in it, and whether they feel permitted to do so. Participants reflected on play throughout their lives while drawing or doodling with colored pencils and crayons, making play part of the research

itself. Research interviews were transcribed, de-identified, and then analyzed using open, axial, and selective coding procedures. We conducted member checks to verify the accuracy of our interpretations of the data. Preliminary findings indicate that while college students continue to view play as important, they appear to be redefining their definitions of play. Additionally, play is often seen as secondary to adult responsibilities.

Title: An Analysis of Turnout in Colorado's 8th Congressional District

Authors: Aaron Reber

Faculty Mentors: Edie Lucero

Associations: Political Science, Discovery Scholar

Abstract:

Colorado's District 8 is the newest district in Colorado, one of the most competitive in the nation, with a Cook Political Index rating of even, and a seat that flipped from Democrat to Republican in 2024 by less than 10,000 votes. In my presentation, I used a subset of a file from the Secretary of State to analyze CD8 turnout from 2020 to 2024. The findings showed that turnout across all demographics decreased, with two notable exceptions, which I shall present in my presentation. The turnout in CD8 contrasts with the overall turnout in Colorado, which increased across all demographics except one

Title: Euphemisms and the Nazi Party: Linguistic Propaganda and the Manipulation of the Masses

Authors: Arianna Barela

Faculty Mentors: Dr. Grant Weller

Associations: History

Abstract:

Adolf Hitler and the Nazi Party used many different tactics to manipulate and control the masses. The main outlet for this was through propaganda. These pieces conditioned people to think a certain way and to dictate what the world could see. The biggest tool of this was the use of euphemism to downplay the reality of Nazi ideology, their plans, and their actions. The language of Nazi's speeches, art, and writings gives us insight into the way they wanted marginalized

communities to be perceived by the German population, and how they'd use it as a tactic of degradation to promote the Aryan race. As they did this, they also understated their plans for these communities so they'd gain more support. The use of linguistic propaganda gave the Nazi Party a way to manipulate their goals, and the implications of euphemism allowed them to do it in a way that would seem less harsh than their actual dehumanizing, horrific goals.

Title: Humanism and the Upper Class in Renaissance Italy: Neo-Latin and the Obstacles of Hierarchy

Authors: Arianna Barela

Faculty Mentors: Dr. Grant Weller

Associations: History

Abstract:

The Italian Renaissance allowed for the ability to learn, translate, and create new ideas in Italy and around the world. It created the opportunity for arts, philosophy, and science to grow and facilitated connections to the past with the revival of Latin in the education system. Which bridged connections amongst the well-educated worldwide, and allowed humanism to grow and have a tool to do so. Humanism stresses the importance of following classical values and human development. Humanists, therefore, adopted Latin culture in those classical terms, and rejected the forms of vulgar Latin that had developed over time. This brought the rise of Neo-Latin and made a system that favored the upper classes. This, along with educational advancements, created a barrier between social classes and solidified the power moves the wealthy were willing to make to create such distinctions. Neo-Latin became a standard of wealth and understanding, and solidified the ways that class systems would dictate one's life in Renaissance Italy.

Title: Napoleon III: Architecture of a New Paris

Authors: Jayson Lu

Faculty Mentors: Grant Weller

Associations: History

Abstract:

The city of Paris would undergo a radical change during the 18th century under the leadership of Louis-Napoleon Bonaparte III. The rebuilding would last for 17 to 20 years beginning in the early 1850s and ending by 1870. In rebuilding Paris it would change the city from its medieval past and into the Paris of today through building large boulevards for the convenience of transportation, removing filth on the roads so people can walk the streets, and new neighborhoods for the rising population.

Title: German-Sino Relations: Degradation and Turnover to Japan

Authors: Jayson Lu

Faculty Mentors: Grant Weller

Associations: History

Abstract:

The Sino-German relation between the years 1920-1937 was amicable as Germany sought to expand its influence for the resources of the Kuomintang China's interior. The relation continued even under the Nazi government, but when the Second Sino-Japanese War began, Germany did not intervene to aid China and instead would ally itself with Japan. Germany in the years prior had invested into China building railroads, sending military advisers, and provided loans. So, why did Germany break off its relation with China even though they had invested economically and militarily in favor of cooperation with Japan?

Title: Methamphetamines in Nazi Germany

Authors: Garrett Jett

Faculty Mentors: Professor Grant Weller

Associations: History, Reisher Scholar

Abstract:

The concept of the *Volksgemeinschaft* introduced by the Nazi Party in the 1930's fundamentally changed the relationship of the German people to the state. The German population was expected to fully contribute to the aims of the Nazi Party, by combating the effects of the Great Depression and creating an independent German economy through rearmament. The chemical industry was key to this goal with companies like IG Farben, Merck, and Bayer all leading the

way in the development of synthetic materials required for rearmament such as gas produced by coal and synthetic rubber. The head pharmacist of the drug company Temmler, Dr. Fritz Hauschild, was intrigued by the performance of American athletes during the 1936 Olympic Games in Berlin and their use of an amphetamine called Benzedrine. Dr. Hauschild wanted to create a performance enhancing drug through a new method of synthesizing methamphetamines. The drug, called Pervitin, was marketed to the German population as an over the counter drug to combat circulation issues, low energy, depression, and even low libido in women. Pervitin became a sensation with everyone from students to housewives taking it multiple times daily, becoming as common as a cup of coffee. Pervitin stands in stark contrast with the official policies of the Nazi Party that were overwhelming anti-drug, alcohol, and cigarette. Pervitins use, however, was sold to the military as a way of combating fatigue in soldiers, leading to both its use on the battlefield and to Germany's enormous success on the Western and Eastern Fronts at the beginning of World War II.

Title: Rome's Legacy

Authors: Benjamin Buchanan

Faculty Mentors: Grant Weller

Associations: History

Abstract:

This poster examines the exchange of culture that occurred between Visigothic factions and the Romans following the sack of Rome in 410 AD. The specific question that the poster aims to answer is: "What was the immediate legacy of the Western Roman Empire relative to the societies that occupied formerly Roman territory?" The poster examines the adoption or discardment of Roman culture and practices in societies that conquered land formerly in Western Roman Empire. It explores how Visigoths and other groups elected to embrace or adopt certain social, political, and legal practices of the Roman Empire, and why they executed the abolishment of others. The timeframe of study generally follows events after Rome was sacked around 410 AD, however the collapse of the Western Roman Empire occurred over many years so a departure from that period is necessary to accomplish the goal of the poster. Sources for the poster range from modern literature on the topic to ancient sources like histories from authors that lived through this significant change in cultural landscape. Ultimately, encounters with Roman custom had a significant impact on the cultures that came into contact with it through occupation. Some groups fully embraced Roman legal, political, and social doctrine. Others embraced it only when it benefitted their cause, using it as a tool to be leveraged, and some entirely rejected it.

Title: The SS and Nazi Ideology

Authors: Benjamin Buchanan

Faculty Mentors: Grant Weller

Associations: History

Abstract:

This poster examines the role of the SS in Nazi Germany and the Second World War. It explores the directive of the SS as the practical arm accomplishing the goals of Nazi ideology. The specific question answered by the poster is "What role did the SS play in accomplishing the goals of the Third Reich?" Sources for the poster range from modern literature on the subject to reports and images of SS affairs during the years of the Third Reich. The poster presents how the SS influenced the execution of Nazi political, cultural, social, and military goals, as well as the role of the SS in the government. It explores how the organization was composed and what tasks were delegated to and carried out by SS units. Information on its various factions, such as the Waffen-SS and SD, is linked to the purpose of the poster as a means of exploring how these factions operated relative to the goals of the Nazi Party. SS units were tasked with the practical realization of the Nazi ideology. They imposed and enforced the aims of Nazi leadership and were responsible for many of the atrocities committed during the time of the Third Reich. This includes mass war crimes and the execution of the Holocaust. They were responsible for operating concentration camps, executing populations in occupied territory, and identifying, arresting, and eliminating perceived enemies of the Nazi regime. The SS also acted as an armed force involved in combat with adversary nations, fighting campaigns in conjunction with the German Army. They were a tool applied to combating adversaries abroad and enforcing Nazi rule within.

Title: Nazi Experimentation and its Effects

Authors: Elliot Sikes

Faculty Mentors: Dr. Judy Gaughn

Associations: History, Phi Alpha Theta

Abstract:

Hitler and the Nazi party committed numerous atrocities during the Holocaust. Many of these atrocities were committed under the guise of medical treatment or medical discovery, when in reality the experiments conducted by the Nazis were torture and nothing more. Numerous experiments were conducted on those interred, including women and children, and most of these experiments were fatal. Such experimentation includes the purposeful infection of incisions, pressurization experiments, cold experiments, twin experiments, and the list goes on. These experiments were conducted unethically and without the consent of those being experimented on, with little to no concern for the outcomes of these people's lives. To the Nazis, those interred were not viewed as people but rather things to use however they saw fit. I want to display these experiments to show the horrors that interred people endured as well as the results of these experiments. I also aim to start a conversation on whether or not such unethically acquired information could and should be used in modern medical innovation. The experiments were highly unethical, but does using the information they provide mean that anything found from the data collected is also unethical? Bringing together the historical information and ethical conversations I hope to answer these questions through this research.

Title: The Dual Spiritual Strategy of Nazi Propaganda

Authors: Charlize Perez

Faculty Mentors: Professor Grant Weller

Associations:

Abstract:

This research aims to explore the complicated role of spirituality and religion in Nazi Germany for propaganda and manipulation purposes. By exploring Christian symbolism, mystic alternatives, and the new racial ideologies that came from the combination of these forces, we can challenge the oversimplified idea of Nazi ideology being fully pagan or atheist. While early Nazi imagery embraced Christianized language and “Hitler like God” posters for popular support, internal conflict between party members began the change to a flexible political spirituality. Drawing on primary sources such as SS and Nazi party documents, letters from religious officials, and testimony from the Nuremberg trials, we can trace the evolution of adaptation methods and how new ideologies unfolded.

Title: Zionism Before and After the Holocaust: Conscious Historical Understanding through Memory & Scholarship

Authors: Breeanna Guerra Rodriguez

Faculty Mentors: Dr. Grant Weller

Associations: History & Spanish

Abstract:

With respect to Holocaust memory, how should Zionism be recognized and understood in modern Holocaust studies? This question seeks to educate the broader academic community about Zionism as a practiced ideology and the consequential repercussions. In drawing my conclusion, I argue that the frameworks in which Zionism is rooted in are of colonial origin which perpetrate genocidal tactics such as land dispossession through forced expulsion and systematic oppression. I draw from pre-existing bodies of research in Holocaust studies as well as primary sources from pre and post WWII Europe, Palestine, and the United States. The importance of this research as an educational tool is anchored in social justice, holistically contributing to the socio-cultural impact of Holocaust studies.

Title: The Grandchildren of Europe: The Relationships of 19th Century Nobility

Authors: Micah Trujillo

Faculty Mentors: Grant Weller

Associations: History

Abstract:

For this semester's project, I would like to present my research on the intimate and personal relationships of 19th century nobility, focussing on the grandchildren, and near family of Queen Victoria. Since her lineage became so expansive, and many became some of the leading households of prominent royal families, I thought that this would be an interesting topic. Furthermore, because of their familial relationships, I wanted to see what their lives were like on a personal level. What did they think about each other? Were they close? Did they even like each other? We often know about their political achievements and their decisions on laws and influence on the middle and lower classes, but I'm determined to find out what they were like behind closed doors. My analysis will use both letters and other primary-sources written by or about specific characters of this grand royal family. I'm hoping that my research will give a better understanding of the familial relationships of the aristocracy of late 19th century Europe, and will help in seeing them and their decisions made, from a different perspective.

Title: Sentencing Disparities in Corruption Cases in China: An Exploratory Study

Authors: Alexandra Hasui, Rebecca Boehs, Aoife Currier

Faculty Mentors: Yunhan Zhao

Associations: Criminology, Discovery Scholar

Abstract:

In 2012, under the leadership of President Xi Jinping, the Chinese government initiated one of the largest anti-corruption campaigns in the history of the Chinese Communist Party. By April 2022, disciplinary inspection and supervisory agencies nationwide had filed and investigated more than 4.3 million cases involving over 4.7 million individuals. Yet, despite the unprecedented scale of this campaign, little is known about the sociodemographic characteristics of those prosecuted or the extent to which sentencing outcomes vary across such characteristics. Drawing on court decisions from 2013 published on China Judgments Online, this study seeks to fill this gap by examining the sociodemographic backgrounds of defendants in corruption cases and assessing whether sentencing outcomes differ across these groups. The data were compiled using automated programs based on large language models, and future stages of the project will extend the analysis to cases from 2014 to 2020.

Title: Stigma, Meaning, and Knowledge in the Legal Cannabis Industry

Authors: Chey Farris, Jasmine Saleh, Kalina Bradley, Lauren Olivares, Olivia Eggert:

Faculty Mentors: Dr. Aaron Johnson

Associations: Criminology, Biology, Cannabis Biology & Chemistry, Humanities and Social Sciences, Discovery Scholar

Abstract:

This project draws on data from the Southern Colorado Cannabis Industry Ethnography (SCCIE), an ongoing qualitative study of workers in the legal cannabis industry. Prior analyses revealed that cannabis labor can be considered a form of "dirty work," highlighting how workers navigate stigma, legitimacy challenges, and marginal occupational status despite increasing legalization and normalization. Based on in-depth interviews with industry employees, this phase of the project revisits and extends that framework.

While stigma remains a central feature of cannabis work, emerging findings suggest that workers also develop and deploy forms of practical, experiential, and embodied knowledge that are not

fully captured by existing “dirty work” frameworks. In particular, budtenders and other frontline workers articulate a distinct form of occupational expertise rooted in product knowledge, customer interaction, harm reduction, and lived experience with cannabis. This project conceptualizes these insights as the “wisdom of weed workers,” an emergent epistemic dimension of cannabis labor that coexists with, and at times challenges, stigma.

By tracing the shift from stigma-centered analysis toward recognition of worker knowledge, this research contributes to sociological understandings of dirty work, occupational identity, and the social construction of expertise in newly legal industries. It also raises broader questions about whose knowledge is recognized, legitimized, or dismissed in contexts marked by rapid legal and cultural change.

Title: Bias in Translation: The Toledo Method of Translation and Violence vs. Bridge-Building

Authors: Olivia Winkelman

Faculty Mentors: Dr. Grant Weller

Associations: History

Abstract:

Title: The Hidden Roots of Nazi Ideology: Esoteric Nazism, the Thule Society, and Ariosophy

Authors: Olivia Winkelman

Faculty Mentors: Dr. Grant Weller

Associations: History

Abstract:

The Occult and mysticism played an integral role in the construction of Nazi ideology and white supremacist theory under Adolf Hitler’s dictatorship. Pseudoscience was often a direct byproduct of occultism and mysticism serving as foundational aspects of Nazism and Ariosophy, with pseudoscientific projects furthering the goals of the NSDAP and Hitler’s desires for a people united by race. Pinnacle figures in the National Socialist German Workers’ Party such as Heinrich Himmler, a leader of the NSDAP and a former leader of the SS, and Wolfram Sievers, the managing director of the NS Association German Ancestral Heritage. Occultist language was co-opted to construct a reordered history, centering on Ariosophy and white supremacism, to

legitimize the Nazi Party in the public eye and justify heinous acts. This project analyzes how the Occult and mysticism impacted and influenced foundational Nazi ideology and aided in the further perpetuation of white supremacism and Ariosophy. From the years 1919, the founding of the NSDAP, to 1945, the end of World War II, the Occult held strong institutional involvement through its inherent intertwining with ideology, leadership, and the rewriting of German history to promote false narratives regarding the supremacy of an "Aryan" race and the inferiority of social, racial, religious, and physical difference.

Key words: Ariosophy, the Occult, Nazi Germany, social theory, racial theory

Title: The Legacy of Nazi-Era Art in Germany and the United States: Provenance, Restitution, and Historical Memory

Authors: Hailey Gardner

Faculty Mentors: Professor Grant Weller

Associations: History

Abstract:

This poster investigates how provenance research, museum display practices, and restitution efforts surrounding Nazi-looted art have shaped post-war memory and the ongoing process of Vergangenheitsbewältigung (coming to terms with the past) in Germany and the United States. Focusing on the period from 1935 to 1945 and its aftermath, this study examines the motivations and compromises of artists working under the Third Reich, and traces the enduring cultural and political consequences of systematic dispossession.

Despite its historical significance, the intersection of art history and Holocaust memory remains underexplored in the scholarly literature. Drawing on provenance studies, museum ethics, and memory studies, this project offers new frameworks for understanding how looted art continues to function as a site of historical reckoning and moral accountability. In doing so, it challenges prevailing narratives within the field and deepens our understanding of how societies confront, and are irrevocably shaped by, their most difficult pasts.

Title: Positive Reinterpretations in Autobiographical Memories: Dispositional Gratitude related to stronger Fading Affect Bias

Authors: Zach Smailer and Charlotte Kneuper

Faculty Mentors: Dr. Richard Walker

Associations: Psychology, Discovery Scholar

Abstract:

The fading affect bias (FAB) names the phenomenon that the affect intensity of negative autobiographical memories (AMs) fades more rapidly and to a greater extent over time than the affect intensity of positive AMs, which has been interpreted an adaptive process promoting a positive self-concept. Personality traits such as grit and mindfulness have been associated with an increased FAB, whereas anxiety and depression have been associated with a decreased FAB. The goal of this study was to examine the association of the FAB with dispositional gratitude. As gratitude is defined as the tendency to notice and appreciate positive aspects of life, it may be linked to a more positive view of one's personal past, resulting in a stronger FAB. Analyses were based on 702 adults (aged 18–93 years; 65.95% women; 0.71% diverse gender), who completed the Gratitude Questionnaire – Six Item Form (GQ-6) and reported six self-defining AMs in a free recall procedure (3526 AMs in total). Participants rated the affect intensity of each AM retrospectively from the perspective of event occurrence and from the momentary perspective of event recall. Higher levels of gratitude were associated with a stronger FAB. Moreover, they were associated with a higher likelihood to report AMs that changed from negative to positive valence (flexible affect). These findings suggest that gratitude may play a role in fostering a positive and healthy perspective on one's personal past, thereby acting as a protective factor against the potential detrimental effects of negative life events once transformed into AMs.

Hasan School of Business

Title: CSUP P3 Economic Impact Study

Authors: Reyna Macaluso, Ben Para, Dylan Larson

Faculty Mentors: Dr. Michael Wakefield

Associations: Accounting, Business Management ,Discovery Scholar

Abstract:

This technical report will examine the economic impact of the planned Colorado State University Pueblo P3 development project. Approximately 114 acres of land located south of the campus remains undeveloped and underutilized. The purpose of this report is to evaluate the economic value generated through the development and expansion of this land. The analysis is based on reasonable, predictive estimates for construction costs, full-time employment levels, and the

employee compensation associated with the future developments. These estimates were derived from proposed construction contracts and data from similar business establishments in the surrounding area. Additionally, factors such as acreage usage, workforce estimations, and compensation trends were considered. This report comprehensively provides an estimate of the total economic impact the P3 development is expected to have on Pueblo, Colorado, expressed in terms of projected dollar value.

ORAL PRESENTATIONS

8:30 AM - 9:30 AM

Effects of Pinyon-juniper Mastication Treatments on Bumble Bee Communities

Authors:

Eliza Cash, Dave McNitt, Jake Powers, Claire Ramos

Faculty Mentor:

Dr. Claire Ramos

Presenters:

Eliza Cash

Abstract:

Pinyon-juniper (PJ) woodlands cover 40 million ha in the western United States and support high wildlife diversity. About 20% of these woodlands are managed on public lands by the Bureau of Land Management (BLM) to provide livestock grazing and wildlife habitat. Many of these woodlands are treated to mitigate wildfire risk by cutting and mulching trees on site via mastication. The impacts of mastication treatments on wildlife species, including pollinators, are unclear. Bumble bee populations are declining globally due a variety of factors including habitat loss and degradation. Conserving these populations and their habitat is a priority due to the essential pollination services bumble bees provide. As such, we aim to determine the impacts of PJ mastication on bumble bee abundance and floral preferences to make effective

recommendations to land managers planning treatments. We established sites in a paired plot design in masticated and nearby control areas on BLM land throughout Fremont County, Colorado. At each plot, we completed vegetation sampling and bumble bee surveys. In a preliminary data analysis, bumble bees were more abundant in treated areas. Bumble bee abundance increased with decreasing shrub cover and increasing floral species richness. We will complete another season of data collection and expand the data analysis to include other habitat variables. PJ mastication may provide a useful tool for managers looking to conserve pollinators while meeting other land management objectives.

9:00 AM – 9:30 AM

Understanding and Preventing Transthyretin Aggregation

Authors:

Rikayla Quezada

Faculty Mentor:

Dr. Cassidy Dobson

Presenters:

Rikayla Quezada

Abstract:

Transthyretin, or TTR, is a protein made in the liver that functions to help carry important biomolecules such as thyroid hormone and Vitamin A throughout the body. Under normal conditions, TTR forms a stable structure made of four subunits. However, certain mutations and/or changes in the environment can cause TTR to misfold and aggregate, causing amyloid fibril formation throughout the circulatory system. The inability to degrade amyloid fibrils of TTR is linked to several complications such as nerve damage, and heart failure. One of these known mutations involves incorrect disulfide bond formation between different proteins leading to irreversible aggregate formation. Our research is focused on whether a chaperone protein, known as Disulfide Bond Forming Enzyme (DBF) can prevent or reverse the formation of incorrect disulfide bond formation between TTR. DBF has previously been shown to restore and correct disulfide bond connectivity, but its restoration of correct structure has never been investigated on TTR. We have isolated both wild-type and a mutant form of TTR known for aggregation and compared disulfide bond aggregation status in the presence and absence of DBF

to understand if DBF can prevent or potentially reverse the formation of disulfide-mediated TTR aggregates.

10:00AM – 10:30 AM

Prevention and Reversal of Disulfide-Mediated Tau Aggregation by the Molecular Chaperone Disulfide Bond Forming Enzyme

Authors:

Madison Gutierrez

Faculty Mentor:

Dr. Cassidy Dobson

Presenters:

Madison Gutierrez

Abstract:

Neurodegenerative diseases such as Alzheimer's disease, Parkinson's disease, and frontotemporal dementia affect over 50 million people worldwide and are characterized by progressive cognitive and motor decline. These disorders are incurable and involve the degeneration of neurons in the brain and spinal cord. The microtubule-associated Tau protein (MAPT) is a hallmark of Alzheimer's disease and frontotemporal dementia due to its critical role in microtubule assembly, tubulin regulation, and axonal stability. Pathological aggregation of Tau leads to the formation of tauopathies and neurofibrillary tangles, which contribute to neurodegeneration. In particular, Tau aggregation driven by intermolecular disulfide bond formation between its two cysteine residues results in highly stable, nearly irreversible tau aggregates. This study investigates whether the disulfide bond-forming enzyme (DBF), acting as a molecular chaperone, can prevent or reverse Tau aggregation. Human Tau protein was subjected to aggregation under oxidizing conditions using chemical agents, including copper (II) chloride, oxidized glutathione, and cystine, to promote intermolecular disulfide bond formation. Following the disulfide-mediated tau aggregates, the ATP-dependent disulfide bond–forming enzyme (DBF) was introduced to evaluate its ability to reverse pre-formed Tau aggregates. Moreover, Tau and DBF were co-expressed in *Escherichia coli* and exposed to the same oxidizing conditions in the presence of ATP to determine whether DBF can prevent disulfide-mediated aggregation during its formation, compared to Tau expressed alone. The findings from

this study may contribute to the development of therapeutic strategies aimed at reducing neurofibrillary tangles or MAPT aggregation associated with Alzheimer's disease and related neurodegenerative disorders.

11:00 AM – 11:30 AM

Fuel-Optimal Optimal Control in Unstable Three-Body Orbits

Authors:

Benjamin Spangler

Faculty Mentor:
Bruce Lundberg, PhD
Presenters:
Benjamin Spangler

Abstract:
Spacecraft motion near libration points in the circular restricted three-body problem (CR3BP) is of interest for long-duration mission design and station-keeping. Linearized models provide analytical insight, but trajectories generated from these approximations diverge from the true nonlinear dynamics over time. We use linearized solutions as initial states and formulate an optimal-control problem to stabilize the true nonlinear dynamics. Pontryagin's Maximum Principle is applied to derive necessary conditions for fuel-optimal control, leading to a boundary-value problem solved via shooting methods. The resulting control stabilizes an orbit about a libration point. We also explored parameterizing the orbit, determining the cost for different paths. Unsurprisingly, as the size of the orbit decreased so did the cost. Possible next steps include finding fuel-optimal paths to insert into orbit around a libration point, extending to three dimensions, or considerations of elliptical three body systems.

12:30PM – 2:30PM

Fall Prevention In Older Adults

Authors:

Atihmbom Yondo Destine, Isaiah Muniz, Ernestina Obeng, Phillip Umba

Faculty Mentor:

Heather Brown

Presenters:

Atihmbom Yondo Destine, Isaiah Muniz, Ernestina Obeng, Phillip Umba

Abstract:

Purpose: The purpose of this translational research study is to evaluate the effectiveness of structured physical therapy and gait mobility interventions in reducing fall incidence among adults aged 65years and older. **Background & Significance:** Falls in the older adult population remain a leading cause of injury, hospitalization, and loss of independence. Age-related changes such as decreased strength, impaired balance, and reduced mobility significantly increase fall risk. Fall prevention continues to be a major concern in nursing practice, as nurses play a critical role in assessing risk, implementing preventative strategies, and promoting patient safety. **Methods:** This is a translational research study utilizing a literature review design. All authors hold current certifications for the Collaborative Institutional Training Initiative's (CITI) online training for "Biomedical Research: Basic Course on Research Ethics". This study does not include human subjects and is exempt from IRB approval. **Findings:** Evidence from the literature demonstrates that structured physical therapy and gait mobility programs improve balance, strength, and coordination, resulting in a measurable reduction in fall rates and fall-related injuries among older adults. **Conclusion:** The findings support the use of structured mobility interventions as effective, non-pharmacological strategies for fall prevention. Nurses should advocate for and implement these interventions to enhance patient safety, promote independence, and improve quality of life in the older adults population.

Keywords: fall prevention, physical therapy, gait training, mobility, older adults

12:30PM – 1:00PM

Fear Beyond the Fields: The Lived Experiences of Undocumented Farmworkers

Authors:

Jazmin Gomez

Faculty Mentor:

Calhoun-Stuber,Susan

Presenters:

Jazmin Gomez

Abstract:

Under the Trump administration immigration laws have changed drastically while leaving several undocumented farmworkers under constant fear of being separated from family or even deported. This study analyzes the day-to-day experiences for undocumented farmworkers while trying to understand the sacrifices they make for themselves and loved ones. The research uses ethnographic methods to interview farmworkers and advocates who work closely to reinforce undocumented farmworkers. This also shows how the fear of deportation expands beyond working conditions, affecting workers' sense of safety, belonging, and involvement within their communities. By centering on these stories, this study clarifies the overlooked realities of farmworker under legal insecurity, offering a more intricate understanding of what it means to live as an undocumented farmworker during this administration.

1:00PM – 1:30PM

Food Insecurity on Campus: Prevalence and Influences at a Regional-Comprehensive, Hispanic Serving University

Authors:

Nadia Ayala, Kahli Bottoms, Nicole Sharon, Blessing Madueke, Daizhanae Taylor

Faculty Mentor:

Bethany KiesBolkema

Presenters:

Nadia Ayala, Kahli Bottoms, Nicole Sharon, Blessing Madueke, Daizhanae Taylor

Abstract:

Food insecurity among U.S. college students is a consistently documented issue, with research showing that it affects a large portion of the student population and has serious implications for well-being and academic success. More than one group of researchers has found higher food insecurity reported for Hispanic and African American students as compared to white students

on the same campus, and that food insecurity was significantly associated with both race/ethnicity and financial aid status. This research project is a mixed-methods study is to determine the prevalence of food insecurity (i.e. not enough access to food) and the factors that influence that prevalence for students living in campus housing at a Hispanic serving, regional comprehensive university in the western United States. Students living on campus will be surveyed and leaders from campus residence life and student support services will provide input through a focus group in order to answer the following research questions: 1. How many students living on CSU Pueblo's campus during the spring of 2026 are experiencing food insecurity? 2. What are the factors that most influence food access for students living on campus at CSU Pueblo? The literature highlights important gaps, especially the need for long-term, systemic solutions that address affordability, access to federal assistance, and inequalities within higher education Results from the study can be used to better inform decision making and improve food access for students living on campus.

1:30PM - 2:00PM

The Knowledge Lost by Ignoring Female Composers: A gynocentric analysis of Hildegard von Bingen's Ordo Virtutum (1151)

Authors:

Marissa Martinez

Faculty Mentor:

Dr. David Volk

Presenters:

Marissa Martinez

Abstract:

In the study of musicology, female composers are rarely considered, while male composers dominate musical discussion. With this disregard of female composers, there is a significant gap in historical knowledge and repertoire; the only notable female composer of the Middle Ages is Hildegard von Bingen. Despite this, through studying Hildegard’s writings, scholars of multiple disciplines have made various groundbreaking discoveries which can be analyzed using modern-day theories. Hildegard’s sacred allegorical play, *Ordo Virtutum* (1151) can be inspected through a lens of gynocentric feminism due to the intervallic juxtaposition, in which the female

voices are consonant and the male voices feature more dissonance. Applying gynocentrism to *Ordo Virtutum* encourages further acknowledgement of female composers and provides opportunities for present-day scholars to connect modern theories to ancient musical works, ultimately expanding overall knowledge across disciplines.

2:00PM – 2:30PM

Indigenous and Educated: Strengthening College Access for Native American Communities in New Mexico Through Student Experiences with Higher Education

Authors:

Golden Finch

Faculty Mentor:

Professor Strickler

Presenters:

Golden Finch

Abstract:

My presentation will comprehensively cover the potential state and tribal level solutions for Native American students who are struggling to achieve higher academic opportunities and who are currently living in New Mexico. By utilizing a specifically designed mix of qualitative and quantitative survey questions that examine the challenges associated with pursuing and successfully finishing higher education, and by surveying members of several different tribes from across the state of New Mexico, I was able to gather a broad and representative range of experiences as well as personal suggestions. A recurring and significant theme identified between participants is the need for a stronger and more structured emphasis on motivation, mentorship, and guidance throughout the college application process, in addition to increased support in the search for scholarship opportunities during their senior or junior year of high school. This consistent and strongly suggested theme has led me to propose a comprehensive and actionable educational policy for both the state of New Mexico and at the tribal level.