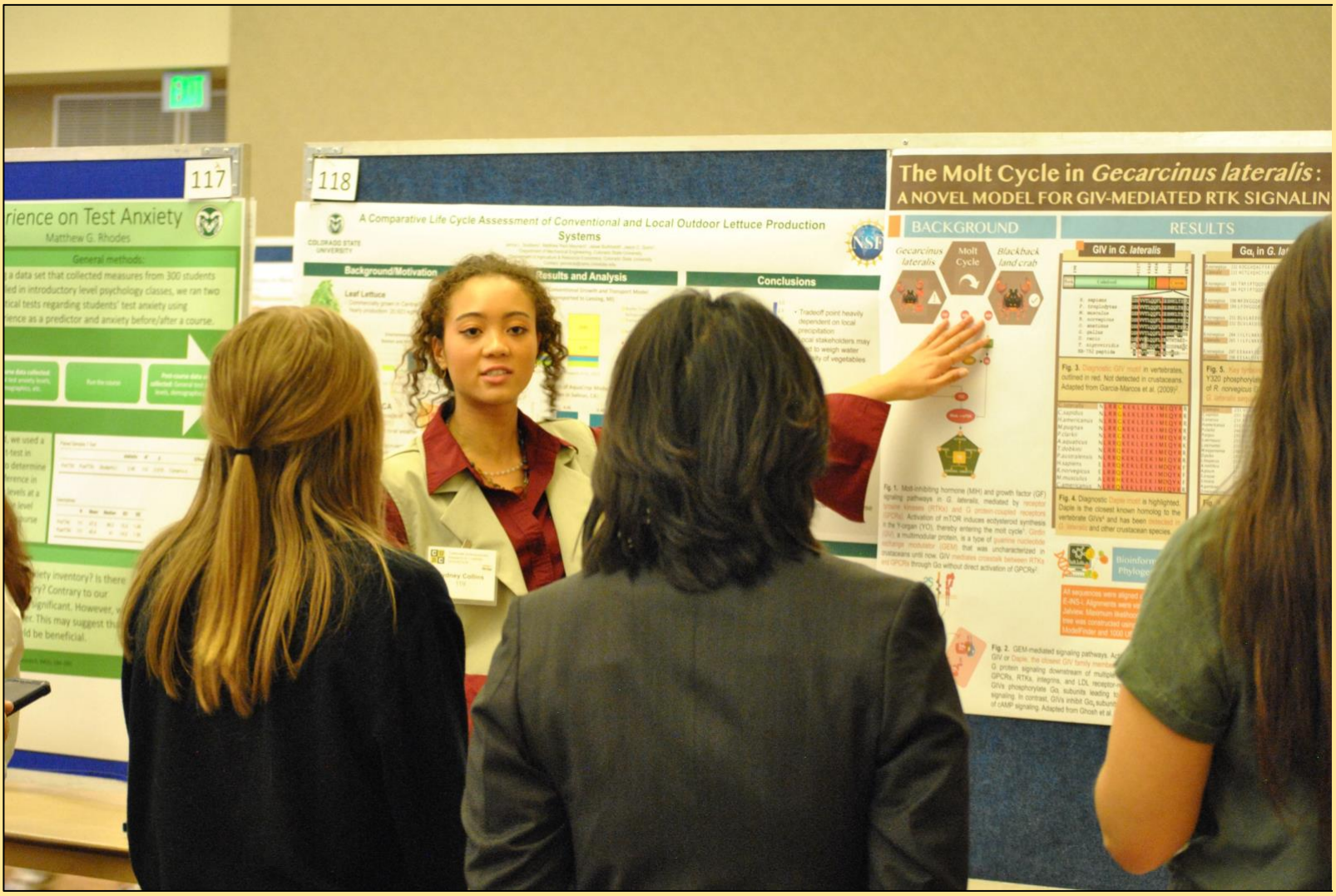
CURC

2024



Celebrate Undergraduate Research and Creativity

ACKNOWLEDGMENTS

We express our gratitude to the following people and departments:

CURC Steering Committee 2024
College of Liberal Arts: Ellie Light
Warner College of Natural Resources: Chris Myrick
Walter Scott College of Engineering: Christie Peebles
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College of Agricultural Sciences: Thomas Borch
Office for Undergraduate Research and Artistry: Louise Allen, Jenniffer Riley, Josephine Gawtry

CURC 2024 is generously supported by the Office for Undergraduate Research and Artistry, The
Institute for Learning and Teaching and The Office for the Vice President for Research

Each year various CSU units, institutes, and colleges sponsor student awards to recognizecreative and scholarly excellence presented at CURC. The sponsors in 2023 include:
The Energy Institute
The Graduate School
The College of Liberal Arts
The Data Science Research Institute

JOURNAL OF UNDERGRADUATE RESEARCH

The Journal of Undergraduate Research (JUR) is a peer-reviewed, undergraduate journal registered with the Library of Congress that accepts submissions of any subject, from any undergraduate institution. We receive hundreds of sub missions for publication every year, from institutions ranging from small liberal arts colleges to international institutions. The review process for publication includes peer, graduate, and faculty referees, ensuring that the Journal publishes competitive material that follows the Journal's standards for academic, creative, and passionate work.

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JUR PRESS

A LETTER FROM THE DIRECTOR OF OURA

Dear CSU Community,

The Celebrate Undergraduate Research and Creativity (CURC) 2024 Showcase has arrived. This is an exciting event with a long history. More than 3 decades ago, the Office of the Provost began working with College of Natural Sciences to facilitate the expansion of their annual research poster session into the university-wide event that we know today as the Celebrate Undergraduate Research and Creativity Showcase. With the inclusion of all disciplines represented at CSU, CURC showcases much more than traditional research. This year CURC will feature work from over 330 students. The types of submissions include: research, community engaged learning, creative writing, performing and visual arts. New this year is a collaboration with Tree Stump Films to host the Tree Stump Film Festival at CURC in the LSC Theater starting at 5:00pm.

To all of the students who are participating, let me just say how impressed I am by the level of dedication, skill, and creativity that you have demonstrated. You spent many hours researching and creating your projects and crafted posters, presentations, art, and performances of exceptional quality while doing so. Each and everyone of you should be proud of this accomplishment!

To our volunteers, thank you for helping the day of CURC run smoothly. To the editors of the Journal for Undergraduate Research, especially Abi Somers, and Theresa Farley thank you for putting this abstract booklet together and for making CSU proud to be home of JUR.

We are exceedingly grateful to the judges who dedicate their time to thoughtfully review posters and other works and provide feedback for students. We cannot pull off this event without your extensive help, as well as your support and encouragement. Thank you, thank you, thank you!

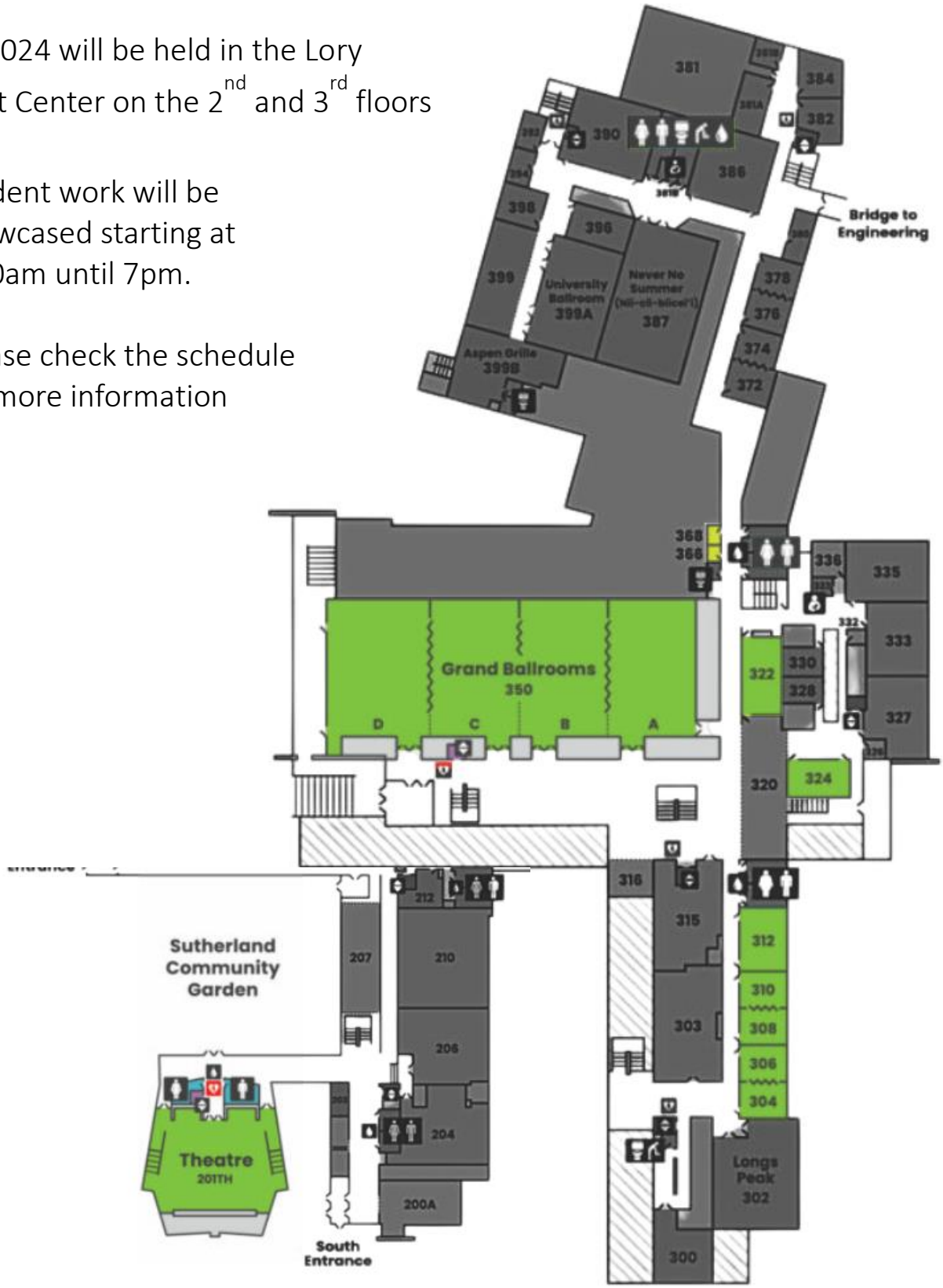
Thank you to The Institute for Learning and Teaching (TILT) and the Office for the Vice President for Research (OVPR) for helping to support a campus-wide event of this scale. We thank the Energy Institute, the Graduate School, the College of Liberal Arts, and the Data Science Research Institute for sponsoring student awards. Many cheers to everyone who helped make CURC 2024 a success! Have a great CURC and remember that Research and Creativity are for everyone.

LAYOUT OF PRESENTATIONS

CURC 2024 will be held in the Lory Student Center on the 2nd and 3rd floors

Student work will be showcased starting at 9:30am until 7pm.

Please check the schedule for more information



CURC 2024 SCHEDULE AND INFORMATION

TIME	EVENT	LOCATION
9:30-10:45 AM	POSTERS I	LSC BALLROOM & 322
11:00-12:15 PM	VISUAL ARTS	LSC 324
11:00-12:15 PM	ORAL PRESENTATIONS I	LSC 304, 308 & 312
12:30-1:45 PM	POSTERS II	LSC BALLROOM & 322
12:30-1:45 PM	ORAL PRESENTATIONS II	LSC 308
2:00-3:15 PM	PERFORMING ART	LSC THEATER
2:45-3:15 PM	ORAL PRESENTATIONS III	LSC 304 & 312
3:00-4:00 PM	POP-UP OPERA	LSC SUTHERLAND COURTYARD
3:30-4:45 PM	WRITTEN WORK READINGS	LSC 312
5:00-7:00 PM	TREE STUMP FILM FESTIVAL @ CURC	LSC THEATER

Celebrate Undergraduate Research and Creativity

26 Longitudinal Analysis of Climate Adaptation Strategies for U.S. Dairy Farms

Lauren Benfield
Dr. Jasmine Dillon
College of Agricultural Sciences
Research Poster

With 94% of adults in the U.S. consuming dairy daily, the importance of the dairy industry cannot be understated. Over the past decades, the average temperature increase per decade has risen from 0.06°C to 0.20°C, tripling since 1982. Extreme temperatures and humidity can have a negative impact on dairy cow performance and lead to heat stress, making the industry vulnerable to meeting future demands. The goal of this project was to assess changes in management in U.S. dairy farms due to increasing temperature and humidity to make recommendations for future adoption of management-intensive practices. We compiled regional dry-bulb temperature and relative humidity data at a county level and used the Temperature-Humidity Index (THI) formula to divide the U.S. into 6 THI clusters as an indicator of weather stress. Next, based on geographical location, we grouped data collected by the National Animal Health Monitoring System (NAHMS) from 2002 to 2014 on dairy farm management into the 6 THI clusters. Using python and matplotlib, our analysis showed that lactating cows managed under management intensive cooling methods such as fans, tunnels, and sprinklers increased from 91% to 100% over time. The use of freestalls, a form of indoor housing, increased by 20%. Cluster 6, the hottest cluster, saw each cooling method increase in use by roughly 15%, suggesting a connection between increasing temperatures and the need for intensive cooling. As global temperatures continue to escalate, use of management-intensive cooling methods and indoor housing are expected to rise accordingly.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63965

17 Thermoregulation in Early Postnatal Lambs After Gestational Nutrient Challenge

Gracie Bracco
Caitlin Cadaret
College of Agricultural Sciences
Research Poster

Thermoregulation in Early Postnatal Lambs After Gestational Nutrient Challenge
Gracie Bracco, Ellen Roberts, Rachael Stucke, Alison Kuderka, and Caitlin Cadaret
Sheep operations are widespread in the US which results in varying climates that may undergo nutrient challenges, specifically during winter. At birth neonates must learn to thermoregulate in their new environment and severe nutrient deprivation is known to cause weak lambs that quickly go hypothermic. However, less is known about how average restriction in range operations affects these animals. The objective of this project was to gain a better understanding of how moderate nutrient challenge during gestation affects thermoregulation in early postnatal lambs. Core temperatures were collected using a rectal thermometer for the first seven days of life and then weekly thereafter. There was a treatment by time interaction in which lambs from nutrient restricted dams had lower core body temperatures on days 1,3,4, and 5 compared to control lambs. No

differences existed after the first week of life. Our results indicate that lambs from ewes on a nutrient restricted diet have a more difficult time thermoregulating in the first week of life than lambs from the ewes that received full nutrient requirements during gestation. Producers must consider variations in nutrient availability between years as these thermoregulatory issues occur with moderate restriction and put lambs at an increased risk for hypothermia, potentially requiring more intervention from producers for survival.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63687

13 Assessing the Impact of Urban Environments on the Biomolecular Composition of 'Mosco' Chili Peppers

Kathryn Braun
Dr. Jessica Prenni
College of Agricultural Sciences
Research Poster

The rapid increase in urban populations and urbanization, coupled with the increasing demand for natural resources, has underscored the critical significance of global sustainability. Urban farming has been recognized as a promising solution to address these challenges. Despite the growing popularity of urban agriculture, there is a lack of research on how the built environment and urban micro-climates impact plant growth and food crops cultivated in cities. Our study aims to address this gap in knowledge by investigating how urban climates impact the growth and quality of 'Mosco' chili peppers, a significant crop in the Southwest United States. Peppers were cultivated in four different locations at the CSU Spur research facility in Denver, Colorado, including a ground-level plot, two rooftop areas with varying sunlight exposure, and a rooftop site under a solar panel array. Throughout the growing season, climate data and plant growth metrics were consistently monitored. Post-harvest, we characterized the biomolecular composition of the peppers using standardized methods from the Periodic Table of Food Initiative (PTFI). Collectively, the results of this study offer valuable insights into the impact of urban environments to the production and quality of peppers, informing sustainable urban farming practices and enhancing our understanding of plant adaptability in city settings.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64072

11 Stock Plant Management Techniques to Optimize Vegetative Cutting Production

Colten Davis
Ronda Kosk and Dr. James Klett
College of Agricultural Sciences
Research Poster

Callirhoe involucrata, known as “winecups”, is a North American native plant that is often grown as a xeriscape plant in full sun. This perennial blooms with fuchsia-pink flowers from April to hard frost and is promoted in the Plant Select® program. Demand for certain taxa in the program has exceeded supply. Many perennial taxa are propagated by vegetative means. Non-flowering, vegetative tissues are desirable for asexual propagation because cuttings that are reproductive can have reduced or

delayed rooting. This can result in a lack in crop uniformity. Due to this, we researched growing stock plants under differing photoperiods to extend the length of vegetative period, increase vegetative growth, as well as determine if this will enhance the quality of rooted cuttings taken.
In grow tents equipped with LED lamps, three photoperiods of light were evaluated: 8 hours, 10 hours, and 12 hours. Three experiments were conducted between April 2023 and January 2024. Twenty-Four replicates of *Callirhoe* were divided evenly into different tents and given identical fertilizer solutions. The mean duration of vegetative growth in weeks increased as the length of photoperiod decreased, illustrating that reproductive growth occurs later with shorter photoperiods. As the photoperiod decreased, the quality of cuttings increased; 8-hour photoperiods yielded the strongest cuttings with the highest probability of rooting and number of roots. This study illustrates that a greenhouse grower can utilize a decreased photoperiod treatment of 8-10 hours on their *Callirhoe involucrata* stock plants to delay reproductive growth and get higher quality rooted cuttings.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64089

18 growing new markets for pulse crops in Colorado

Ian Edwards-Clancy
College of Agricultural Sciences
Research Poster

"Growing new markets for Colorado pulse crops" was a project geared towards exploring how local markets can be expanded to new consumers and products. Pulses, a category of edible dry seeds in the legume family, are crucial crops for sustainable agricultural practices due to their ability to fix nitrogen and their high protein content. Along with this, having local agriculture supporting local communities reduces carbon emissions and strengthens supply chains. To find out how to better serve consumers and suppliers, interviews across the state and extensive background research was done to create a detailed picture of the Colorado Dry Bean and lentil industry. Research was gathered from the national agriculture statistics service to inform about total acres used, varieties planted, commodity prices, and other actionable information. Interviews were conducted with restaurants, commodity organizations, and suppliers. Through this, we identified major growing regions in northeast and southwest Colorado, a lack of facilities where pulse producers can store or process their harvest, and interested businesses that would be willing to look into switching supply chains to use Colorado pulse crops. Interviews in the southwest showed that unique regional varieties like the Anasazi were popular for tourists looking to experience authentic regional cuisine. Tourism also increased overall pulse sales, as tourists saw local crops as both a superior good and souvenir. Through all my research, I found that there are many restaurants that are interested in showcasing Colorado products, with price and quality being top considerations.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64017

162 Elemental Showdown: Battle of Open and Microwave Methods for ICP-MS Analysis

John Evans
Jacqueline M Chaparro
College of Agricultural Sciences
Research Poster

Elemental analysis using inductively coupled plasma mass spectrometry (ICP-MS) is an invaluable technique for measuring toxic and essential elemental composition of food samples. The digestion of samples using nitric acid is a prerequisite for analysis, for which microwave digestion is the preferred method. However, microwave digestion systems frequently possess restricted capacity for concurrently preparing a large number of samples. Alternatively, an open vessel method relies solely on acid over an extended period of time. This approach can potentially decrease the workload required to prepare the same number of samples. This research evaluates the efficacy of open vessel digestion of samples from 5 distinct food groups, for the analysis of 26 elements that comprise The Periodic Table of Food Initiative (PTFI) ionomics method. Each sample was subjected to both digestion methods, with 3 replicates (n=15) being digested via microwave digestion or open vessel digestion. An additional replicate (n=5) was digested with an open vessel method at 25˚C to determine the minimum amount of time required for complete sample digestion. Regardless of the digestion method used, Ionomics results showed little to no differences in elemental composition depending on the type of food. Therefore, an open vessel method is a viable approach for elemental analysis of certain food groups and, for large sample sets, more efficient in terms of workload. Ultimately, the choice for sample preparation method will be dependent on sample size and digestion process practicality.
https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64011

71 Streamlining Sample Preparation: The Decision Tree Tool for the Periodic Table of Food Initiative

Macy Gruszczynski
College of Agricultural Sciences
Research Poster

The Periodic Table of Food Initiative (PTFI) is a global effort to advance our understanding of the world's edible biodiversity. The early steps of food collection, sample preparation, and sample processing are imperative to the success of downstream comparison of foods and rely on standardized practices and rich metadata collection. PTFI processing begins with collection of food samples from various locations such as grocery stores, fields, or fresh markets. Sample preparation is next, which includes washing, cutting, and (sometimes) cooking the food. The methods are written and photographed to create detailed standard operating procedures (SOPs). Prior to processing, the food is stored in –80C. Sample processing begins with lyophilization, or freeze-drying. The sample is lyophilized for roughly 72 hours to remove moisture and concentrate sample. Following lyophilization, the sample undergoes homogenization to ensure

uniformity for extraction efficiency. To finalize processing, the sample is weighed out into smaller portions called aliquots for analysis. This method can be seamlessly applied to a vast array of food types. However, certain food types, such as high-fat products, beverages, and high sugar content challenge a single method for all food types. For example, liquid foods stored in -80C will melt during homogenization, so a cyrohomogenization method was implemented by freezing the grinder at -20C and the sample in -80C prior to homogenization. Using our experience with these steps for the processing of over 500 foods, we have created a standardized decision tree tool to support future analysis for any unique food type.

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206 Effects of Composting on Soil Organic Matter Pools in a Dryland Agricultural System

Sarah Harper
Tess Noble Strohm
College of Agricultural Sciences
Research Poster

The Ogallala aquifer is situated within the Great Plains of the United States and is responsible for providing irrigation water to much of the surrounding area. Unfortunately, overuse of this water source for agricultural production has led to rapid depletion of the aquifer and the adoption of dryland production by many farmers who once relied on its abundance. Shifting to dryland systems presents producers with the challenge of retaining water from rain and snowmelt within the ground for as long as possible through improving soil water infiltration and holding capacity. As a result, Soil organic matter (SOM), which has the ability to improve the forementioned soil qualities, has been an increasingly important topic of discussion for those studying dryland agricultural systems. While there are a wide range of practices which can stimulate SOM production, one of interest is the use of manure containing compost as cattle manure is a widely available resource to many producers. In this study, preliminary data from test plots in Akron, Colorado is used to draw connections between different compost application rates and changes in SOM content. Furthermore, data in this poster will present how different compost rates could affect the structure and function of the organic matter.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64133

1 Hyperspectral Imaging and Machine Learning for Plant Health Assessment

Emma Hoopes
Phuong Dao
College of Agricultural Sciences
Research Poster

Crop diseases present a major threat to crop health and productivity in agricultural systems. Often, these diseases cause no visible symptoms in the plant until late in the infection. Thus, early detection and management can be difficult, especially at large scales, leading to high yield loss and plant mortality. When infected, plants respond to the impact by reallocating their

resources toward defensive secondary metabolites. It is difficult and time-consuming to manually characterize the changes. However, hyperspectral imaging presents can overcome this problem, as the changes in plant foliar chemistry produce distinct spectral reflectance patterns. Integrating this technology with machine learning (ML) provides a powerful tool for detecting, phenotyping, and characterizing diseases, disease resistance, and assessing plant trait variation.
In this project, we apply these methods to screen and characterize *Rhizoctonia* infections in greenhouse-grown sugar beets. Hyperspectral images were captured on 122 plants before and after disease inoculation using a Specim IQ sensor with 204 spectral bands between 400-1000 nm. We evaluate the performance of well-established ML algorithms on full spectra and spectral indices in disease detection. Once a baseline is established, we can use hyperspectral drones to gather data from crop fields and analyze the infection in real-time. The results of these flights promote a better understanding of crop-disease interactions, allowing for improved decision-making in crop protection and disease-resistant crop breeding.

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15 Nutrient Challenge During Gestation on Lamb Growth and Development

Ava Kalsbeek
Caitlin Cadaret
College of Agricultural Sciences
Research Poster

Nutrient-dense feed can be difficult to come by throughout the winter when pregnant ewes are usually gestating. The common practice is to supplement ewes at the end of gestation when nutrient requirements are the highest, however, impacts of this strategy on ewe and lamb performance are not clear. Therefore, the objective of this study was to investigate how dam nutrition—meeting 100% of nutritional needs (CON) for the entire gestational period or a diet restricted to 50% of protein and 70% of the energy requirements (NR) from 30-125 days of gestation (dGA) —affected growth and development. Body weights and morphometrics were collected daily and weekly, respectively, from birth-30d. Interestingly, NR lambs tended (P

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5 Changes in soil health in relation to management in dryland agroecosystems

Brittani Meis, Eilee Murray
Meagan Schipanski
College of Agricultural Sciences
Research Poster

Carbon supports microbial growth and metabolism, thereby influencing many soil processes including nutrient cycling. Carbon mineralization (Cmin) and permanganate oxidizable carbon (POX-C) are proxies that have been used as soil health indicators, with the assumption that healthier soils may be formed under regenerative agricultural practices and are most quantified under laboratory conditions. POX-C soil analyses indicate concentrations

of polyphenolic compounds associated with the soil microbiome and plant residues in the soil system. These concentrations can reflect organic matter in the soil, contributing to nutrient availability for crops and soil resiliency. Higher Cmin rates indicate more efficient C cycling and more active, diverse microbial communities that can improve soil physical, chemical, and biological properties. Multiple variables, such as soil texture, climate, soil depth, organic matter, and management types (i.e. tillage), affect the amount and type of carbon available for mineralization and oxidation. We sampled 32 farms grouped into three management categories (long-term practitioner, conventional, and transitioning) across eastern Colorado, western Nebraska and Kansas at 0-5 and 5-15 cm to assess how variables such as bulk density (BD), climatic variables such as potential evapotranspiration (PET), soil organic matter (SOM), and management affect Cmin rates and POXC concentrations under controlled laboratory conditions. The results of these studies were integrated into personalized soil-health portfolios for individual producers. Producers can use these portfolios to monitor the impacts of yearly management adjustments, and evolving soil health properties on their farms.

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73 Examining the Efficacy of *Fusarium* spp. Isolates in Wheat Stem Sawfly Management

Johanna Merkel
Punya Nachappa
College of Agricultural Sciences
Research Poster

The wheat stem sawfly (WSS), *Cephus cinctus* Norton, is a primary pest of wheat in Colorado. It causes significant economic damage and is difficult to control by traditional management practices due to its life cycle wherein all life stages, save the adult stage, occur inside the plant. The discovery of endophytic *Fusarium* spp. in wheat presents the possibility of these fungal species being used to control WSS as a mycopesticide. This study explores the efficacy of two *Fusarium* spp. complexes—*F. annulatum* and *F. fujikuori*—in causing mycoses of WSS larvae. We conducted a preliminary bioassay that examined larval mortality and symptoms of mycoses with conidial concentrations of 1 x 104 CFU/mL for both isolates. We found 60% larval mortality from both isolates compared to 13% mortality from a 0.05% Tween 20 control. This research shows promise for *Fusarium* spp. to be used in WSS management. Next steps include a large-scale bioassay, and a greenhouse assay to determine how *Fusarium* spp. interacts with the larvae inside the wheat plant.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64048

9 Indicators of Soil Health Changes in Dryland Agroecosystems

Eilee Murray
Dr. Meagan Schipanski
College of Agricultural Sciences
Research Poster

Soil health analyses for the FARMS project (Farmers Advancing Regenerative Management Systems) looked at multiple components of soil health to build individualized reports for farmers. These soil health reports help provide farmers with scientific feedback on the impacts management decisions make on their soils. Management information was collected from producers, and our team developed an index score for each farm based off of the 5 principles of regenerative management. In our analyses, we found that the component of the regenerative index that had the most impact was the presence of living roots in a field system. We found that the presence of living biomass was positively correlated to better soil stability, the total organic matter in the soil, and POX-C values.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64118

4 Ewe Mammary Health and Milk Yield After Poor Nutrition During Gestation

Allie Stone
Caitlin Cadaret
College of Agricultural Sciences
Research Poster

Pregnant ewes are often ranched on open pasture during winter months, when nutrient dense feed can be hard to come by. How this feeding strategy impacts milk and udder quality in periparturient ewes has not been well studied. Therefore, this study set out to observe how indicators of udder health and milk quality are impacted in ewes based on how their diet meets their nutritional demands during gestation. To do this, control ewes were individually fed a diet meeting 100% of National Research Council (NRC) requirements for the entirety of gestation, while nutrient restricted ewes received a diet that contained approximately 70% of their energy requirements and 50% of their protein requirements from 30-125 days of gestation (dGA). All ewes were fed 100% of their requirements from 125 dGA to lambing. Ten days before their due date and then weekly thereafter, udder health was determined by scoring of udder morphology based on published standardized scales, physical measurements of their udder circumference and teat lengths, and palpation for evidence mastitis. To determine milk quality, a sample of colostrum and peak milk were collected and analyzed. This study is ongoing, but we hypothesize that there could be increased incidence of mastitis, reduced mammary development, and lower or prematurely terminated milk production among the ewes that experienced nutrient restriction, due to less ability to develop the necessary caloric reserves. The results of this study will be beneficial to shepherds when deciding how to manage flocks to optimize dam and lamb health and production.

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3 Associations between human and novel object approach test outcomes and health status in preweaned Holstein heifer calves:; a cohort study.

Emily Wilson
Catie Cramer

College of Agricultural Sciences
Research Poster

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63592

Dairy calf health impacts animal welfare, and productivity**.** Recognizing sickness behaviors aides caretakers in promptly identifying and providing care to sick animals. The objective of this cohort study was to investigate whether calves contacting a human (HA) or novel object (NOA) during approach tests are associated with diarrhea and fever status within the first 4 weeks of life in preweaned Holstein heifer calves. Calves in this study are a subset from a larger study investigating the effect of IGY supplementation on calf health. Calves (n = 28) on one dairy underwent twice weekly health exams for diarrhea (fecal score 2) and fever (rectal temperature 38.9°C). HA and NOA tests were conducted weekly. For the HA test, a researcher stood stationary outside the pen and recorded if a calf made contact within 60 seconds (yes/no). For the NOA, a researcher recorded if the calf contacted a novel object within 60 seconds. Four separate logistic regressions with calf as a random effect and controlling for age were used to determine if HA or NOA contact (outcomes) were associated with diarrhea or fever (predictors). Calves with diarrhea were 0.25 times as likely to touch the human (OR: 0.24, 95%CI: 0.09-0.69; P=0.008). Calves with diarrhea tended to be less likely to approach the object (P=0.055). Calves with a fever tended to be less likely to approach the human (P=0.07) and the novel object (P=0.09). Preliminary findings suggest illness impacts exploratory behavior, highlighting the need for more research to inform disease detection strategies.

10 Assessing the Impact of Employee Compensation Announcements on Stock Market Returns

Sarah Driscoll
Dr. Samantha Conroy
College of Business
Research Poster

Research on the effects of changes in employee pay on firm performance is limited, despite its significant implications for employees and organizations. This study employs an event study methodology to investigate the impact of changes in worker pay on firm value. An event study evaluates how events influence company stock price changes. Pay announcements from 2000 to 2023 were collected through a keyword search strategy, focusing on articles directly addressing pay adjustments. Irrelevant articles, such as those of non-US companies or CEO compensation, were excluded. The remaining articles were coded to determine whether worker pay was increased or decreased.

Currently, the research team is in the process of refining the final list of events. Once completed, the analysis will identify trends and propose avenues for future research. This study contributes to a deeper understanding of the relationship between employee compensation strategies and organizational performance.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63752

12 Exploring AI Appreciation or Aversion: Factors Influencing User Attitudes and Outcomes

Kevin Kaster
Adela Chen & Hamed Qahri-Saremi
College of Business
Research Poster

The rapid advancement of artificial intelligence (AI) holds significant implications for businesses and individuals across diverse sectors. These cutting-edge technologies enhance and assist user's decision-making processes in their daily tasks and boost their productivity. Beyond augmenting human capabilities, AI streamlines business operations by alleviating the burden of critical decisions or reinforcing established decision-making frameworks. The successful integration and utilization of these technologies rely upon users' willingness to adopt them in their decision-making processes. Users of AI applications can develop both positive (e.g., appreciation) and negative (e.g., aversion) orientations toward AI. However, our comprehension of the underlying factors contributing to users' appreciation or aversion toward AI remains scattered and fragmented. This project seeks to synthesize the findings about the dynamics between AI and human actors through a comprehensive meta-analysis. By doing so, we aim to shed light on the antecedents and consequences of users' appreciation and aversion toward AI, offering valuable insights for businesses and decision-makers.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64143

20 Discrimination Lawsuits: Corporate Responses and Proactive Best Practices

Jacob Lozano
Dr. Tiffany Trzebiatowski
College of Business
Research Poster

While fair treatment practices within the workplace, as well as equal employment opportunities and paths to promotion are being worked towards, firms- as well as their CEOs and board of directors- often fall short, which may result in lawsuits brought forth on the basis of discrimination. Facing this reality, firms will often choose respective internal and external courses of action in response. The objective of this poster is to outline specific methods of resolution taken by firms. Additionally, this poster aims to highlight future corporate best practices to proactively avoid future offenses. Through a review of empirical studies (mainly focused on S&P 500 firms), internal and external responses chosen by the firm were discovered. The former consists of amending the organization's structure- such as through CEO dismissal or the increased diversity on the board of directors- or within the firm itself. This increased diversity serves as a way to alleviate current stakeholder discontent as well as reducing the likelihood of future discrimination conflicts. The external response includes the appeasement or denial of wrongdoing to stakeholders. Moreover, in the extreme cases, a firm may respond by retaliating against the plaintiff. Typically, firms that opt to retaliate against the plaintiff or deny wrongdoing tend to face higher external pressures from stakeholders, resulting in greater harm continuing after a legal settlement. These findings identify optimal courses of actions for firms, which, in turn, may allow for more robust and proactive corporate policies and greater emphasis on diversity within the workplace.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63918

22 Uncertain Language in Earnings Conference Calls and Analyst Forecast Dispersion - A Preliminary Study

Phuong Nguyen, Joshua Chavez
Wenrui Zhang, Xinran Wang
College of Business
Research Poster

Effective communication during earnings conference calls is crucial for managers to convey information accurately and reduce uncertainty among analysts. This is because forecast dispersion from financial analysts can have significant implications for a company's stock price and valuation. Our study aims to investigate whether managers' usage of uncertain language during earnings conference calls is associated with greater dispersion in analysts' forecasts. This underscores the importance of effective communication in shaping the information environment. Our study employs a quantitative approach, utilizing data from earnings call transcripts and analyst forecasts to calculate the correlation between managers' usage of uncertain words and analyst forecast dispersion across a sample of 120 audio recordings from 5 random S&P 500 companies from 2018 to 2023. The expected result would be that a higher

percentage of uncertain words used by managers during earnings calls will be positively correlated with greater dispersion in analysts' earnings forecasts.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64146

8 Does the PCAOB's Oversight Influence US Audit Firm's Deployment of their Foreign Auditor Network?

Emmett Pelissier
Dr. Eric Lohwasser
College of Business
Research Poster

The Public Company Accounting Oversight Board (PCAOB), established in 2003, oversees audits of public companies and SEC-registered broker-dealers. US audit firms may rely on overseas component auditors to provide assurance over certain portions of the financial statements that publicly traded companies file with the Securities and Exchange Commission (SEC). PCAOB oversight extends to firms who audit US public companies, regardless of whether that audit firm is located in the US.
The PCAOB has increased its enforcement actions against foreign auditors to ensure the reliability of US financial reporting for publicly traded companies on our exchanges and to ensure that auditors who attest to the accuracy of their public disclosures are performing audits that meet the high standard of US regulatory bodies. Answering this research question is important because despite this increase, we do not know whether PCAOB enforcement actions and the consequences stemming from these actions have a measurable effect on improving the financial statement reliability through US capital markets.
To address this, we are examining PCAOB inspection reports provided to the public and hand collecting PCAOB sanctions to examine whether PCAOB oversight has an effect on US audit firm's deployment of their foreign auditor network. This research question has important implications whether we do or do not find an effect.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63732

6 Uncovering Barriers: Exploring the Perspectives of HR Professionals on Hiring Ex-Offenders

Alison Sherwood
Chris Henle
College of Business
Research Poster

Around 77 million individuals in the United States possess a criminal record, constituting a significant segment of the population with enduring implications beyond their time in prison. Despite efforts toward reintegration, societal biases and discrimination persist, hindering successful community re-entry. This study examines the barriers faced by individuals with criminal records, analyzing both personal characteristics and the perceptions of Human Resources (HR) professionals. Employing a literature review first to uncover employment barriers due to applicants (deficit in education and range of skills, inadequate employment history, lack of affordable transportation and housing, and networking and social connections), then uncovering employment barriers due

to HR professionals (Safety concerns, fear of victimization, legal liability, poor work ethic, accountability, attendance, discomfort, the reputation of a manager, and their organization, transition time, policies and company culture, and trust in the justice system). Next in interviews with HR professionals current barriers will be identified and compared amongst the ones found in the literature review. These comparisons will help to shape current literature on barriers ex-offenders face and go toward creating intervention programs to address biases and enhance inclusive employment practices, fostering successful reintegration.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63665

V1 Me, you, and the non-human figure. Can you feel what they feel?

Theo Altmaier
College of Liberal Arts
Visual Art

My art narrates my lived experiences. The subjects in my paintings, although unrelatable in their form as non-human creatures, are "vessels" for my fellow humans to empathize with. I draw from my own life, imaginary creatures, and mundane interiors to make my compositions. In my practice, I integrate different oil painting techniques to create a cohesive composition on large-scale canvases and panels. I experiment with the audience's empathy and our inclination to see ourselves as separate from the art and the artist's experience and message. For this reason, the figures in my painting are non-human. My hope is for my work to be relatable to diverse audiences. Paintings of people can highlight differences between the viewer and the art. But with these fantasy and non-human creatures, there is nothing to exclude you except your imagination. Joy is a common theme in my art, accomplished through bright colors and enticing textures. Large-scale paintings invite the audience to step into a life-size experience. My goal is to invite the viewer to suspend their disbelief and relate to the figures.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63950

210 Coding in the American Friendship Project

John Argenio, Emily Davied
Dr. Natalie Pennington
College of Liberal Arts
Research Poster

My colleague Emily Davied, and I are a part of the Research in Interpersonal Communications Collaborative at Colorado State University. Together, we worked on coding within the American Friendship Project with the help of Dr. Natalie Pennington. The AFP is a tri-university collaborative between Colorado State University, Michigan State University, and Kansas State University. The goal of this study is to create an accurate, ever-updating account of American friendship through mostly survey-based responses. Our role in this project was coding with one of the survey questions of our choice. We selected, "Please take a moment to reflect on what it means to be a friend. Identify three characteristics that would lead you to call someone a friend, writing one sentence for each characteristic you identified." Over a month, we reached an acceptable level of intercoder reliability. We coded over 1600 responses, each into 21 different quantitative categories. The AFP reports on five critical facets of social health as it relates to friendship: 1) the structural factors of friendship (e.g., who are they, how many); 2) friendship quality (e.g., satisfaction, closeness); 3) social support from friends; 4) the quantity of online and offline communication; and 5) social well-being (e.g., life satisfaction, loneliness, connection). Data was collected from two national samples of American adults in 2022 and 2023 and from a large sample of college students from three universities in

2022. We are continuing to work on the AFP as part of our undergraduate research.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63862

40 Proposal: S.A.V.E.D Space Curriculum

Lauren Banas
College of Liberal Arts
Community Engaged Learning Poster

Safe spaces are characterized by ensuring, which is often hard to do, physical and psychological safety. Brave spaces embrace criticism and debating or dialoguing different ideas and perspectives. The conversation between “Safe” and “Brave” spaces has been ongoing for years, with scholars in constant debate over whether one holds precedence and efficacy over the other. Several settings have been examined under the lenses of safe and brave, and the cacophony of research surrounding the subjects suggests adherence to promoting these ideals is applicable in virtually any setting. An examination of pre-existing research on these spaces finds that despite the constant tension between the polarities of safe and brave, to maximize the potential of deliberative discussions, protect freedom of speech, and maintain the physical and psychological well-being of participants, a balanced combination of these terms is needed. Research also shows that certain situations may require an emphasis on one over the other. Thus, this project examines the tension between the terms and explores the application and navigation of these terms in a deliberative setting and within Colorado State University’s Center for Public Deliberation. This project aims to differentiate between safe and brave spaces and provide individuals with the knowledge and skills necessary to know how and when to utilize one "space" over the other. Furthermore, this project intends to result in a theoretical proposal for the CPD to utilize in the creation of its training and course materials, with the potential for this research to expand externally to other educational institutions.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64054

F7 Roughstock: Raised For The Job

Milo Gladstein
College of Liberal Arts
Film

Roughstock is the result of a yearlong project following a community of rodeo riders in Northern Colorado. Right alongside the horses and bulls raised as “roughstock” for rodeo work, the generations of cowboys depicted here were born into the arena. Their love of rodeo and their close-knit community represent what it means to be true cowboys and cowgirls, whose work with livestock is still defining the mythos and the reality of the American West. The discipline and danger of rodeo require complete commitment and teach these young people a way of life both in and out of the area, keeping a tough work ethic, faith and family at its core. Cowboy and rancher J.D. Ford, referring to the signal given by a rider ready to come out of the chute, said, “You’re playing with life and death every time you nod your head.”

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W3 "Forgiveness"

Saul Guardado
College of Liberal Arts
Written Work

This is a short story that covers the story of a ghost who spends his days hanging on the rooftop of his old high school. We learn throughout the story that he remains on that rooftop to stop and help those people who are considering suicide; either by scaring them or simply by talking to them. But one day, one person from his past comes to see him. An old friend named Grace who was the one responsible for his death. Now the ghost, whose name is Ash, has to decide if he wants to help this person or not. Which will take him through a rollercoaster of memories and emotions as he engages in a conversation with her.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63453

F6 The Arc: Promotional Video

Phoenix Heavner
College of Liberal Arts
Film

This is a promotional video for The Arc, a disability rights organization that works with and for people with IDD to advance the human rights and wellbeing of people with IDD, their families and communities.

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61 Organization Size and Culture: Decoding Organizational Culture Dynamics

Hannah Howison
College of Liberal Arts
Research Poster

The interplay between organizational size and culture is a topic of significant interest in organizational behavior. In this paper, I explore how the size of an organization influences its organizational culture, focusing on insights derived from the automotive industry. Drawing on interviews and experiences of Derek Howison, a seasoned professional with extensive exposure to companies of varying sizes, I examine the dynamics between organizational size, values, communication, and overall efficiency.
My analysis reveals that smaller companies like Volvo Cars and Xtime exhibit more cohesive values and efficient communication channels than larger counterparts like Nissan Cars of North America and Ford Motor Company. Smaller organizations foster a culture characterized by direct communication, reduced hierarchical barriers, and a strong emphasis on interpersonal relationships. This results in increased transparency, collaboration, and employee satisfaction.
Furthermore, an organization's size significantly impacts its approach to decision-making and responsiveness to employee input. Smaller companies, with their flatter hierarchies and streamlined processes, are more nimble and adaptable, leading to a more agile organizational culture. In contrast, larger organizations often face challenges maintaining cohesive values and fostering effective

communication across various hierarchy levels.
My findings highlight the importance of considering organizational size when assessing the quality of organizational culture. Smaller companies, by their size, are better positioned to cultivate a more beneficial culture that promotes employee engagement, innovation, and organizational effectiveness. This research contributes to a deeper understanding of how organizational size shapes culture.

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47 Investigating the Wellbeing of Stakeholders in the School of Music, Theatre, and Dance (SMTD) at CSU

Max Johnson, Andrew Rutten, Olivia Ferguson
Meghan Taylor
College of Liberal Arts
Research Poster

Students and professionals engaged in music, theatre, and dance have a well-documented history of occupational health problems associated with learning and executing their crafts. While there is some evidence that musicians have positive overall wellbeing, it is unclear how health problems can influence potential outcomes for stakeholders in theatre and dance. Also, perceived social support has been identified as a factor contributing to general mental health, but more investigation is necessary to understand its influence across the music, theatre, and dance professions. However, no known research has taken a comprehensive approach to understand the influence of wellbeing and perceived social support on students, faculty, and staff within a single collegiate level performing arts program. Therefore, this study aims to use the PERMA Profiler and Multidimensional Scale of Perceived Social Support (MSPSS) to assess stakeholders in this context. The results of this research may provide educators, administrators, performing arts health researchers, and medical professionals with insights into the relationship between wellbeing and perceived social support among these groups, so they can make informed decisions when developing support for all stakeholders engaging in collegiate level performing arts.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64100

W1 Obituary to the Land

Evelyn Kliebenstein
College of Liberal Arts
Written Work

“Obituary to the Land” is an exploration of the relationship that can be observed between the self and the world. There is a balance to be found between honestly or actively participating in one’s life and respecting the land from which it came. My desire was to inspire the reader to consider the way they as an individual interact with the world, as well as the methods that humanity collectively accepts and employs for self sustainment. My goal was to personify the world - to make her human - to play with a deeper level of empathy towards its destruction.

The grief I feel for a life I do not know is entirely consuming. I also address this as a letter to myself; these are ideas that I believe to be paramount to the complete realization of one's potential and joy. Taking inspiration from the transcendentalist and existentialist movements, my intention throughout the piece was to braid together the enormous contradictions that accompany the simple act of being alive. I first drafted this piece as a short song in CSU's course Thinking Toward A Thriving Planet, and over time it has resonated deeply with my questions and concerns about what it is *to be*. My speaker lives in the space between asking and answering, though such uncertainty is daunting. Thus, I offer my sentiments through a long apology. The attention we pay to our lives and our world is sacred - so much of oneself can be revealed through observing the natural world.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/62908

I'm a senior! That's all I really wanted to say.

Alex Mccraw
College of Liberal Arts
Written Work

I'm a senior!

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63460

F3 The Rocket Scientist vs. the Journalist (dir. Ali Niaz)

Ali Niaz
Jenny Fischer
College of Liberal Arts
Film

212 Navigating Tradition and Health: Examining Intravaginal Practices and Female Genital Cutting

Helen Obuna, Keyaria Ivey
College of Liberal Arts,College of Health and Human Sciences
Research Poster

This research poster explores the complex relationship between intravaginal practices, specifically female genital cutting (FGC), and cultural norms through personal narratives from diverse cultural contexts. Drawing on quotes from individuals impacted by these practices, including mothers from Egypt and young women from rural Gambia, the poster delves into the tensions between cultural traditions and the human rights implications of FGC. Through a critical lens informed by Black feminist standpoint theory, the poster critiques Western perspectives that overlook the voices and agency of affected communities. It proposes the Comparative Ethnographic Narrative Analysis Method (CENAM) as a culturally sensitive approach to understanding the nuanced experiences of individuals within their cultural contexts. By prioritizing personal narratives over ethical debates, the poster advocates for meaningful engagement with affected communities to promote alternative practices that uphold women's health and autonomy while respecting cultural heritage. Ultimately, it calls for a shift towards multicultural dialogue and

sensitivity in addressing the complexities of intravaginal practices and FGC.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64040

45 The Effects of Cross-Cultural Communication in the Classroom Setting

Brooke Painter
Meagan Todd
College of Liberal Arts
Research Poster

As educational institutions become increasingly globalized, students and educators from diverse cultural backgrounds are given the opportunity to come together and share specific knowledge and experiences. Gaining a deeper understanding about these students' lives helps to promote more inclusive learning environments, enhance student engagement, and foster a sense of belonging for foreign students. The goal of our research was to discover the effects of cross-cultural communication in classroom settings, specifically how international students integrate into a new environment and what resources the university provides to ensure their success. Our methodology consisted of semi-structured interviews and surveys. We conducted four interviews, two students and two professors, which we asked questions surrounding the impact of cross-cultural communication within their education. Then we released a survey in which ten international students answered questions surrounding their personal experiences inside the classroom. Through interviews we learned that a multicultural classroom is beneficial in a variety of ways and lessens the feeling of 'othering' to international students, as well as placing importance on peer relationships through project-based classes. Through surveys we learned that the level of comfortability differs within the classroom setting and there is universality of non-verbal cues, some which help non-native English speakers more than others. We hope our results of international students and cross-cultural communication contribute primary perspectives to further research in this field.

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49 Underserved Audience Extension Internship/Fellowship in Douglas County

Karen Rodriguez, Alejandra Aparicio Miranda
Eric Ishiwata
College of Liberal Arts,College of Health and Human Sciences
Community Engaged Learning Poster

Karen Rodriguez and Alejandra Aparicio assisted the Douglas County Extension Office with identifying people, places, organizations, and programs that existed in Douglas County that have traditionally not been reached by CSU Extension programming, specifically to the Latinx population. They co-created documents that assisted CSU Extension in identifying ways to change their work to meet community members where they are through surveys and outreach, to provide impactful programming that is consistent with the OEE mission, and to empower communities through research-based

information. These documents included a barriers analysis, suggestions for the Douglas County Fair and overall for the office, and culture considerations. They also conducted interviews with community members and organizations, to create a helpful document of the resources they provide and their location through the ARC map. Their research is continuously creating change in Douglas County, and other CSU Extension programming that will begin the conversation to keep adapting programming to community needs.

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P2 Echoes of Mastery: Exploring Mangani's *Bass Concerto*

Andrew Rutten
College of Liberal Arts
Performing Art

One of the most popular clarinet-centric composers living today, **Michele Mangani** (b. 1966) has produced over 1000 works and arrangements for solo instruments, orchestra, band, and chamber groups. His compositions have been regularly performed by and dedicated to some of the world's leading clarinetists including Wenzel Fuchs (Berlin Philharmonic), Corrado Giuffredi (international soloist), and Ricardo Morales (Philadelphia Orchestra). Most recently, Mangani was commissioned by the International Clarinet Association to write a piece for clarinet and string quartet, which premiered in 2023 at the 50th annual ClarinetFest conference in Denver, Colorado. Mangani is also a distinguished educator and is currently Professor of Music for Wind Instruments at the G. Rossini Conservatory in Pesaro, Italy where he conducts and arranges for their top wind band.

In the first movement of Mangani's ***Bass Concerto***, the great range and technical capabilities of the bass clarinet are on full display**.** The piece is clearly inspired by the form and style of Felix Mendelssohn's *Violin Concerto in E Minor, Op. 64* from 1844 – one of the most famous concertos in the violin repertoire. Mangani also borrows many rhythmic gestures and harmonies from Mendelssohn but reworks and presents them in a way that allows the bass clarinet to flourish throughout its four-octave standard range. Overall, the *Bass Concerto* is a technical showcase with countless runs but also contains sections that offer a more delicate and lyrical side of the instrument.

Program
Bass Concerto (2017) by Michele Mangani
I. Allegro
Andrew Rutten, bass clarinet
Dr. Jooyeon Chang, piano

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64035

O12 Being Trans in Public: A CSU Case Study

Sandrin Molina, Ella Smith
Nikoli Attai, Caridad Souza
College of Liberal Arts
Oral Presentation

The national debate on transgender rights – particularly for gender-nonconforming (GNC) youth – questions the legitimacy of gender affirmation. Transgender and GNC

students at CSU face various forms of discrimination such as racial, cultural, ableist, classist, gendered, religious, sexual, and xenophobic biases. These biases compound the difficulties of being open about their gender identity. Utilizing an intersectional and transformational framework, this study is about the experiences of transgender students at CSU, focusing on the challenges they face in public campus spaces and the University's response to these issues. We will discuss our community-based, participatory research methods, and examine emerging themes from preliminary content analysis of twenty documents – official CSU publications and media from *The Rocky Mountain Collegian* about transgender and queer topics – and over twenty semi-structured interviews. We will also situate these themes in relation to creative work by queer and trans artists and writers who inspire us to celebrate CSU's trans students' triumphs despite the challenges they face, to develop viable and actionable recommendations, and to improve support for transgender and GNC students on campus. By amplifying voices and highlighting unmet needs, we aim to advocate for inclusive campus policies and practices that respect and uphold their diverse identities and lived experiences.

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F5 We The Creator

Sophie Stern
Jaime Jacobsen
College of Liberal Arts
Film

"We the Creators" is a visual journey into the heart of creativity, spotlighting a dynamic creative agency and band based in Denver, Colorado. This compelling documentary captures what it truly means to be a creator, weaving together the passion, sense of community, and the shared successes of these artistic individuals. Through their story, we'll discover what drives these individuals to create and how their unique perspectives enrich the creative scene of Denver, Colorado, serving as inspiration for other creatives who aspire to do the same.

O13 Haplorhine Nocturnality: Comparative Selection in Two Exceptional Primates

Rachel Winter
Kimberly Nichols
College of Liberal Arts
Oral Presentation

Tarsiers have historically been categorized alongside the earliest confirmed primates – extinct Omomyoidea - in the Suborder Haplorhini (Fleagle, 2013; Rose *et al.*, 2012). Collectively, this group is informally referred to as Tarsiiformes. In addition to derived haplorhine traits (*e.g.*, closed eye orbits, internal lacrimal ducts), this group is united by a rare adaptation common to extinct and extant Tarsiiformes that has provoked interest in tarsier origins. All appear to be nocturnal.
Whereas nocturnality is prevalent among extant primates of the Suborder Strepsirhini (lemurs, lorises, and galagoes), it is only observed in two extant haplorhines, tarsiers and the tropical American owl monkey (Campbell *et al*., 2011).

Comparison of similarities and differences between the modern nocturnal haplorhines may provide insights into the context of evolutionary processes that favored nocturnality.
Whereas tarsiers are the only known nocturnal mammal equipped with full-color vision (trichromatic), the owl monkey is the only known primate lacking color perception (monochromatic).
My comparative examination of the two nocturnal haplorhines is focused on a central component of modern evolutionary theory – **why would natural selection favor the development of seemingly contradictory adaptations in two species that are both addressing nocturnality?**
This project draws from theoretical perspectives utilized in biological anthropology, primate paleontology, vertebrate paleontology, primatology, and evolutionary biology.
My primary goal is to place adaptations within a temporal context to determine the emergent conditions of nocturnality in two exceptional haplorhine primates.

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39 Protective Effects of Breast Milk Against Necrotizing Enterocolitis (NEC) in Preterm Infants

Lauren Averill, Willow Purvis, Hannah Houfek
Lance Poehlein
College of Health and Human Sciences
Research Poster

Necrotizing enterocolitis (NEC) is a gastrointestinal disorder that occurs when bacteria invade the intestinal wall and cause inflammation which then leads to tissue death. Premature infants are at a higher risk of NEC with almost 70% of NEC cases occurring in infants born before 36 weeks' gestation.1 This condition is characterized by vomiting, lethargy, trouble feeding, and abdominal tenderness and is a leading cause of mortality in neonates.1 Preterm infants are at higher risk for developing NEC because of their immature immune systems and impaired intestinal barriers.2 Human breast milk (HBM) contains bioactive substances that have been looked at as a protective measure against NEC.

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30 Assessment of Kombucha Bacterial Cellulose for Apparel Applications

Bridget Brown
Yan Li
College of Health and Human Sciences
Research Poster

The fashion industry's detrimental environmental impact is creating a demand for sustainable textile alternatives. Kombucha Bacterial Cellulose (KBC) poses as a biodegradable sustainable material that could potentially be applicable as a textile within the fashion industry. This study evaluates KBC's mechanical properties and fermentation factors resulting in various kinds of KBC growth. It examines qualitative factors of the cultivation process like uniformity and texture and quantifies characteristics using lab equipment. The mechanical properties assessed include GSM, thickness, and tensile strength. This study also gives a molecular analysis using FTIR. People will benefit from this product and knowledge due to KBC's low-cost cultivation process, which could facilitate scalable production, benefiting manufacturers, designers, and eco-conscious consumers. Beyond apparel, KBC holds potential in biomedical, food, and electronics industries. This research could contribute to advancements in broader industrial applications.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64031

22 Undergraduate Research Associate

David Brown
Dr. Christopher Bell
College of Health and Human Sciences
Research Poster

Beta-3 adrenergic receptors have been identified as a potential pharmacological target for the treatment of metabolic diseases such as obesity and diabetes. Sustained stimulation of these receptors increases the volume and activity of thermogenic (calorie burning) tissues.

Endogenous stimulation of these tissues requires an increase in sympathetic activation, Ralso has a powerful effect on cardiac function, evoking potential safety concerns. The purpose of this study was to examine autonomic cardiac regulation, via analysis of heart rate variability, during standardized, pharmacological beta-adrenergic receptor (b-AR) stimulation (intravenous isoproterenol) with and without simultaneous b3-AR stimulation (oral mirabegron). Using a randomized, cross-over design, beat-by-beat heart rate was recorded (3-lead electrocardiogram) in 13 healthy young adults (6 males, 7 females) prior to and during three incremental doses of isoproterenol (6, 12 and 24 ng per kg of fat free mass per min) following ingestion of either a placebo or mirabegron (100 mg). Intravenous b-AR stimulation appreciably modified several indices of heart rate variability (*P* 50 ms, and baseline width of RRi), frequency domain (absolute power of low-frequency and high frequency bands), and non-linear metrics (Poincaré plot standard deviations). With the exception of RRi, b3-AR stimulation did not influence any of these responses (all *P*>0.09). These preliminary data suggest that during standardized b-AR stimulation, activation of b3-ARs does not unfavorably influence cardiac autonomic regulation.

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38 Co-designing an Interactive Community-Facing Education Center at the Avenir Museum

Stella Buselmeier, Alexis Rinaldi, Sierra Zanier

Leah Scolere
College of Health and Human Sciences
Community Engaged Learning Poster

As a student-led service-learning project, this collaboration focused on renovating an existing space in the UCA building into the Janet J. Else Education Center as an extension of the mission of the Avenir Museum of Design and Merchandising. Adopting a 'designing with' co-design approach, this project involved interior architecture and design students, client stakeholders from the Avenir Museum, end-users, and a representative of facilities in the design process. The co-design process spanned across multiple semesters and included precedent studies and site visits. The iterative engagement began in second-year design studios (led by Lisa Switzer and Kate Bedford) with four teams of 20 students co-creating ideas with the client-stakeholder team. This broader visioning effort was followed by focus group sessions and design development between a team of three interior architecture and design students and the client-stakeholders from the Avenir.

Informed by the co-design process, the proposed design for the Janet J. Else Education Center is a community-serving, interactive learning environment dedicated to engaging with a variety of age groups about global, historical, and environmental influences behind the life cycle of clothing and textiles. To maximize inclusivity, the proposed spatial design is centered on a modular-wall display system that features raw material exploration, interactive weaving, and dynamic studio space.

As an experiential learning environment, interactive technology and displays will

foster personal exploration related to the culture of color, indigenous practices, weaving techniques, global textiles, and sustainable practices. Continued work is being completed to refine the integration of the content with the spatial design.

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29 Smartphone-Measured Temporal Gait Characteristics in Young Athletes: Dual Task Effects.

Jackson Buresh
Brian Tracy
College of Health and Human Sciences
Research Poster

Smartphone-Measured Temporal Gait Characteristics in Young Athletes: Dual Task Effects.
Jackson B. Buresh, Josephine W. Glenn, Jaclyn A. Stephens, and Brian L. Tracy.
Colorado State University, Fort Collins, CO.
PURPOSE: Mild brain injury, as experienced in sports-related concussion, can produce deficits in the speed and variability of walking gait, especially during cognitive challenge. Quantitative measures of gait often requires equipment that is non-portable, expensive, or requires trained personnel. However, the movement sensors in smart-devices (e.g., iPod Touch) can capture the timing of heel-strikes during gait. The purpose here was to demonstrate differences in gait characteristics between single and dual task walking tests, as measured by a smart device.
METHODS: College aged team sports athletes (n=17) with a mixed history of concussion performed brisk 30s walking trials on a 15 m straight course with two low obstacles, with (COG) and without (NOCOG) a concurrent verbal cognitive challenge. An iPod Touch was securely attached to the lateral
aspect of both ankles. A data collection App was used to log (100Hz) the acceleration signals to detect the acceleration spike for each heel strike. The timestamps of each heel strike were determined offline. Total walk distance, number of steps, average gait speed, average step length, average step duration, and SD and CV of step duration were measured for all trials. Each subject performed five COG and five NOCOG trials and the outcome measures were averaged across trials within each condition.
RESULTS: Walk distance was 9.69% less (P=0.001), average gait speed was 9.47% less (P=0.001), and step number was 5.78 % less (P=0.001) for COG vs. NOCOG. Average step length tended to be 3.45% (P=0.08) less for COG vs. NOCOG. Average step duration was 7.03% greater (P=0.007) and SD of step duration was 8.24% greater (P=0.066) for COG vs. NOCOG. There was no significant difference in CV of step duration (P=0.47) between COG and NOCOG.
CONCLUSIONS: The smart device platform can be used to detect the expected dual task effects (COG vs NOCOG) in gait performance. COG tests showed less distance traveled, fewer and shorter steps taken,
and slower gait speed. COG tests also showed longer step durations and greater standard deviation in step duration. These results show impaired gait performance when a cognitive challenge is introduced.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63867

32 Examine the effects of age and exercise on protein expression in plasma-treated HMC3 cells

Madeline Colvin
Thomas LaRocca
College of Health and Human Sciences
Research Poster

It is well understood that aging is accompanied by a vast array of changes. Particularly, changes in physical appearance and behavior tend to be the most noticeable. However, alterations below the surface of the skin, although less understood, are often the driving force behind the more detrimental effects of aging. For instance, aging often induces inflammation within the brain (i.e., neuroinflammation), which has been found to impair cognitive function. Neuroinflammation is driven by glial cells, such as microglia, which contribute to inflammation via the secretion of pro-inflammatory cytokines (e.g. IL-1β, IL-6). Looking even further downstream, transcription factors like NF-kB play a role in inflammatory signaling and, therefore, are central to inflammaging. With potential to reduce inflammation, exercise serves as one of the best ways to preserve cognitive function. However, the precise factors that contribute to microglial inflammation are unknown. The aim of this study was to examine how age-related changes in circulating factors, such as pro-inflammatory cytokines, contribute to microglial inflammation, and whether exercise has the potential to reverse these events. Additionally, this study aimed to investigate the relationship between the age-related changes in circulating factors and cognitive function/perceived stress.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64140

24 Beta-adrenergic receptor stimulation as an alternative perturbation to exercise to study cardiac autonomic regulation

Reagan Cyphers
Christopher Bell
College of Health and Human Sciences
Research Poster

Heart rate variability, the fluctuation in intervals between cardiac cycles, is used to assess cardiac autonomic regulation. Recently, the technique has been used to study cardiac control during exercise with mixed results on account of motion artefact and signal interference from ventilation and contracting skeletal muscle. Isoproterenol is a non-selective beta-adrenergic receptor (b-AR) agonist that mimics some of the actions of the sympathetic nervous system during exercise. The goal of this project was to determine the feasibility of studying heart rate variability in resting, motionless adults during intravenous b-AR stimulation with isoproterenol. A second aim was to explore potential sex differences in these responses. In 15 healthy young adults (6 males, 9 females) beat-by-beat heart rate was recorded (3-lead electrocardiogram) during quiet rest, and during three incremental doses of isoproterenol (6, 12 and 24 ng per kg of fat free mass per min). Intravenous b-AR stimulation appreciably modified several indices of heart rate variability (*P* 50 ms, and baseline width of RRi), frequency domain (absolute power of low-frequency and high frequency bands), and non-linear metrics (Poincaré plot standard deviations). With the exception of

RRi, sex did not influence any of these responses (all *P*>0.20). b-AR stimulation appears to be a feasible and potential alternative perturbation to exercise to study cardiac autonomic regulation in humans.

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26 Exploring the Impact of Probiotic-Rich Foods on the Gut Microbiome in Adults Living with Bipolar Disorder

Tess DeFilippi, Arielle Fougerat
Colleen Burke
College of Health and Human Sciences
Research Poster

Recent studies have shown that there is a link between the status of the gut microbiome and psychological health. It is clear that there is a connection between people with bipolar disorder and certain genuses of bacteria in the gut. The “gut-brain axis” is the complicated bi-directional relationship between the host's gut microbiota and their brain function. Due to this relationship, the health of the gut microbiome can affect many different aspects of both physical and mental health. Gut dysbiosis is when the composition of the microbiome is altered and has negative effects on the body. Certain foods have proven to be beneficial to maintaining the integrity of the gut microbiome, one group being probiotics. Probiotics are living bacteria in the gut that help maintain a healthy gut microbiome. *Lactobacillus* and *Faecalibacterium* are examples of probiotics that help reduce inflammation, stress, and depressive symptoms, and are at low levels in people with bipolar disorder. Introducing probiotics into the diets of people with bipolar disorder can help alleviate physical and psychological symptoms.

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151 Pilot Case Study: Documenting Integrated Model-Based Estimating

Allannah DeLong
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College of Health and Human Sciences
Research Poster

This Pilot Case Study presents a framework, known as the Integrated Estimating workflow, designed to standardize and simplify model-based estimating processes. The preconstruction sector in the construction industry has faced challenges in adopting model-based practices, resulting in a lag in implementing BIM-based workflows. The case study developed is to address adoption barriers and enhance efficiency in preconstruction. The model encompasses focusing on five categories: Intentional Model Authoring, Qualitative and Quantitative Data, Integration of Cost, Estimating Standardization, and Application of Automation or Augmentation. Through previous studies and project implementations, the framework demonstrates increased efficiency, improved design comprehension, and enhanced collaboration between disciplines. Moreover, the framework supports scalability and clarity while remaining software accessibility, enabling its application across various platforms. Initial project implementations demonstrated improved design, including increased model comprehensibility,

reduced estimating labor, and improved change management processes. The case study framework offers a standardized approach to model-based estimating, providing clarity in terminology and methodology. In conclusion, the Integrated Estimating framework presents a promising solution to advancing model-based estimating practices in the preconstruction sector.

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206 Unveiling the Connection Between Cognitive Function and Motor Performance After Stroke?

Isabella Flores
Dr. Neha Lodha
College of Health and Human Sciences
Research Poster

Introduction: It has been well-established that stroke impacts both cognitive and motor function. Yet, these functions are examined individually in a clinical setting. It is unknown whether the cognitive and motor impairments following stroke are linked. Both cognitive and motor abilities are essential for functional independence, and impairments in either domain may be detrimental to post-stroke recovery and rehabilitation. Oftentimes, if cognitive factors are examined at all, they are looked at as an aftereffect, and not as a causal agent.
Aim: The goal of the current study is to examine the effects of stroke on cognitive and motor function and determine whether they are linked. Among the several cognitive domains, attention was chosen as our primary cognitive function for assessment, as the ability to focus on and process multiple pieces of information at once is essential to success in activities of daily living. Further, we decided to assess motor accuracy in goal-directed ankle movement as the key motor function because conscious, controlled movements facilitate safe motion.
Methods: Stroke (N = 32) and control (N = 28) participants volunteered to participate in this study. The stroke participants were divided into cognitive normal (N=15) and cognitive impaired (N=17) sub-groups based on extensive neuropsychological testing. Both groups performed a) a divided attention task and b) goal-directed ankle dorsiflexion movements to accurately reach a force-time target. For the divided attention task, we measured the processing time as the minimum amount of stimulus exposure time that results in a correct response. For the goal-directed ankle movements, we measured the time error, amplitude error, and overall error.
Results & Discussion: The stroke group demonstrated greater processing time in divided attention task (p Significance: Although we cannot say that performance within the divided attention task predicts performance in the goal directed dorsiflexion task, we can confidently say that the performance within the two tasks is linked. This is still very important, as not only does it provide a stepping stone for continued research towards a predictive model within behavioural markers, it also provides a small glimpse into possible avenues to focus on in clinical stroke rehabilitation.

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16 Analysis of Adolescent Alliance During Mindfulness Intervention Tasks: Implications for Promoting Nutrition.

Clarissa Hernandez Jeppesen
Lauren Shomaker
College of Health and Human Sciences
Research Poster

The BREATHE study is a randomized controlled pilot and feasibility study focused on the prevention of type 2 diabetes in teens that are at risk. The study evaluates three intervention group conditions: Cognitive Behavioral Therapy (CBT), Learning to BREATHE (L2B), and Health Education (HE), to which enrolled teens are randomly assigned. Mindfulness, the idea of living in the present moment, has become a practice of interest in research over the last several years and is the foundation of the L2B group condition. Studies have shown an inverse relationship between mindfulness and binge eating and its associated eating attitudes (Pivarunas et al., 2015). Knowing this, mindfulness may be a powerful tool to include in nutrition related interventions. Session 1 of the L2B intervention carries the essential message to listen to one's body since it is trying to say something and presents several mindful practices, two of them being mindful eating and belly breathing. Using the TPOCS-A coding system (McLeod & Weisz, 2005) to rate Therapeutic Task Alliance for these tasks across 8 cohorts, I aim to answer the research question: "Do adolescents show strong alliance towards the 'Mindful Eating' and 'Belly Breathing' activities of Session 1 of the L2B group program?" The answer to this question will promote future nutrition intervention development and implementation and continue to close a research gap existing in adolescent wellness intervention programs.

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227 White Matter Content and its Correlation to Activity Levels Throughout Healthy Aging

Miles Hopkins, Jake Lonergan
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Research Poster

The human brain is largely composed of white matter (WM), which is responsible for cognitive functions like decision-making, emotional regulation, and developmental processes. The degradation of WM is associated with many neurological deficits, as well as the cognitive decline that comes with healthy aging. Physical activity (PA) plays a significant role in the aging health of white matter (WM), with research suggesting that it can mitigate the severity of cognitive decline later in life. Individuals who engage in consistent exercise over extended periods of their lives have demonstrated improvements in response time to auditory and visual stimuli, enhanced sensory discrimination, better reasoning skills, improved working memory, and increased fluid intelligence. Historically, WM has been monitored using diffusion tensor imaging (DTI), which quantifies the direction and magnitude of water diffusion around the axon. A variable of DTI, Fractional anisotropy (FA), is a measure of the directional dependence of diffusion and is used as a proxy of WM microstructural

integrity. In addition to FA, the current study explored the use of a more advanced MRI technique, called Neurite orientation dispersion and density imaging. Variables such as neurite density (intracellular volume fraction Vic), extracellular water diffusion (isotropic volume fraction Viso), and neuronal complexity (orientation dispersion index ODI) are utilized to get a more comprehensive view of WM health, beyond the measures of DTI. The objective of this study was to explore the connections between habitual physical activity patterns, age, and white matter health in neurologically healthy adults (age 20-80, n=128).

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23 Price and Warning Labeling Impacts on Red Meat Consumption Among Adult Consumers in the U.S.

Bailey Kelly, Autumn Pivonka, Maya Lee
Colleen Burke
College of Health and Human Sciences
Research Poster

Despite the enormous impact of red meat on the environment and physical health, red meat consumption remains extremely high among adults in the United States. Similar to efforts that lower the purchasing of cigarettes, experts wonder whether policies that require warnings of the health implications or environmental impacts directly printed onto the packaging would decrease red meat consumption in the U.S., decreasing cardiometabolic mortality. This capstone explores how changing prices of red meat and meat alternatives, and packaging with warnings of the health and environmental implications impact the purchasing habits of adults in the U.S. Prior research supports changes in prices being the most influential on U.S. consumers, followed by physical health warnings, then environmental warnings. This change is still smaller than the impact of increasing the prices of red meat and decreasing the prices of meat alternatives. When red meat is taxed higher and labeled with the health risks of red meat consumption, studies found the largest decrease in red meat purchasing. Knowledge of the impacts of red meat has been shown to further change consumer behavior. In another study, parents purchase less red meat for their families when they are made aware of the health risks involved with red meat consumption. Labeling and price increases on red meat invoke the most change to red meat consumption; therefore, in the future, we recommend cautionary labeling and redirecting red meat subsidies to alternate food sources in efforts to support public and environmental health in the United States.

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208 Using 3D Printing to Create Biomimetic Shark Skin Fabric

Jared Logan
Dr. Yan Vivian Li
College of Health and Human Sciences
Research Poster

This study explored the fabric performance properties of 3D printed biomimetic shark skin fabrics adorned with varying denticle sizes—small, medium, and large. Investigated aspects included stiffness,

mechanical characteristics, and antimicrobial properties. As denticle size decreased, fabric stiffness increased. Mechanical anisotropy was observed, with fabrics exhibiting different strengths along widthwise and lengthwise directions. Fabrics with small denticles displayed superior tensile strength and elongation. Additionally, medium and small-sized denticle fabrics exhibited good antimicrobial properties. Conversely, fabrics with large denticles lacked antimicrobial efficacy. Overall, fabrics with small denticles showed promise for swimwear integration, boasting favorable mechanical and antimicrobial attributes. These findings offer valuable guidance for the ongoing development of 3D printed shark skin fabrics in functional clothing and textile innovation. Future work may explore fabricating fabrics with nanoscale denticles and assessing fabric comfort for practical applications.

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O14 Different Minds: Supporting Neurodivergent Students in Higher Education

Jaylin Nichols
Dr. Aimee Walker
College of Health and Human Sciences
Oral Presentation

University classrooms can be intimidating for students who identify as neurodivergent. The traditional teaching approach, including heavy inactive lectures and inflexible deadlines, is designed for the average neurotypical learner. Neurodivergent students, when faced with the same student learning objectives as their neurotypical peers, do not receive the support they need as learners in this neurotypical classroom. There is an increasing enrolment of neurodivergent students in American universities creating a larger necessity to support their unique experiences (Wang et al., 2024). To explore this problem, we conducted informal student focus groups at Colorado State University (CSU) to better understand the needs of this marginalized group. The participants, who identify as neurodivergent students, shared the educational hurdles that they experienced within CSU's classrooms. Our analysis of existing educational supports at the university level coupled with our focus group data suggests neurodivergent students would benefit from additional support found in the extant literature. Research has shown many recommendations on ways to make universities more accessible to neurodivergent students (Dwyer et al. 2023). Our future research goal is to explore the needs of neurodivergent CSU students and advocate for more effective support structures and pedagogical practices to support and empower ALL students to succeed and thrive academically.

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36 The wool& 100 Day Dress Challenge and the Green Eggs and Ham Effect

Mitchell Olivieri
Dr. Sonali Diddi, Dr. Jennifer Paff, Dr. Jihyun Sung, and Dr. Ruoh-Nan (Terry) Yan
College of Health and Human Sciences
Research Poster

The wool& 100 Day Dress Challenge invites consumers to purchase a dress from the company and to wear it for 100 consecutive days. The purpose of this qualitative study is to explore how the constraints on dressing imposed by the wool& 100 Day Dress Challenge may set a context participants' fashion styling habits, taking into consideration the "green eggs and ham" hypothesis, or the idea that working with obstructions can result in more creative outputs.

Data were collected from 12 female-identifying participants who took part in the wool& 100 Day Dress Challenge. Each participant took part in three interviews across and after the Challenge. Interviews were transcribed verbatim and were analyzed using constant comparison processes. Findings revealed that limitations imposed by the wool& 100-day Dress Challenge inspired participants to adopt new styling approaches and accessory applications. Specifically, analyses revealed that a single garment restriction prompted participants to explore unconventional accessory pairings, experiment with layering, and find new techniques to fulfill the need for variation amongst outfits. As such, findings provide additional support for the "green eggs and ham" hypothesis.

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33 Redefining Inclusive Healthcare Design: Trauma-Informed Solutions for Amputee Patients' Recovery

Alyssa Oshiro

Jain Kwon
College of Health and Human Sciences
Research Poster

This design project, Ka Amputation & Rehabilitation Center caters to the needs of amputee patients, families, and healthcare professionals. The amputee community has been underserved within the healthcare domains, not always receiving the adequate level of attention and care necessary for recovery. Trauma-informed design research led to stimulating features aimed at creating moments of positive distraction, helping patients accept their new reality. This project's Art Deco style is inspired by the Egyptian concept, Ka (soul), to emulate the process of rebirth. The center offers patients a place to go through this transition while feeling prioritized through the functions this facility offers, the inclusive design considerations. Furthermore, the center provides a place for holistic healthcare (e.g., limb amputation, recovery, and rehabilitation) and offers patients and their families space to stay. Spatial adjacencies were an essential consideration. Including physical therapy space adjacent to family units provides amputee patients with easily accessible space for rehabilitation. In the design process, diverse user groups and design specialists provided insight into important features for an amputation and rehabilitation center and accommodations for patients, doctors, and visitors. Overall, the project aims to create an inclusive and equitable environment for amputees to recover feeling encouraged to confront this journey with strength and dignity.

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251 A practical guide to understanding intercellular communication through extracellular vesicles

Alex Rarick
Dr. Dan Lark
College of Health and Human Sciences
Research Poster

Background: Communication between tissues, organs, and varying cell types is essential to maintain health. Cells can communicate with each other through small protein and gene-containing packages known as Extracellular Vesicles (EVs). Every cell can produce EVs but we understand very little about how many can be sent from different cell types. Our laboratory analyzed a large cell atlas dataset to create an "EV Atlas" where we can predict which cell types release the most EVs, and what those EVs might carry. This massive dataset can be challenging to navigate, so my goal was to produce a simple, 1-page document to understand EV biology in specific cell types.
Methods: The "EV Atlas" predicts EV secretion based on single-cell expression of genes that encode the machinery required for cells to produce EVs and their cargo. Analysis of the atlas identified skeletal muscle satellite cells (SkM-SCs) as an interesting starting point for my project. For our 1-page document, we performed a literature search to find background information on SkM-SCs and research on their EVs, conducted an "EV Atlas" analysis of SkM-SCs highlighting the EV genes expressed, and provided future directions that researchers may take to use SkM-SC EVs as biomarkers of health and disease or develop therapies.
Results and Conclusions: Our project aims to provide practical, accessible information about EVs to researchers from a variety of scientific fields. Because EVs are increasingly used in medicine, we hope that this project will increase understanding of EV biology for scientists now and in the future.

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189 Impaired Postural Stability After Cannabis Use in Older Adults: Portable Smartphone Measures.

Valeria Salinas-Vargas
Brian L. Tracy
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Research Poster

Impaired Postural Stability After Cannabis Use in Older Adults: Portable Smartphone Measures.

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27 Lower Limb Force Asymmetries: Implications for Balance Performance and Power Output in People with Multiple Sclerosis

Matthew Scarsbrook
Chris Patrick

College of Health and Human Sciences
Research Poster

Multiple sclerosis (MS) is a neurodegenerative disease that results in damage to the central nervous system, hindering communication between neurons. This decrease in communication leads to balance impairments that put people with MS (PwMS) at an increased risk of falls and other adverse events. PwMS often have one side of the body more affected by the disease, which gives rise to common asymmetries in force production and gait. Lower limb power output and balance performance are both robust predictors of fall risk. Understanding how lower limb force asymmetries influence both lower limb power output and balance performance has the potential inform fall prevention strategies and reduce the risk of falls, promoting mobility and safety in PwMS. My project compared force asymmetries during a five time sit-to-stand task (5STS) to performance on the Mini Balance Evaluation Systems Test, a clinical balance assessment, and to lower limb power obtained from force plates during the 5STS. We found that PwMS who had greater force asymmetry between each leg during the 5STS tended to produce less power and exhibit poorer balance performance than those who were less asymmetric. These results suggest that force asymmetries may be influencing both power output and balance in PwMS, emphasizing the need for comprehensive assessment approaches and further research into rehabilitation strategies to address lower limb asymmetries and improve balance in PwMS.

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31 Biological Age and Sex as Determinants of Skeletal Muscle Extracellular Vesicle Secretion

Ellie Shyu
Daniel Lark
College of Health and Human Sciences
Research Poster

Skeletal muscle (SkM) enables voluntary movement and secretes extracellular vesicles (EVs) as a means of cellular communication. SkM mass, function and fiber type composition change with aging, but its effects on EV secretion are incompletely defined. Our lab showed that SkM EV gene expression decreased in aging mice, suggesting a decrease in EV secretion. However, fiber type changes suggest that aging could also increase EV secretion. Here we studied the effects of biological age (8 vs 19 months), sex (male vs female) and SkM type (vastus medialis, plantaris, soleus, red gastrocnemius, and white gastrocnemius) on EV secretion. SkM was collected after euthanasia, cut into 5 mg pieces, and incubated in cell culture media for 24 hours. We isolated EVs from conditioned media and quantified secretion. No significant main effect was observed for age, sex, or tissue type. There were no significant interactions either. Consolidating data based on tissue type revealed some significant differences in EV secretion but there was no clear relationship between EV secretion and SkM fiber type.This data challenges our previous finding that muscle fiber type influences SkM EV secretion and suggest that aging may not decrease SkM EV secretion either. EV cargo is another major factor for EV function, so our future plans include examining differences in EV

cargo, like tetraspanin proteins and nucleic acids.

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20 The Ketogenic Diet as a Potential Treatment for Breast Cancer

Lydia Sinanian, Natalie Tang, Jack Bortscheller
Miranda Symcox
College of Health and Human Sciences
Research Poster

One of the most prevalent types of cancers in the US is breast cancer, with over 300,000 cases annually. It is characterized by the abnormal proliferation of cancerous cells in the milk ducts. Cancer cells undergo a phenomenon known as The Warburg Effect, which is the cancer cells' preference for converting glucose to lactate, even in the presence of oxygen, indicating a reliance on glycolysis over oxidative phosphorylation for ATP production. In recent years, the keto diet, which is a carbohydrate-restricted diet, has come to the forefront as a possible treatment mechanism in individuals with cancer, as it may function to starve cancer cells of the glucose that they require to grow and proliferate. The lack of dietary glucose also causes a decrease in circulating insulin levels, thus potentially decreasing the interactions between growth hormone and its receptors that lead to the production of IGF-1. This could in turn inhibit the downstream signaling pathways that normally cause cell proliferation and inhibition of apoptosis. Several studies have found that a ketogenic diet may be beneficial in inhibiting tumor growth and altering the cellular metabolism of cancer cells, as seen via decreased levels of lactate, IGF-1, and other markers of inflammation. However, the restrictive nature of the diet is of particular concern in regards to potential weight loss and changes in energy levels coupled with cancer cachexia and/or other treatment side effects.

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38 Impact of a Blueberry and Whey Protein Smoothie on Blood Pressure in Healthy Adults

Natalie Tang, Jack Bortscheller
Dr. Sarah Johnson
College of Health and Human Sciences
Research Poster

Many risk factors contribute to the development and progression of cardiovascular disease including hypertension. The assessment of vascular health through parameters such as blood pressure can be integral to understanding the pathogenesis of cardiovascular events. Extensive research has underscored the protective attributes of polyphenols, particularly within the context of vascular function. The consumption of blueberries has been associated with various cardiovascular benefits and in combination with proteins, it may improve the bioaccessibility and stability of the polyphenol thus ameliorating cardiovascular health. We performed a randomized, single-blind clinical study assessing the combined effects of 22g freeze-dried blueberry and 15g whey protein compared to blueberry alone. Treatments of blueberry protein smoothie

mixture were given to participants after an overnight fast. Biomarkers of vascular functions including blood pressures were measured at a supine position before smoothie consumption and 1-, 2-, 4-, and 6-hours post-consumption. In our assessment, we evaluated participants' blood pressure to understand the synergistic effects of protein and blueberry polyphenols. Our results did not show a change of blood pressure with the addition of whey protein compared to blueberry alone. We also will assess the differences in blood pressure responses in our participants stratified by their blood lipid profile, however this assessment is still ongoing. Future directions can include assessing other measures of vascular health like endothelial function. More studies can be conducted in exploring the optimal dosage for the addition of protein powder and treatment consumption time.

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35 TRAUMA-INFORMED DESIGN FOR LGBTQ+ SURVIVORS OF INTIMATE PARTNER VIOLENCE

Susanne Tousignant
Dr. Jain Kwon
College of Health and Human Sciences
Research Poster

The Inner Vibrancy Center aims to provide a refuge for survivors of Intimate Partner Violence (IPV), with an emphasis on LGBTQ+ users, by nurturing individual agency, while fostering a sense of community. The project procedures consist of a building analysis, precedent studies for end user research, and design development. The process was based on the symbolic interaction framework and Trauma-Informed-Design (TID) principles, focusing on safety, community, comfort, and choice. The design concept, 'Existentia' draws inspiration from the fluidity of human experiences that are shaped by our perspectives and perceptions. The three-story building provides reserved spaces for clinics, counseling, resource centers and short and long term housing options that are well-lit with clear sightlines to egress and staff contributing to perceived and physical safety. The main level features two main entry points with the center of the building an open community lounge where staff and survivors can socialize or find solitude and have control over features like dimmable lighting, contributing to a sense of autonomy. Additionally, all levels are visually connected to daylight and community through surrounding light wells in the atrium space. This project illustrates how the physical environment can address users' psychological and social needs, supporting one's existence.

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18 thermal insulation assessment of mycelium based composite

Alex Wood
Dr. Yan Vivian Li
College of Health and Human Sciences
Research Poster

The fashion industry is one of the largest climate polluting industries. Moreover, the textile side of the apparel industry accounts for the majority of the climate damage. However, not many students or

professionals recognize the importance of textiles in the fashion industry. When I started in the apparel and merchandising program I worked hard at making connections within the program. In return, I was offered an opportunity to start an independent study into textile science. Mycelium is the root organism of the mushroom fungus. Mycelium uses substrates to provide nutrients, and these will be in the final material. Additionally, mycelium is completely biodegradable and uses no new material to create. Mycelium can be grown to create leather and similar products in the apparel industry. However, for my research with my mycelium I chose to research mycelium's ability to become a thermal insulation material.

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54 DNA Damage: The Role Enzymes Play in Deaminated Base Repair

Rayia Adams
Alex Alon
College of Natural Sciences
Research Poster

All life stores its genetic information as deoxyribonucleic acid (DNA). DNA is often prone to damage, which, if left unresolved, can have a large impact on cell viability. Spontaneous deamination is a common type of DNA damage accelerated by high temperatures that converts the canonical bases deoxyadenosine (dA), deoxycytidine (dC), and deoxyguanosine (dG) into deoxyinosine (dI), deoxyuridine (dU), and deoxyxanthosine (dX), respectively. dI is structurally similar to dG and pairs well with dC, generating transition mutations if left unrepaired.
Thermococcus kodakarensis (*Tko*), is a hyperthermophilic archaeon that thrives at 85°C, but surprisingly does not possess an elevated amount of deaminated bases in its genome, suggesting there are numerous redundant pathways to resolve dI. *Tko* encodes several enzymes to resolve dI in the dNTP pool and genome, which are conserved across the three domains of life. TK2111 and TK1747 encode enzymes that decrease the amount of deoxyinosine triphosphate (dITP) available in the nucleotide pool and TK0906 encodes Endonuclease V, which helps remove incorporated dI. I am generating *Tko* strains lacking these dI repair components in every possible combination and will use both qualitative and quantitative methods to determine the amount of dI accumulation in each mutant strain. The combined studies will explain how dI repair enzymes play a role in deaminated base repair *in vivo*, their individual levels of importance, and whether they work in tandem. The findings will provide information on the relationships between dI repair enzymes, which can be extrapolated to other domains of life.

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228 Assessing the Impact of sfRNA Ablation on West Nile Virus Infection in Bat Cells

Amanda Bartels
Lauren Malsick
College of Natural Sciences
Research Poster

West Nile Virus (WNV), a mosquito-borne flavivirus, has triggered numerous outbreaks globally. While bats are recognized as reservoir hosts for WNV, the exact details of their role in the virus's transmission cycle remain unclear. Further study of bats' ability to act as reservoir hosts may provide indications as to how they are able to carry WNV without becoming symptomatic. The RNA decay pathway is a critical cellular mechanism for RNA degradation that is exploited by WNV to facilitate viral replication and enhance pathogenicity. WNV interferes with the RNA decay pathway of the cell by inhibiting the exoribonuclease 1 enzyme (XRN1) via the highly structured 3' untranslated region (3'UTR) of its viral genome, resulting in increased subgenomic flaviviral RNA (sfRNA) production. The function of these

sfRNAs in bat cells is unknown but may provide an indication as to how bats are able to remain asymptomatic. The objective of this study is to gain insights into the function of sfRNA production on pathogenesis in bat cells. By engineering WNV sfRNA-deficient mutants through targeted mutagenesis, sfRNA1 and sfRNA2 are ablated. Growth kinetics of the sfRNA-deficient clones will provide novel insights into how reduced production of sfRNA impacts viral replication. Understanding the mechanisms of flavivirus infection in bat cells will enhance our knowledge of the cellular mechanisms of WNV pathogenesis and aid the identification of novel targets for antiviral strategies.

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52 A Molting Mystery: LGRs Role in Crustacean Molting

Kendal Berasley
Dr. Jorge Perez-Moreno
College of Natural Sciences,Warner College of Natural Resources
Research Poster

Crab fishing is one of the most profitable and devastating modes of fishing to the ocean leading researchers to study how we can reduce the need for wild caught animals. This study examines a portion of the signaling pathway for molting in *Gecarcinus lateralis* (black-backed land crab), which is an essential process for growth and could increase the yield of fisheries. The aim of this study is to identify what previous studies call the LAF pro receptor, or the limb autonomy factor receptor. This factor regulates the regeneration of new limbs through the growth of limb buds. LGR3s or leucine-rich repeat G-protein coupled receptors are a group of candidates for the LAF pro receptor. The receptors are bound to insulin-like peptides which delay crabs from entering pre-molt and allow them to regenerate damaged limb buds. LGR3s are a good candidate as they have been shown to delay molting in *drosophila* from larva to adult when imaginal discs are damaged. The delay is caused by the release of an insulin-like peptide called Dilp8. PCR was used to determine which of the LGR3 candidates were present in *Gecarcinus lateralis* tissues including claw muscles and the Y-organ which is responsible for synthesis of molting hormones. Further study will be done to evaluate which tissues have LGR3 candidates present and which molt stages they can be found in.

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56 The Effect of Plant Growth Regulator Treatments on Embryo Generation in Doubled Haploid Wheat Breeding

Emily Billow
Meenakshi Santra
College of Natural Sciences
Research Poster

Doubled haploid technology is a revolutionary technique implemented to reduce the time required to develop a wheat cultivar. Genetic uniformity is obtained by the rescue of embryos containing only one set of parental chromosomes followed by chromosome

doubling, effectively producing predictable genomes that can easily be manipulated in breeding programs. The efficiency of doubled haploid wheat production relies on sufficient generation of haploid embryos, posing a challenge to molecular plant breeders. Plant growth regulators are an essential factor in embryo development, influencing cell division and growth. 2,4-D is widely accepted as a hormone that, in low concentrations, improves haploid embryo formation. In combination with 2,4-D, several other plant growth regulators were tested at the Colorado State University Wheat Breeding Lab to determine their effect on the success of embryo production. Three different wheat varieties were treated with several different plant growth regulators then the subsequent seeds, embryos, and regenerated plants were evaluated. Plants treated with silver nitrate produced larger embryos and more plants regenerated, thus a higher rate of embryo induction. Results suggest that the combined effect of 2,4-D and silver nitrate may be more successful than 2,4-D alone. Utilizing this combination of plant growth regulators in doubled haploid wheat breeding can significantly enhance the number of haploid plants recovered and reduce the costs associated with unsuccessful embryo development. Improving the efficiency of doubled haploid breeding increases the production rate of new varieties of wheat that have increased growing quality and disease-resistance.

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231 Tracking the activity of *Thermococcus kodakarensis* DNA polymerase B *in vivo*

Marina Black
Geraldy Liman and Thomas Santangelo
College of Natural Sciences
Research Poster

Each Domain of life encodes for a unique family of DNA polymerase that serves as the main replicative polymerase; Eukarya uses Pol B enzymes, Bacteria use Pol C enzymes, and most Archaea utilize Pol D enzymes. The retention of a dispensable Pol B DNA polymerase in most archaeal clades argues that Pol D and Pol B have specialized roles in vivo. While Pol B and Pol D have been characterized *in vitro*, the roles for each *in vivo* remain enigmatic. DNA polymerase encodes a steric gate which functions to exclude *rNTP*, the building blocks of RNA, from its active site. The steric gate in DNA polymerase only allows *dNTP*, the building blocks of DNA, to enter its active site. Tracking the *in vivo* function(s) of a DNA polymerase can be done through the expression of a mutant DNA polymerase lacking its steric gate, to increase the incorporation of *rNTP* into the genome. Coupling this steric gate lacking Pol B mutant with the RAre DAmage and Repair sequencing (RADAR-seq) we can track and correlate the increase of *rNTP* incorporations in the genome with the activity of the mutated steric gate lacking Pol B.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64051

O15 Extending the Capabilities of Generative Networks to Improve Image

Classification Networks and Image Interpretability

Mikyla Bowen
Jesse W. Wilson
College of Natural Sciences,Walter Scott Jr. College of Engineering
Oral Presentation

Advancements in artificial intelligence (AI) and imaging offer promise for improving diagnosis and automating classification. However, a lack of interpretability leaves clinicians hesitant to rely on AI algorithms and requires more training for Reflectance Confocal Microscopy (RCM). This poster proposes a novel approach to interpretability using image translation networks (image2image). Image2image produces hypothetical images for each diagnostic class and quantifies the image translation distance for its classification decisions. Image2image, allows the visualization of necessary alterations for an image to fit into each respective class, facilitating visual inspection unlike traditional convolutional neural networks (CNNs).

Expanding on initial research, a StarGAN, capable of multiclass transformations, was used as the generative network in the image2image classification problem. Utilizing the Bone Marrow Cytology in Hematologic Malignancies dataset, we achieved 87% accuracy in a three-class identification task, showcasing the method's potential on larger tasks. Subsequently, leveraging the International Skin Imaging Collaboration (ISIC) archive and additional cytology dataset classes, image2image unveiled morphological similarities among classes.

Furthermore, to address interpretability issues of different imaging techniques, we attempted to bridge the gap between RCM and Multiphoton Microscopy (MPM) using the same principle of image2image to translate between modalities. While RCM offers advantages like non-invasive imaging, its interpretability is limited by unfamiliar image appearances. In contrast, MPM produces more interpretable images resembling standard H&E stains but lacks clinical approval. We applied the image2image to improve the interpretability and usability across these modalities, advancing technology usability on both machine learning algorithms and imaging technologies fronts.

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111 Elevation affects wing coloration in the clouded sulfur butterfly

Lindsay Buckentine, McKenna Gonzalez
Lily Durkee
College of Natural Sciences,Warner College of Natural Resources
Research Poster

Elevation gradients provide a way to study populations across a range of environmental conditions within relatively small spatial scales. Adaptation to the local habitat may occur in response to the unique selection pressures present at different elevations, resulting in distinct populations becoming adapted to different environments. Here, we used morphological characteristics to investigate local adaptation in a native butterfly. Our study focuses on the Rocky Mountain

subspecies of the clouded sulfur (*Colias philodice eriphyle* Edwards) (Lepidoptera: Pieridae). The subspecies occupies a wide range of elevations, from the Colorado foothills to subalpine meadows (1500-3000m above sea level). Past studies have documented differences in wing morphology across an elevation gradient, including an increase in black scales on the wings, or melanization, at high elevations in Crested Butte, Colorado. Melanization in butterfly wings increases heat absorption, which is beneficial in colder environments, such as those present at high elevations. Here, we build off this past work by examining wing morphology, specifically ventral and dorsal melanization and wing size, across different elevations at twenty sites in Colorado and southern Wyoming. We photographed clouded sulfur wings and then used ImageJ to document the morphology of the dorsal and ventral sides of the wings. Our analysis will be used to evaluate morphological wing adaptations to clouded sulfur butterfly populations present in high and low elevations.

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73 Expression and hypoxia sensitivity of ZO1 in the deer mouse placenta

Hannah Butkus
Kathryn Wilsterman
College of Natural Sciences
Research Poster

High elevations are associated with lower birth weights across mammals, and adaptation to high elevations mitigates these negative effects. By understanding how adaptation protects against reproductive dysfunction, we may be able to identify treatment or intervention opportunities. We have observed differences in placental development between highland-adapted and lowland deer mice that are associated with fetal growth outcomes. To better understand the basis of these differences, I investigated the role of zona-occludens-1 (ZO1), a protein that is involved in maintaining tight junctions between cells, often along vasculature. I performed immunohistochemistry on placentas collected from gestating deer mice (*Peromyscus maniculatus*) derived from Mount Blue Sky, Colorado (highland-adapted) or Ann Arbor Michigan (lowland-resident) that were subjected to hypobaric hypoxia or normobaric normoxia during late gestation. I found that ZO1 is present throughout the placenta, including around vasculature. However, I also observed discrete clusters of ZO1-positive cells within the junctional zone (JZ; the hormone-producing compartment). I further found that signal intensity within the ZO1-positive clusters in the JZ did not differ between populations, suggesting that populations do not differ in ZO1 protein production. However, we did observe differences in cluster size in response to hypoxia. The results of my project identify a hypoxia-sensitive cell-type in the JZ that may contribute to fetal growth trajectories. Follow-up research should focus on identifying the ZO1 cell-type in the JZ and understanding how these hypoxia-sensitive phenotypes arise across gestation.

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60 Automatically Identifying the Human Sense of Familiarity Using Eye Gaze Features

Trevor Chartier
Dr. Nathaniel Blanchard
College of Natural Sciences
Research Poster

Familiarity is a cognitive state that is widely experienced. The feeling of familiarity may arise when an individual senses a connection to a person's face or a particular place, as if they have experienced it before. The source of familiarity may be obvious to an individual, as in the case of recollection, it may be unknown, or the experience may actually be new, as in the case of Déjà vu. Despite its commonality, there have been few attempts to automatically detect the internal state of familiarity. Here, we test the feasibility of classifying instances of familiarity from eye gaze features. This study utilized an existing paradigm from cognitive psychology to elicit familiarity from configurally similar virtual scenes, including some in virtual reality environments. A dataset was built consisting of eye gaze features directly prior to both positive and negative reports of familiarity. The data was applied to various machine learning algorithms, and the best performing models were selected. The ability to automatically detect the internal state of familiarity would allow for its implementation in applications like intelligent virtual tutoring systems. These systems could use the presence of familiarity to gauge a student's level of curiosity and information-seeking, adapting accordingly to optimize learning potential.

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82 The Fast and the Furious: Tracking the Effect of the Tomoa Skip on Speed Climbing

Caleb Chou
Andee Kaplan
College of Natural Sciences
Research Poster

Sport climbing is an athletic discipline comprised of three sub-disciplines -- lead climbing, bouldering, and speed climbing. These three sub-disciplines have distinct goals, resulting in specialization of athletes into one of the three events. The year 2020 marked the first inclusion of sport climbing in the Olympic Games. While this decision was met with excitement from the climbing community, it was not without controversy. The International Olympic Committee had allocated one set of medals for the entire sport, necessitating the combination of sub-disciplines into one competition. As a result, athletes who specialized in lead and bouldering were forced to train and compete in speed for the first time in their careers. One such athlete was Tomoa Narasaki, a World Champion boulderer, who introduced a new method of approaching the speed event. This approach, deemed the Tomoa Skip (TS), was subsequently adopted by many of the top speed climbers. Concurrently, speed records fell rapidly (from 5.48s in 2017 to the current record of 4.90s in 2023). Speed climbing involves ascending a 15m wall containing the same pattern of obstacles. Thus, records can be compared across time. In this paper we investigate the effect of

the TS on speed climbing by answering two questions: (1) Did the TS result in a decrease in speed times? and (2) Do climbers who utilize the TS fall more? The success of the TS highlights the potential of collaboration between different disciplines of sport, showing athletes of different backgrounds may contribute to the evolution of competition.

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O1 Inferring the feeding ecology of a neqly documented raptor from the early Eocene (56-52 million years ago)

Janie Christensen
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Oral Presentation

Cenozoic (66ma-present) birds are understudied due to poor preservation and a field-wide bias towards mammals. However, birds, especially predatory ones, are very important to study as they play important roles in the ecosystem. An unusual locality of the Willwood Formation in Wyoming is likely a predator-caused accumulation of mostly mall mammals, and contains a single raptorial bird claw. To better understand this locality and this fossil, two steps were needed: 1. Identifying it, and 2. Reconstructing its ecology. Certain characteristics confirm the fossil is a bird, specifically a raptor, and either an owl or an Accipitrid (hawks, eagles, and kites). Furthermore, it is a different species than one of the known owls of the Willwood, implying a highly diverse bird of prey guild and possible competition or niche portioning. Comparisons with modern raptor claws tested the hypothesis that prey type correlates claw morphology. As predicted, a larger bony knob involved in claw flexion predicts larger prey, as well as separates out piscivores and insectivores. Applying this to the fossil claw implies it consumed non-insect, non-fish prey, like the animals in the accumulation, but it isn't entirely clear what size of prey it consumed and if this matches the accumulation. Finding more fossil material from this bird in the future will help us better understand it, and investigating a mammalian predator is also warranted. But for now, this research is important as it establishes that our primate ancestors coexisted with multiple types of predatory birds, who very likely preyed upon them.

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216 SPN-4 promotes 3'UTR dependent mRNA clearance at the oocyte-to-embryo transition in Caenorhabditis elegans

Karissa Coleman
Erin Osborne Nishimura
College of Natural Sciences
Research Poster

Regulation of maternally inherited mRNA transcripts during the early stages of zygotic development drives the cellular divisions at the oocyte-to-embryo transition (OET). Many maternally inherited transcripts enriched in the oocyte are rapidly degraded after fertilization (Stoeckius et al., 2014) by associating with SPN-4, a cytoplasmic RNA-

binding protein that likely recruits the Ccr4-Not deadenylase complex. Using immunopurification, we purified SPN-4 from late-stage oocytes and performed RNA-seq to identify 728 mRNAs that associate with this RNA-binding protein with 4-fold enrichment, *P*lin-41 mRNA was confirmed as a SPN-4 associated target. Indeed, single-molecule fluorescence *in situ* hybridization (smFISH) studies confirm that *lin-41* mRNA requires SPN-4 and its own 3'UTR for proper clearance in early embryos. To determine the sequence within the *lin-41* 3'UTR required for *lin-41* mRNA degradation in early embryos, we systematically deleted regions within the *lin-41* 3'UTR and performed smFISH to assess *lin-41* mRNA abundance. Using a FISHquant analysis pipeline, we observe deletions that remove a sequence within the FOX region of the *lin-41* 3'UTR significantly increase *lin-41* mRNA abundance. This result suggests this region recruits SPN-4 to promote mRNA clearance. We hypothesize other maternally inherited transcripts that contain potential SPN-4-binding sites also associate with SPN-4 to regulate their abundance and ultimately control cell fate during the OET.

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F1 The Election Day Earthquake

Ryan Connor
Frank Boring and Pete Waack
College of Natural Sciences
Film

The Earthquake Documentary by Ryan Connor and his team at Tree Stump Films dives into an earthquake that shook Colorado and surrounding areas affecting over 330,000 square miles. This short film utilizes stunning cinematography, archival footage from the earthquake, and an interview from Jerry Magloughlin, Associate Professor of Geology at Colorado State University, to create an immersive experience into this natural event. This 6.6 magnitude earthquake caused a great deal of damage, especially in the Denver metropolitan area. Though this earthquake occurred in 1882, Ryan Connor brings life to this historic event for present day viewers through this documentary.

59 Colorado State University Softball Pitching Analysis

Danielle Contreras
Dr. Aaron Nielsen
College of Natural Sciences
Research Poster

Colorado State University Softball Pitching analysis was done using data collected from Rapsodo. Data was collected from 4 pitchers from September 2022 – September 2023 on 5 different pitch types (Changeup, Curveball, Drop ball, Fastball, and Riser). 3,311 pitches were recorded all together. Multivariate Regression, Random Forest, and KNN were all used to answer the research question of how does release height(numeric), spin efficiency(numeric), and spin direction(factor) affect the end result of a pitch (ball or strike), by pitch type(factor)? Visualizations from the data were used to create an ideal range for the predictor variables above based on the pitch type.

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63 Controlling Electron Flux, Energy Production, and Energy Conservation *in vivo* Through Protein-Protein Tethering

David Crosby
Sere Williams
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Research Poster

Microbial metabolism stands as a cornerstone of biotechnological innovation, offering a myriad of opportunities for sustainable bioproduct generation. At its core, microbial metabolism encompasses the biochemical processes by which microorganisms transform substrates into energy and various end products. Understanding these metabolic pathways and manipulating electron flow within a cell sheds light on fundamental aspects of microbial physiology and holds tremendous promise for unlocking the potential of bioproducts with diverse applications. The model archaeal species *Thermococcus kodakarensis* thrives in an anaerobic, hyperthermophilic environment and often is forced to use protons as the terminal electron acceptor, thereby generating copious amounts of biological hydrogen as a waste product. This unique metabolism is a keystone of sustainable energy sources made via microorganisms, as hydrogen gas can be used as a clean and efficient form of bioenergy. Electron flux in *T. kodakarensis* is directed through three different proteinaceous electron carriers called ferredoxins(Fds) and each ferredoxin retains specific and distinct interactions with different metabolic pathways. Only one ferredoxin (Fd-3) naturally supplies electrons to the membrane-bound hydrogenase(MBH) to generate H2, and improving electron delivery to MBH through different Fds is hypothesized to potentially increase H2 production. To evaluate the specificity of the Fds, we generated strains wherein distinct Fds were tethered via protein fusions to different subunits of MBH to examine growth rates and H2 production rates. The evidence suggests that hydrogen can be produced with foreign ferredoxin tethering, and the ideal tethering strategies will be discussed with respect to the amount of H2 production and Fd-specificity. The rules dictating Fd-specificity in *T. kodakarensis* likely apply to many systems where the re-direction of electron flux could prove beneficial to generate various bioproducts.

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197 Where do our migratory birds come from? Investigating the Breeding Origins of Hermit Thrushes at Riveredge Nature Center

Tomas Dardis
Kristen Ruegg
College of Natural Sciences,Warner College of Natural Resources
Research Poster

Understanding where birds are coming from and where they are going during migration is often critical information for researchers working at bird monitoring stations. However, this information is often very difficult to attain using bird banding or observational methods. We can now answer these questions using genetic tools designed to identify the breeding origin of

birds migrating anywhere outside their breeding range. For my thesis, I worked with Al Sherkow from the Riveredge Nature Center in Wisconsin to help him find out where Hermit Thrushes migrating through his banding station came from. To achieve this goal, I extracted DNA from feather samples collected during Fall migration and then implemented a SNP-based genetic assay to assign individuals to genetic populations. Our results showed Hermit Thrushes migrating through Riveredge Nature Center were from the Eastern Taiga breeding population. We also found that these birds originated in Southwestern and Southeastern Canada. This suggests that most of the birds likely migrated upwards of 1,000 miles before stopping over in Wisconsin. Al and his team will be using this information to both improve their understanding of the biology of migrating Hermit Thrushes and can use this resulting information to help educate the local community about bird movement.

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195 Local Adaptation in the Feather Microstructures of Gray-crowned Rosy Finches

Sophie Deitch
Erica Robertson & Dr. Kristen Ruegg
College of Natural Sciences
Research Poster

Studying local adaptation, or when a population is better adapted to its local environment than another population might be, can be important to understanding how populations may respond differently to climate change in their environment. Local adaptation is especially relevant in alpine species where the potential for undergoing range shifts to maintain their ideal conditions is constrained. To study this, we used an elevationally-constrained species, the Sierra Gray-crowned Rosy Finch (*Leucosticte tephrocotis dawsoni*) as a model to compare body feather microstructures (traits important for avian thermoregulation) between two populations. We predicted that feathers from colder climates would have a higher density and longer length of plumulaceous barbules and nodes for increased warmth. The feathers were photographed under a microscope and then measured using *ImageJ*. We measured the length and density of barbules and nodes in the pennaceous and plumulaceous regions of each feather. Our statistical analyses revealed significant variation in barbule length and node density between the two populations, with no significant difference in barbule density. These results imply that local adaptation is occurring in these populations, with barbule length and node density more important for adapting to local environmental conditions than barbule density. We hope to apply our results from this model to other species, especially those at risk from climate change.

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85 Minimum Sequence Requirements of PrLDs in Yeast for Stress Granule Localization

Alessandra Donev

Eric Ross
College of Natural Sciences
Research Poster

In response to cellular stress such as pH or temperature changes cells can rapidly form cytoplasmic assemblies called stress granules. Stress granules are complex, reversible ribonucleoprotein assemblies that form by liquid-liquid-phase separation – a process whereby a solution separates into two distinct liquids. Interestingly, many of the proteins found in stress granules contain prion-like domains (PrLD), which are protein segments that resemble yeast prion domains. Various PrLDs are sufficient for stress granule localization. Our lab is therefore examining the sequence features of PrLDs that promote localization to stress granules. In this specific project, we are performing truncations of two synthetic PrLDs to define the minimum amino acid sequence required for stress granule localization. Through truncation we hope to better understand the sequence requirements necessary for this cellular event to occur.

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46 NMR Studies of a Bioactive Vanadium(V) Schiff Base Catecholate for Characterization of Major Isomer in Solution

André Eberspacher
Andrew Bates
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Research Poster

Hydrophobic vanadium(V) Schiff base catecholate complexes have recently been reported to have properties which may make them suitable for chemotherapy against aggressive forms of brain cancer. Complexes of this class demonstrate dynamic solution spectra, displaying multiple peaks in their ^{51}V NMR spectra, complicating characterization. Determining the conformation of the major isomer in solution is important to understanding the biological activity of the molecule. The compound in this study, [VO(HSHED)(DTB)], where HSHED is a ternary Schiff base ligand, and DTB is 3,5-di-tertbutylcatecholate, a sterically hindered catechol ligand, was investigated to determine the structure of the major isomer present in organic solutions. The combination of the Schiff base and the catechol have the potential to form multiple diastereomeric complexes- with four possible geometric isomers. Studies in different solvents reveal different numbers of peaks at different chemical shifts (δ) which change in ratio and linewidth, indicating these peaks are isomers and not impurities. To investigate the structure of the major isomer, 2D NMR spectroscopic methods were employed to understand the general connectivity and spatial conformation of the molecule in solution. Specifically, correlation spectroscopy (^{1}H-^{1}H COSY) was used to determine the connectivity and nuclear Overhauser effect spectroscopy (NOESY) was used to identify the conformation. NMR spectroscopy results will be interpreted, and the major isomer structure will be identified and discussed.

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220 Characterization of the *C. elegans* Intestinal Transcriptome with spatiotemporal resolution during embryogenesis

Justin Ellis
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College of Natural Sciences
Research Poster

At 20 cells, the *Caenorhabditis elegans* intestine functions to regulates digestion, energy homeostasis, and host defense, while dynamically responding to its environment. It also serves to direct yolk production for the next generation and signals genetic aging. However, how these functions are regulated throughout the intestine remains unclear. The current model assumes monolithic function, uniformly performing organ-specific processes throughout the intestine and overlooks its multifaceted roles. Although sparse, research supports the spatial patterning of select transcripts among intestinal cells, lending itself to the cellular and morphological differences observed throughout the *C. elegans* intestine. Given this, we think a more accurate hypothesis is that the intestine carries out its intestinal functions heterogeneously, resulting in sub-functionalized intestinal cells. Here, we seek to spatiotemporally resolve the intestinal cell transcriptome and determine if intestinal cells indeed take on specific sub-functions. To assess intestinal cell gene expression profiles, we used Fluorescence Activated Cell sorting (FACs) combined with single cell RNA-sequencing (scRNA-seq). This allowed us to generate a complete transcriptional profile of the *C. elegans* intestine in a mixed-stage embryo population. After identifying unique intestinal cell clusters, we then must link them with their specific cell identity post hoc using small molecule inexpensive Fluorescent In Situ Hybridization (smiFISH). This allows us to visualize individual mRNA molecules and assess their spatial expression throughout the intestine. By clustering on cellular gene expression profiles, several unique intestinal cell states could be identified through scRNA-seq, supporting a heterogenous model of intestinal gene expression.

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191 Growth-phase-dependent ratio of histones in the hyperthermophilic archaeon *Thermococcus kodakarensis*

Adrea Engel
Brett Burkhart
College of Natural Sciences
Research Poster

Thermococcus kodakarensis (Tk) encodes for two histone proteins, Histone A (HTkA) and Histone B (HTkB), both ~ 67 amino acids long. Most Archaeal organisms use histones to organize and compact their genomes. Either histone has been shown to be required for cell viability in Tk [1]. Archaeal histones are known to dimerize, forming both homo and heterodimers. Experimental evidence demonstrates that HTkB exhibits a somewhat stronger ability to compact DNA compared to HTkA during growth phase changes. [2]. Experimental protocols to expose the ratios of HTkA & HTkB during various growth phases have yet to be designed and implemented in Tk.

Here, we will evaluate the discrepancies between histone ratios during exponential and stationary growth phases, with the aim of providing insight into the functional and regulatory roles of histones as they adapt to the dynamic needs of the cell. We anticipate demonstrating the differential expression of each histone during changing growth phases. Specifically, we believe that HTkA will become less abundant whereas HTkB will become more abundant and form higher order oligomers as the cell enters stationary phase. This is consistent with current data suggesting that HTkA is more abundant in active genomic regions, while HTkB likely plays a more critical role in supporting the cell as it enters a stage of less genomic expression [4].
Overall, our results are expected to reveal the details of growth-phase-dependent regulation of histone expression in Tk and to shed light on the bio-functional differences between the two histones in this hyperthermophilic archaeon.
In addition to learning more about the domain Archaea, we anticipate learning more about how the eukaryotic chromatin dynamics are impacted by growth phases. Archaeal and Eukaryotic histones share homology within the core histone-fold. As histone-based chromatin architecture is absent in bacterial organisms, we assume that the archaeal histones are the progenitors to the eukaryote chromatin systems. By studying TK, we aim to gain insights into our human evolutionary history.

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98 Investigating the proteome response to changing bicarbonate uptake in a model algae.

Chris Faber
Brandon Rohnke, Seijn Park, Kenneth Reardon, Graham Peers.
College of Natural Sciences
Research Poster

Nannochloropsis oceanica is a red-lineage algae and a promising feedstock for biofuel and bioproduct production. Improving the photosynthetic efficiency of *N. oceanica* would increase biofuel production, making a more economically competitive source of carbon-neutral fuel. *N. oceanica* utilizes a series of carbonic anhydrases to help concentrate inorganic carbon around the enzyme Rubisco to enhance carbon fixation through photosynthesis. However, it lacks many features of carbon concentrating mechanisms typically found in algae. Thus, improving carbon acquisition could be a route to improve the productivity of *N. oceanica*. This work characterizes a strain of *N. oceanica* heterologously expressing BicA, a protein found in many cyanobacteria that actively transports bicarbonate into the bacterial cytosol. Previously, our group showed this strain grows better in high bicarbonate than wildtype strains. We hypothesized that an increase in carbon availability leads to the upregulation of proteins involved in the Calvin-Benson cycle and that photosynthetic proteins may also see an increase in activity due to more resources. In turn, we would expect a decrease in high-light stress and decreased expression of proteins involved in non-photochemical quenching. After growing both cultures to a harvestable size, we then performed chemical and mechanical

protein extraction lysis techniques. Through comparative proteomics, we hope to show how the expression of BicA alters protein expression under low and high amounts of exogenous bicarbonate. With this understanding, we can begin working towards optimizing the growth of *N. oceanica* for biofuel applications.

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77 Advanced Analytics Research For CSU Softball

Aidan Feeley
Dr. Aaron Nielsen
College of Natural Sciences
Research Poster

This study explores the application of Rapsodo, a camera-based sports analytics tool used to capture advanced softball statistics. Rapsodo captures a plethora of advanced metrics such as exit velocity, launch angle, spin direction, and spin rate. Leveraging statistical methodologies, this project aims to determine optimal values of these metrics for coaching purposes. Specifically, the research delves into understanding the most advantageous regions within the strike zone for batters, characterized by their highest frequency of successful outcomes. This investigation features the generation of strike zone heat map plots, highlighting areas within the zone where batters exhibit peak performance. Furthermore, the study investigates the spin direction metric to figure out the optimal spin direction targets for batters. Employing multiple linear regression models and data filtration techniques, the analysis attempts to attribute hit-type results to each batted ball, thus providing insights into ideal spin directions.

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190 Radio Telemetry: The Roosting Habits of *Rhinophylla pumilio* and *Artibeus lituratus* at Tiputini Biodiversity Station

Erin Floyd, Garrett Sellers, Ellie Bollich
Tanya Dewey
College of Natural Sciences,Warner College of Natural Resources
Research Poster

The research project conducted at Tiputini Biodiversity Station concerned the roosting habits of bat species *Rhinophylla pumilio* and *Artibeus lituratus*. The two bats were captured, tagged with transmitters, and released to be tracked using radio telemetry at Tiputini Biodiversity Station in Ecuador's Amazon basin. The bats were tracked and located over five days to determine their roosting habits and locality. Our research showed that the regional population of *Rhinophylla pumilio* practices similar tent roosting behavior to other populations throughout its home range, creating its tents out of leaves. *Artibeus lituratus* was shown to be predominantly a cavity nester. In addition to the observational research performed in the field, literature searches were done to compile a life history of the two bat species to determine if our data correlated with previous research. We found that the roosting habits observed at Tiputini Biodiversity Station in the Amazon

Rainforest correlated with other observations of the bats.

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226 Characterization of Tuberous Sclerosis Complex in Crustaceans

Levi Friss
Talia B Head
College of Natural Sciences
Research Poster

For crustaceans to grow, they must go through the process of molting, a complex hormonally regulated cycle which consists of various stages and checkpoints, primarily regulated by the Y-organ (YO). Molting is divided into several stages: intermolt, the time between molts where the animal spends most of its time; pre-molt, where ecdysteroids begin the processes necessary for molting; ecdysis, when the animal sheds the old exoskeleton; and post-molt, where the animal hardens the exoskeleton and return to a basal metabolic state. An important regulator of cell growth and a member of the mTOR pathway, the Tuberous Sclerosis Complex (TSC) is a large tetrameric GTPase activating protein (GAP) formed from two dimers: hamartin (TSC1) and tuberin (TSC2). TSC activates the GTPase rheb, an activator of mTOR, via hydrolyzing rheb bound GTP. Since many biological signals converge on TSC, it is important to understand the nature and role of TSC within the context of crustacean molting in order to understand how various metabolic and environmental signals affect molting. From the construction of phylogenetic trees from transcriptomic data, we aim to characterize TSC in crustaceans. We found TSC2 is well conserved in decapods, potentially containing two different isoforms. Future studies will look further into the conservation and annotation of these genes, look at associated proteins such as TBC1D7, as well as structural analysis of TSC in order to better understand functional differences of crustacean TSC isoforms.

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70 Mind Over Matter: An in-depth exploration of anxiety, identity and academic performance

Gabriela Fuentes Georgieva, Mikayla Bruce, Joselle Gyamfi, Emily Ocampo-Lara, Nisha Chhetry, Jaellyn Erickson, Richard Morales-Villalva
Stephanie 'Mo' Moreira
College of Natural Sciences,Walter Scott Jr. College of Engineering,College of Veterinary Medicine and Biomedical Sciences
Research Poster

The Innovation Experience 3.0 research initiative stemmed from challenges that science, technology, engineering, math, and medicine (STEMM) discipline students face in a competitive academic environment and how their personal identities and anxiety levels impacted their performance. Over 14 weeks starting in Fall 2023, we delved into literature examining the connections between anxiety, identity, and academic achievement. After completing a pilot survey (*n*=78), we created a final survey instrument consisting of open-ended and Likert scale items designed to measure

identity salience, academic performance and their relationship to self-reported levels of anxiety. Data collection concluded in February 2024 through collaboration with colleges to disseminate the survey, intercept students, advertise in classrooms, and table near high-traffic areas resulting in (*n*=1,091) responses over three weeks. Of the respondents approximately 80% were STEMM students. When asked 756 students (79.25%) agreed that they were a STEMM student. Of the students who self-identified as STEMM students (n=756), 65.40% of those respondents (n=604) experienced anxiety often or all the time. 613 of those participants consider being a STEMM student integral to their identity. Compared to their non-STEMM peers, STEMM students are more likely to report worrying about their academic performance in a classroom setting. Our goal is to identify ways in which CSU STEMM students can receive enhanced support for their academic success and mental well-being. By shedding light on these connections, we aim to foster a more supportive and conducive learning environment for CSU STEMM students, ultimately empowering them to thrive academically and maintain good mental health.

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132 An accessible approach to visualizing RNA with single-molecule resolution

Maddie Gaasch
Kim Hoke
College of Natural Sciences
Research Poster

The ability to visualize RNA with in situ hybridization has been a powerful tool for mapping gene expression in space and quantifying relative expression for several decades. In situ hybridization protocols today can be expensive, which can hinder researchers from visualizing RNA in an accessible manner. Here, we describe a comprehensive, open-source, low-cost protocol for in situ hybridization in wild animals without a well-annotated genome. The protocol is a medley of methods that have been validated in-house and describes probe development, tissue/reagent preparation, and hybridization. Our protocol is flexible across multiple tissue types and fixation methods and applies to a variety of biological questions. Probe development was accomplished using a species-specific transcriptome to identify the sequence of interest through a sequence comparison approach with the National Center for Biotechnological Information's (NCBI) database and their Basic Local Alignment Search Tool (BLAST). Subsequently, we designed probes in Python to create complementary, single-stranded DNA probes for the target mRNA. We purchased fluorescent labels and reagents from commercial vendors that were tailored to bind to the probes and amplify the fluorescent signal. In summary, we offer a convenient all-in-one protocol for a reliable, robust method of visualizing RNA in situ at a lower cost than other fluorescent hybridization avenues, facilitating diverse applications in molecular biology and neuroscience research.

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51 Development, Synthesis, and Characterization of [VO(3tBu-HSHED)dtb] as a potential Anticancer Agent: Preparation for Toxicity Testing

Anna Galaeva
Debbie Crans
College of Natural Sciences
Research Poster

Vanadium(V) Schiff base catecholate complexes are cytotoxic and
show cancer selective properties. The previous development of these complexes, such as [VO(HSHED)cat], showed fast hydrolysis and degradation. The corresponding di-tBu substituted catecholate complex, [VO(HSHED)dtb], was significantly more stable. It was hypothesized that increased hydrophobicity and
steric hinderance near the V coordination sphere would slow the rate of hydrolysis and degradation, leading to increased efficacy. By substitution of starting materials with similar compounds and decorating with one or two aliphatic t-butyl groups, [VO(3tBu-HSHED)dtb] resulted in higher hydrophobicity, steric hindrance, and extended lifetimes in both DMSO/water solutions, as well as cell culture medium. The complex was prepared by condensation of 3-tert-butylsalicylaldehyde and N-(2-hydroxyethyl)ethylenediamine which reacted with vanadyl sulfate to form a dioxo V(V) complex. This complex was then coordinated by non-innocent catechol ligands, 3,5-di-tert-butylcatechol, pyrocatechol, and 3,5-di-adamantylcatechol to form the non-innocent complexes, such as [VO(3tBu-HSHED)dtb]. These compounds were characterized by multinuclear NMR and UV-Vis spectroscopy. Recently, we have scaled up the preparations of this compound for preparation of material for toxicity testing in mice.

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84 Characterization and Differential Gene Expression of the Ecdysone Receptor Complex Across the Crustacean Molt Cycle

Olivia Garvin
Jorge L. Perez-Moreno
College of Natural Sciences
Research Poster

The ecdysone receptor (EcR) plays a key role in the crustacean molt cycle. When a crustacean is ready to molt, its Y-Organ (YO) or molting gland secretes molting hormones called ecdysteroids, specifically the active form 20-hydroxyecdysone (20E). 20E binds to EcR and causes a downstream signaling cascade to occur that results in ecdysis. EcR is a non-covalent heterodimer composed of two different proteins - the EcR protein and retinoid X receptor (RXR) protein. While it is known that EcR is expressed during the molt cycle, it is uncertain to what extent EcR is expressed across different molt stages. The aim of this research is to determine the differential gene expression of the EcR and RXR proteins and isoforms across the molt cycle in the blackback land crab (*Gecarcinus lateralis*). RNA sequencing data obtained from the YOs of multiple *G. lateralis* specimens at different molt stages (intermolt, early-premolt, mid-premolt, late-premolt, postmolt, “blocked”) was analyzed using phylogenetic and bioinformatic techniques to determine differential gene expression levels, with an

emphasis on the EcR complex. Findings from this study will unveil part of the mystery surrounding crustacean molting and thus, have potential impactful implications in the aquaculture and fisheries industries.

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80 Supporting Students' Spatial Reasoning in Science

Lauren Gouldey
Meena Balgopal
College of Natural Sciences
Research Poster

Spatial reasoning is linked to student success in STEM classes and is especially important in introductory courses as students are building content knowledge. Studies report that spatial reasoning can be improved with practice and intervention. Furthermore, there is a positive relationship between spatial reasoning and performance in STEM courses. The goal of this project is to characterize how spatial reasoning is presented in the curricular materials of undergraduate natural science courses at Colorado State University. While research literature focuses on math, engineering, and geoscience course, here we asked how is spatial reasoning presented introductory chemistry and biology curricular materials. We identified the type (intrinsic/extrinsic, static/dynamic) and level (low, medium, high abstraction) of spatial reasoning in learning objectives, lecture materials, and assessments. Subsequently, we identified spatial reasoning alignment and misalignment across the data using latent (implicit) and semantic (explicit) thematic analysis. The results will inform instructors on how they can better support students' spatial reasoning in biology and chemistry. In addition, the protocol developed can be used to analyze spatial reasoning in other course curricula.

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81 Coronaviruses Detected in Ugandan Bat Populations Belonging to the *Rhinolophus*, *Hipposideros*, *Myonycteris*, *Rousettus*, and *Miniopterus* Genera

Anna Hartwick
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Research Poster

Bats are a potential source of zoonoses. Coronaviruses are naturally found in both humans and animals, yet the emergence of SARS-CoV-2 highlighted the importance of understanding coronaviruses in wildlife populations and potential spillovers. However, the frequency of detected coronaviruses in wild bat species in Africa is understudied, including species specific relationships. Our objective is to determine the prevalence and identity of coronaviruses in Ugandan bat populations. Oral (n = 604) and rectal (n = 591) swabs were collected in both the wet and dry seasons from 2021 to 2023 from bats inhabiting six caves. Using consensus primers targeting the polymerase gene, the swab samples were screened for coronavirus RNA. Presumptive positive

amplicons were then sequenced to confirm coronavirus infection status. Polymerase chain reaction (PCR) assays yielded twenty-seven presumptive positive coronavirus RNA detections from bats belonging to the genera *Rhinolophus, Hipposideros, Myonycteris, Rousettus,* and *Miniopterus*. *Hipposideros* had the greatest number of presumptive positives (n = 13/27), followed by *Rhinolophus* (n = 7/27) and *Miniopterus* (n = 7/27). So far, sequence confirmation on eight samples confirmed the presence of coronaviruses belonging to both the subgenus alpha- and beta-coronavirus. Contributing to a growing body of literature centering bats and coronaviruses will not only help us understand their zoonotic potential, but also anticipate future public health issues.

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87 Identifying mechanisms of genomic regulation in *Aedes aegypti*

Spencer Henry
Corey Campbell
College of Natural Sciences
Research Poster

Little is known about how arbovirus infection changes regulation of gene expression in mosquito host genomes. Upon acquisition of a blood meal, which is the primary method of virus acquisition, the mosquito vector *Aedes aegypti* undergoes significant changes in gene expression to stimulate digestion and egg production. Because procurement of a blood meal is often the first step in mosquito vector infection, examining genomic changes following a blood meal is an important step for future research. Understanding the regulatory mechanisms underlying changes in gene expression following a blood meal provides insight on the chromatin regions involved in egg development and metabolic regulation. CUT&RUN, a type of chromatin immunoprecipitation, was used to release genomic DNA fragments for quantification of differential chromatin binding that regulates changes in gene expression in blood-fed and sugar-fed mosquitoes. This study used pools of 20 midguts each of adult female *Aedes aegypti* 3 days after blood feeding and sugar fed controls. Acetylated histone 3 (H3K27ac) and trimethylated histone 3 (H3K9me3) modifications were targeted using an anti-H3K27ac antibody and an anti-H3K9me3 antibody, and DNA was fragmented and released using a pAG-Mnase digestion flanking histones bearing this modification. The results of this study will enhance our understanding of genomic regulation following blood meals. These methods can be applied to future vector research, including understanding the differences in susceptibility to Rift Valley Fever Virus (RVFV) between *Aedes aegypti* and *Culex tarsalis,* recognizing changes in gene expression upon acquisition of RVFV, and understanding the barriers to infection.

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91 Characterization of Ras Homolog Enriched in Brain (Rheb) Among Decapod Crustaceans

Ashley Hernandez
Talia Head and Donald Mykles

College of Natural Sciences
Research Poster

The molting process in crustaceans is a crucial component of their growth and success. The molt cycle is regulated by the Y-organs (YO) which synthesize and secrete molting hormones called ecdysteroids. The molt cycle is defined by four stages: intermolt, premolt, ecdysis, and postmolt. Ras homolog enriched in brain (Rheb) is a GTP-binding protein which is highly expressed in the YO throughout the early and mid-premolt stages. Rheb is a proposed regulator of ecdysteroidogenesis via the mTOR pathway, in which it binds mTOR and forms the active mTORC1. Rheb, and thereby the activation of mTORC1, is inhibited by the Tuberous sclerosis complex (TSC) which initiates the hydrolyzation of GTP to GDP. TSC is highly regulated by phosphorylation, and numerous cellular pathways converge by regulating TSC, Rheb, and mTOR. Little is known about the mechanisms that target Rheb to specific tissues, but phylogenetic analysis and multiple sequence alignments of Rheb have indicated that the gene is highly conserved among the various classifications of crustaceans. Future work will include tissue distribution analysis of Rheb in Gecarcinus lateralis and Carcinus maenas, as well as differential gene expression and proteomic analysis.

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68 Framework for Validating Noise2Noise / Spatial Confounding Adjustment for Count Data

Samuel Herold
Dr. Jesse Wilson / Dr. Kayleigh Keller
College of Natural Sciences,Walter Scott Jr. College of Engineering
Research Poster

Framework for Validating Noise2Noise:

Dr. Jesse Wilson and his lab use new laser scan microscopy technologies to produce biological images. These images contain a substantial amount of noise. This research investigated the effectiveness of the Noise2Noise deep learning framework for denoising. Further, we propose a new stopping criteria and a method to validate the output of Noise2Noise.

Spatial Confounding Adjustment for Count Data:

Controlling for unknown confounders is a classic problem in statistics. This research investigates the effectiveness of Thin Plate Regression Splines for mitigating unknown spatial confounding for count data.

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79 Phonotaxis towards conspecific males is not altered with the addition of unattractive calls in female Cope's gray tree frogs (*Hyla chrysoscelis*).

Rachel Jacks
Kim Hoke
College of Natural Sciences
Research Poster

As more auditory information is present, the origin of the signal becomes harder to locate and understand. How animals

accurately maintain attention with competing auditory stimuli is not well understood. Frogs handle complexity in their acoustic environment exceptionally well; female tree frogs move towards a male of their choice despite competing sounds from males from the same and other species. Using Cope's gray treefrog (*Hyla chrysoscelis),* we tested how the addition of competing stimuli affected a female's ability to locate a conspecific male call. To do this, female frogs that were found paired with a male were collected, isolated, and placed in a small enclosure inside an anechoic chamber. Subjects were then randomly assigned to treatments of differing stimuli: a conspecific call alone, a conspecific call amongst conspecific and heterospecific "distractors", and distractors alone. As expected, we found that females in the treatments that heard conspecific calls had more movement than those that only heard distractors. Furthermore, the females' latency to reach the region closest to the conspecific call was not altered with the addition of distractors. The behaviors analyzed may indicate that mating decisions in these frogs are not affected by the addition of unattractive calls. Future experiments will examine orientation as a measure of attention to investigate how localization strategies change with complexity in the stimulus environment.

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105 Comparison between normal and pathological neural activity in a mouse model of epilepsy

Hannah Kim

Seonil Kim
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Research Poster

Epilepsy is a widespread brain disease impacting all age groups and affects nearly 50 million people according to the World Health Organization. Consequently, significant experimental and theoretical research attempts to find the mechanisms underlying the abnormal (and transient) brain electrical activity caused by epilepsy to facilitate the development of therapeutic solutions. In particular, temporal lobe epilepsy (TLE), the most common form of focal epilepsy in adults, is characterized by seizures and behavioral comorbidities (e.g., impaired memory). With no appropriate treatments for seizures and memory loss in TLE, understanding epileptogenesis is essential for therapeutic development. In TLE, seizure-genic circuits are located in the brain regions that support memory formation such as the hippocampus. In epilepsy, it is known that CA1 activities are abnormal, yet limited studies have compared CA1 dynamics between normal and pathological neural activity in the same animal. Here, we record brain electrical activity in a kainate injection-induced mouse model of acute TLE to analyze hippocampal oscillations before and after seizures in the same animal. We found that 250 mg/kg kainate injection was sufficient to induce behavioral seizures in all animals. Importantly, we demonstrated that in kainate-injected mice, delta powers (0.5 – 4 Hz) were significantly increased while theta activity had no change, and the power of slow gamma bands (30 – 50 Hz) was significantly decreased while fast gamma (50 – 100 Hz) showed no difference. These

findings reveal the importance of analyzing the appropriate network connectivity to investigate epileptiform activity in TLE, which further helps understanding epileptogenesis.

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89 Coral Health and Color

Alex Lanucha, Ben Ballinger , Sol Rivera
DeeDee Wright
College of Natural Sciences
Research Poster

Coral reefs are vital ecosystems, providing habitats for marine animals and economic benefits (Siebeck, 2006). However, they face increasing threats from bleaching events due to stressors like temperature increases and pollution (Van de Hoeck & Bayoumi, 2017). Bleaching, the expulsion of zooxanthellae from corals, leads to color loss and vitality decline. Our study in Isla Espiritu Santos, Mexico, aimed to assess coral health and color saturation. We hypothesized that as distance from the shore increases, the saturation of coral color on the coral health card would increase. Transect lines, 25-feet long, were placed perpendicular to the shore for five landmarks. Measurements were repeated four times per landmark to create 100-foot samples. Moving along the transect in 5-foot increments, we used the coral health card to analyze the saturation. We noted that coral sightings were minimal until we reached 11-feet from the shore. Primarily we observed green, brown, golden-brown, and a small quantity of red coral. While trends suggested increased saturation with distance, data limitations prevent definitive conclusions. It's important to note that this correlation could be influenced by various factors, such as the density of coral in different areas. We collected this data for preliminary research and plan to optimize our methods for future studies. Fieldwork revealed challenges, prompting efforts to refine grid measurements and establish transect lines more effectively. Additionally, expanding landmark diversity is necessary for a better understanding of coral health. Continuing coral reef research is essential for our ecosystems as they continue to be threatened by bleaching events.

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88 Ventilation Rates and Unilateral Eye Closure During Rest in Adult Male Bottlenose Dolphins

Michaela Leclerc
Shane Kanatous
College of Natural Sciences
Research Poster

Aquatic mammals such as the Cetaceans (whales, dolphins, and porpoises) are voluntary breathers and must be conscious to protect themselves from predators and drowning. To maintain consciousness during rest, Cetaceans are adapted to rest at the surface using a completely non-rapid eye movement sleep (NREM), called unihemispheric slow-wave sleep (USWS). During USWS, one part of the brain is awake while the other rest. When resting, *Tursiops truncatus* (Common Bottlenose Dolphin) alternate their eyes being closed, known as unilateral eye closure. It has been

suggested that the closed eye during rest is opposite to the resting part of the brain. However, it is unknown whether both hemispheres rest the same. This study aims to see if there is a difference between the ventilation rates and which eye is closed during rest in adult male *Tursiops truncatus*. One hour of low-activity sessions will be observed using a focal animal from a captive adult male *Tursiops truncatus* population. The ventilation rate and eye closed will be recorded during this observation period. Based on previous studies, we predict no physiological differences during rest between the two brain hemispheres. An observed difference, however, could lead to further research in suggesting lateralization or having a dominant side in *Tursiops truncatus*.

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75 Investigating Regression to the Mean Bias in CMAS Testing Data

Witlie Leslie, Ronnie Delgado
Ben Prytherch
College of Natural Sciences
Research Poster

To assess the academic performance of schools, the state of Colorado uses student growth percentiles to quantify student success and improvement. Students are assigned a growth percentile in relation to their performance compared to students of the same grade from the previous year. Our aim is to investigate the presence of regression to the mean bias in these student growth percentiles, which introduces downward bias for schools that service primarily low income students, and upward bias for schools that service primarily high income students. Because individual student scores are not available to the public, we simulated student scores and free/reduced lunch status in order to find the presence of a regression to the mean effect. Student growth percentiles were simulated with the SGP package which is an open-source software built for R that contains functions and example data to produce student growth percentiles. Our simulated student scores and growth percentiles were made to be as realistic as possible as we used school-level data to match up what the school aggregations of our student scores should be. After investigating the school-level data we found suggestive evidence of a regression to the mean bias in school growth percentiles. In the simulation, we show how the bias could have been created at both the school and student levels.

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55 Genetically Encoded Biosensors to Detect Ubiquitination in Live Cells

Claire Lundstrom
Tingting Yao, Bob Cohen
College of Natural Sciences
Research Poster

Ubiquitin is a highly conserved protein found in all eukaryotes that serves as a key post-translational modification of cellular proteins in multiple essential processes. Understanding the dynamics of protein ubiquitination as a critical point of

regulation is of great interest in many biomedical contexts, yet the ability to monitor substrate ubiquitination directly in live cells is very limited. In mammalian cells, epidermal growth factor receptor (EGFR) is a transmembrane protein whose signaling cascade upregulates cell proliferation and growth in the presence of epidermal growth factor (EGF). Attenuation of EGF signaling is achieved through ubiquitin-mediated endocytosis of EGFR. We are designing **protein biosensors to investigate the dynamics of EGFR ubiquitination in live cells**. The genetically encoded protein sensor utilizes a "split" fluorogenic reporter protein called splitFAST. In our strategy, N- and C-terminal fragments of splitFAST are expressed as fusion products with a ubiquitin binding domain and epidermal growth factor receptor, respectively. When expressed in cells, this yields an avidity-based sensor designed to recognize ubiquitinated EGFR. Importantly, the splitFAST fluorescence is reversible and thus can be used to report receptor ubiquitination/deubiquitination dynamics. Development of a specific and sensitive EGFR ubiquitin sensor would provide key insights into the spatial and temporal characteristics of ubiquitin-mediated endocytosis in the EGF signaling pathway.

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100 Machine Learning for 2D Infant Electrical ImpedanceTomography Medical Imaging

Carlos Mabrey
Kyler Howard
College of Natural Sciences
Research Poster

Electrical Impedance Tomography (EIT) is a non-invasive, radiation-free medical imaging technique primarily used for functional lung monitoring. In this study, we developed an end-to-end machine learning model to enhance spatial resolution compared to previous EIT reconstruction methods.

To achieve improved results, we trained various machine learning networks using simulated voltages as inputs and assigned conductivities as targets. Our training dataset comprises segmented CT scans from the New Mexico Decedent Image Database. We implemented several model architectures using MATLAB, including VGG16, ResNet18, ResNet101, DenseNet, and AUTOMAP.

Notably, our deep learning architecture, DenseNet, outperformed other models. It was constructed with 121 layers and trained on the same data as previous models. Additionally, we explored AUTOMAP, a novel approach that introduces fully connected layers at the beginning of the training process, contrary to the typical placement of fully connected layers in a convolutional neural network.

We evaluated each model using error metrics such as percent difference from targets, root mean square error (RMSE), structural similarity index (SSIM), and correlation (L2). DenseNet exhibited promising results, achieving a **66% reduction in RMSE** compared to previous methods. The network's outputs generated predictive images based on input voltage

data, with a binary filter applied to remove out-of-boundary noise.

Our findings demonstrate the potential of machine learning techniques to enhance EIT reconstruction, paving the way for improved medical imaging in infant lung monitoring.

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104 A Shellfish Journey: Characterizing an Inhibitory Receptor in Crustacean Molting

Ashlynn Madril
Donald Mykles
College of Natural Sciences,College of Veterinary Medicine and Biomedical Sciences
Research Poster

Molting is an essential process that crustaceans undergo as a way to develop and regrow appendages and involves the shedding of the old exoskeleton while the newly grown shell hardens. It requires multiple complex pathways, one of which is the molt-inhibiting hormone (MIH) pathway, an essential pathway for regulating the molting process itself. MIH, a member of the crustacean hyperglycemic hormone (CHH) superfamily, keeps the molting gland, the Y-Organ, in a basal state, preventing crustaceans from constantly initiating the molt cycle. In crustaceans, the MIH receptor has not been fully identified or characterized. It is expected that the MIH receptor is type of G-protein coupled receptor (GPCR) since previous research has found that the resulting activation from MIH binding follows the GPCR downstream pathway through adenylyl cyclase activation. The presence of GPCRs in the MIH analog found in insects also supports this idea. This project examines seven possible CHH-family GPCRs that have been previously identified, and aims to determine the most likely MIH receptor candidate. Using *Gecarcinus lateralis*, the blackback land crab, as a model organism, polymerase chain reactions (PCRs) with custom primers were used to identify the expression of these putative MIH receptors in different tissues, as well as differential gene expression across multiple molt stages. Identifying the MIH receptor is another step towards understanding the intricate molting process in crustaceans which can help in aquaculture industries. Supported by National Science Foundation grant IOS-1922701.

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90 The Diversification of Aphonopelma in the United States

Ethan Manyik
Tanya Dewey
College of Natural Sciences
Research Poster

Tarantulas (Theraphosidae) are a diverse group of spiders mostly associated with tropical and sub-tropical regions. Though the genus *Aphonopelma* has diversified across the western United States. Here I investigate the northward diversification of Tarantulas by using existing genetic and geographical data to recover a phylogeny of the natural relationships between

Aphonopelmids in the United States. Specifically through the analysis of the *MT-CO1 gene* across different phylogenetic schools of thought.

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218 Variation of on-screen time in adult female bottlenose dolphins

Catalina Mazariegos Mejia
Dr. Shane Kanatous
College of Natural Sciences
Research Poster

A managed-care population of bottlenose dolphins (*Tursiops truncatus*) is part of a long-term behavioral study in Roatan, Honduras. Underwater video of dolphins is collected annually using a mobile video-acoustic system. Video was analyzed to calculate the on-screen time for each individual. These times allow rates and proportions with behavioral data to better understand individual variabilities. On-screen time between dolphins could vary by sex, age, and reproductive status. Here, we seek to determining if there is a difference in on-screen time between adult pregnant females and adult non-pregnant females. The non-pregnant females are separated into two sub-categories: lactating-not-pregnant and not-lactating-not-pregnant. Our hypothesis is that adult pregnant females will have less on-screen time than adult not-pregnant females. We do not expect differences between the two categories of not-pregnant females. To answer our question, data collected by DCP in 2019, 2020, and 2021 were used, which includes 9 adult females, 6 of which were pregnant at various times. The results show that pregnant females represent only 39.6% of the total on-screen time compared to not-pregnant females (60.4%). Also, lactating-not-pregnant females correspond to 88.8% of the non-pregnant females, while not-lactating-not-pregnant females correspond to 11.2%. These results suggest pregnancy could influence female visibility in view of the camera, since pregnant females spend less time on screen. More research is needed to investigate individual variabilities, but population studies should consider reproductive status when examining social species.

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93 Educational Tools and Community Engagement in Wildlife Rehabilitation

Becca McDonald
Graham Peers
College of Natural Sciences,Warner College of Natural Resources
Research Poster

Wildlife rehabilitators have the potential to be effective public education resources for teaching about wildlife and promoting community engagement. To help tap into this potential, I collaborated with the Northern Colorado Wildlife Center (NCWC) to develop two educational tools that can be used to teach the public about wildlife issues. Educating the community about wildlife can build support for environmental conservation efforts and promote a better relationship between people and our environment. I focused on the topics of the life stages of birds and bird feeders,

because bird watching and feeding are often accessible ways for people to interact with wildlife. I designed these tools to be hands-on and experiential, which has many benefits in learning environments. After designing and building these tools, I evaluated their effectiveness by conducting a survey about how people's knowledge and attitudes changed after interacting with these tools. Results indicated that the tools were effective in increasing the public's awareness and interest in engaging with wildlife issues. Specifically, 94.1% of respondents reported an improvement in knowledge about bird feeders, and 85.3% reported an improvement in knowledge about bird life stages. Only 5.9% of respondents reported that interacting with the education tools had no impact on their future behaviors. These education tools will continue to effectively teach community members about wildlife as they become further integrated into NCWC's public education efforts.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64016

241 Understanding the Metabolic Guardian of *Thermococcus kodakarensis*: ChIP-Seq for Archaea

Jason McDonald
Brett Burkhart, Tom Santangelo
College of Natural Sciences
Research Poster

Genome-wide occupancy data for transcription regulatory proteins provides insight into the mechanisms that underly gene expression. Chromatin immunoprecipitation with next-generation sequencing (ChIP-seq) is a valuable tool for identifying genome-wide binding locations of transcription regulatory proteins. The workflow is extensively studied in mesophiles but has inherent experimental concerns when performed at physiologically relevant temperatures for hyperthermophiles. The sulfur response regulator (SurR) is a significant transcription regulator for the order Thermococcales as it is directly responsible for the metabolic shift allowing organisms to adapt to the presence or absence of elemental sulfur that can serve as an alternative terminal electron acceptor. Here, employing the model hyperthermophile *Thermococcus kodakarensis* we aimed to identify genomic binding locations of SurR and develop an effective ChIP-seq workflow for hyperthermophilic archaea that yields high-resolution data. Two strains of *Thermococcus kodakarensis* were constructed with an HA epitope tag on SurR, one with genomic modifications and one reliant on ectopic SurR expression. The procedures involve the optimization of crosslinking protein-DNA at biologically relevant growth temperatures and a rapid cooldown using an ice bath and liquid nitrogen. Understanding SurR binding locations defines the SurR regulon under normal biological conditions. Developing effective ChIP-seq methods will allow for future studies on additional DNA-binding proteins in hyperthermophiles allowing for a better understanding of transcription mechanisms at the limits of life.

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P1 Fate: A New Musical (Excerpts)

Katherine McGuinness
College of Liberal Arts, College of Natural Sciences
Performing Art

Fate, a new musical by Katherine McGuinness, is an examination of destiny, free will, motherhood, daughterhood, and all the complications in between. Using the twenty-two cards of tarot's Major Arcana as the inspiration for its (approximately) twenty-two songs, it tells the story of young single mother Dalia Atropos, a descendant of an ancient line of fortune tellers, as she struggles to pick up the pieces of her shattered identity in the wake of her mother's death. For this year's CURC, I will be presenting three numbers from the show: "Wheel of Fortune," "The World," and "Judgement."

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115 Exploring the Interplay: Personality, Mental Health, and Regular Cannabis and Alcohol Use

Tabitha McMichael
Meggan Drennan
College of Natural Sciences
Research Poster

Alcohol and cannabis are among the most frequently used substances by adults in the United States and are commonly co-used. Both alcohol and cannabis have been positively associated with negative mental health outcomes, with alcohol being associated with higher levels of depression and cannabis use being associated with higher levels of anxiety and psychosis. Co-use of alcohol and cannabis has been associated with poorer mental health outcomes. Trends in personality traits have been observed in individuals experiencing depression and anxiety, with neuroticism measuring higher while extraversion and conscientiousness measuring lower. The relationship between substance use, mental health, and personality remains muddled, with limited research on the relationship dynamics. This study examines observational data gathered from individuals with differential substance use patterns – those who regularly use only cannabis (n = 26), regularly use only alcohol (n = 41), who abstain from regular substance use (n = 45), or who engage in both cannabis and alcohol use (n = 48). Psychological outcomes of depression, anxiety, and stress were investigated alongside personality trait assessments. This presentation will discuss the differences in psychological outcomes across the three groups, and explore the interplay between personality characteristics, mental health outcomes, and substance use patterns.

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230 Parallel Cultures: Exploring Shared Experiences in Mathematics Education Among Mexican Transnational Students and Native American Students

Hanna Medina
Jess Ellis Hagman
College of Natural Sciences
Research Poster

The goal of this research project is to explore the intersecting experiences of transnational and Native American students in mathematics education, focusing on similarities in educational background, identity, belonging, and support systems. Through comparative analysis, we examine how language, culture, and institutional dynamics shape the educational journey of these student populations. Utilizing poetic transcription, a multilingual transnational student's voice is amplified. Which provides a deeper insight into their mathematics education journey. By juxtaposing the experiences of these two groups, this research project uncovers shared themes and patterns. Which shed light on the complex intersection of language, culture, and mathematics education. This research project contributes to a deeper understanding of how education systems can better support diverse student populations in their pursuit of a successful mathematics education.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63982

42 Single-Cell RNA Sequencing of *Culex tarsalis* Ovaries

Liz Mielke
Corey L. Campbell
College of Natural Sciences
Research Poster

Rift Valley Fever Virus (RVFV) causes a mosquito-borne viral disease that affects livestock and humans, primarily in Africa, occasionally resulting in mass animal die-offs. These outbreaks can lead to devastating economic and food security losses for farming communities. Over 40 mosquito species can potentially act as transmission vectors. RVFV is thought to be maintained in nature in part by transovarial transmission during mosquito reproduction. Transovarial transmission begins with a disseminated viral infection of the adult female and moves to the developing eggs. Previous reports indicated that about 30% of mosquito's total transcriptomic response is in the ovaries. We chose *Culex tarsalis*, which is a major vector of West Nile Virus and highly competent for transmission of RVFV as a subject for single-cell sequencing analysis. The overall objective of this project is to identify expressed marker genes that can be used to identify specific ovarian cell types. However, the genome annotation is highly provisional. Methods: Ovarian single-cell suspensions were prepared from pools of 20 sets of ovaries. The Chromium Next GEM Single Cell 3' Reagent kit was used to create libraries for high throughput sequencing of RNA from single cells (scRNA-Seq) of adult ovaries that had already laid one round of eggs. Initial scRNA-Seq was performed, then Cell Ranger and cluster analyses were performed.
Results: Improved gene annotation of the *Culex tarsalis* genome has quickly yielded informative marker genes for further analysis. Putative marker genes were confirmed by cross-checking with orthologs from *Aedes Aegypti* and *Culex quinquefasciatus* mosquitoes. Genes of interest from scRNA-seq clusters include the vitellogenin receptor (VgR) and vitellogenin, a crucial lipoprotein for egg development. Another gene cluster appears to represent circulating immune cells, due to expression of cecropin-A1 (CeCA1), an important anti-microbial effector. We have also identified a number of representative

genes from the RNA Interference (RNAi) pathway in our datasets. The RNAi pathway is a major immune response in mosquitoes that triggers induction of a silencing complex that eliminates gene expression of critical proteins, protecting cells against viral infection. Validation of marker genes using *in situ* hybridization methods is currently underway.
Conclusions: We have identified putative target gene markers that will aid in the colocalization of RVFV and those marker genes in ovarian cells. These results provide the foundation for future work to investigate transovarial transmission of RVFV in *Culex tarsalis* mosquitoes.

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95 Purification and Characterization of *S. cerevisiae* Sen1 Helicase

Mattias Mihelich
Grant Schauer
College of Natural Sciences
Research Poster

Barriers to DNA replication progression present major mutagenic risk to cells, as they can cause replication fork stalling and/or collapse and chromosome rearrangement. One such barrier to replication arises from R-loops, RNA:DNA hybrids formed during transcription between template DNA and nascent RNA5. Sen1 is an ATP-dependent 5-to-3' DNA:RNA and DNA:DNA helicase and transcription termination factor4 that is implicated in resolving barriers to replication progression, particularly R-loop conflicts1-2. In S. cerevisiae, Sen1 directly associates with DNA replication machinery, potentially recruited by accessory proteins Ctf4 and Mrc13. Here, we have cloned and purified full length Sen1 (Sen1FL), as well as Sen1 lacking its N-terminal region (Sen1ΔN) which is believed to be regulatory in SETX, the human ortholog of Sen1. We have observed helicase activity in both Sen1FL and Sen1ΔN, in concurrence with other studies1. In an aim to further characterize the processivity of Sen1, we have developed an experimental strategy which simulates a barrier to fork progression; endonuclease deficient Cas9 (dCas9) will be targeted, at several sites, to an in-vitro S. cerevisiae replication template with gRNA. We will then be able to track progression of in-vitro reconstituted yeast replisomes along this template to elucidate the dynamics of replication blockage resolution by Sen1. Using biochemistry and single-molecule imaging techniques, we aim to delve into the mechanism by which Sen1 is targeted to replication forks and resolves R-loop barriers to fork progression.

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103 Directing Electron Flux by Linking GGR and Ferredoxin-2 in *Thermococcus kodakarensis*

Savina Miller
Seré Williams
College of Natural Sciences
Research Poster

Microbes can grow faster than expected based on their metabolic efficiency. Some of these efficient microbes thrive in extreme environments enhancing the

mystery of their efficient metabolism. To better understand these efficiencies, we are probing electron flux in a model archaeal hyperthermophile, *Thermococcus kodakarensis*. *T. kodakarensis* has three proteinaceous electron carriers with respective electron pathways. Ferredoxin-3, responsible for transporting electrons to the membrane bound hydrogenase to produce hydrogen, can be deleted from *T. kodakarensis*. However, removing ferredoxins-2 and 1, responsible for lipid maturation and ATP production respectively, are not compatible with life. An area of inquiry regarding these electron carriers is how directing their flow of electrons phenotypically impacts their function. Geranylgeranyl reductase (GGR) accepts electrons from ferredoxin-2 to remove double bonds from lipids. With a goal to redirect the flux of electrons, it has been hypothesized that linking ferredoxin-2 and GGR could impact metabolic efficiency. Preliminary data has shown that tethering these two proteins leads to increased amounts of unsaturated lipids present in *T. kodakarensis*. This suggests not only that this organism can still function under this genetic modification, but also that the electrons otherwise used in lipid maturation could be directed to other electron carriers to fuel different outputs, such as hydrogen gas generation: a valuable biofuel.

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65 Characterization of Bacterial Dynamics within the *C. elegans* Intestine

Andrew Moore
Jessica Hill

College of Natural Sciences
Research Poster

The gut microbiome is a key regulator of health, modulating various aspects of host physiology such as immunity and metabolism. However, our understanding of fundamental processes underlying interactions between the microbiome and host cells remains incomplete. *Caenorhabditis elegans* is an attractive model organism for studying host-microbe interactions in the gut, and a collection of gut microbes known as CeMbio has been prepared for the organism. Here we characterize JUb66 (*L. amnigena*, a CeMbio community member) as a monoculture and as a part of the CeMbio community. We fed *C. elegans* fluorescently labeled JUb66, imaged them using fluorescence microscopy, and processed the images to determine bacterial spatial patterning in the intestinal lumen. We found that JUb66 preferentially colonizes the mid to posterior region of the intestinal lumen as a monoculture, while its localization shifts primarily to the middle with reduced abundance as part of the community. In comparison, *E. coli* (OP50), the standard lab diet, showed similar spatial preference throughout the intestinal lumen but displayed decreased abundance when compared with JUb66, suggesting a reduced ability to colonize the host. This suggests that coordination of the microbiome and colonization by specific bacteria or a simplified bacterial community may not be finely localized to select intestinal cells throughout the intestine, but rather to larger regions of the intestine. Together, this system allows for future experiments which modulate the host transcriptome to observe effects in the microbiome and is a first step in understanding the underlying

mechanisms of microbiome selection and maintenance.

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222 Predictors of Change in Physical Activity among Cancer Survivors

Paige More
Ann Hess
College of Natural Sciences
Research Poster

This is a collaborative project with Dr. Heather Leach and Mary Crisafio. Dr. Leach is an Associate Professor in the department of Health and Exercise Science and Mary is a graduate student at CSU. Dr. Leach and Mary know that social support, supervised exercise and the inclusion of behavior change theories helps participants of exercise programs for cancer survivors. In this study we are examining predictors of change in physical activity among cancer survivors following a videoconference delivered exercise program. This program is called FitCancer. FitCancer is an eight week supervised and group-based exercise program. These are done through a virtual platform and include social cognitive theory behavior discussions. A total of n = 69 cancer survivors participated in the FitCancer Program. Folks self-selected to be included in the program and many were recruited through a cancer support group. Baseline and demographic information was collected at the start of the program. Three measures of physical activity were recorded at the beginning and end of the program. These three measures are moderate and vigorous physical activity also called aerobic exercise (MVPA), resistance and strengthening exercise (RSE), and total moderate and vigorous physical activity and resistance also called total aerobic and resistance exercise (MVPAR). For each participant there are baseline and post-program assessments. The assessments are: fatigue, self efficacy, quality of life and sit to stand repetitions. The outcome variables are change MVPA, change in RSE, and change in MVPAR.

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V2 Aspen's Gaze

Anna Mriglot
College of Natural Sciences
Visual Art

This painting strives to encapsulate the serene backcountry of Colorado in the fall. At the heart of the composition, a noble aspen tree stands tall. Behind, an undisturbed mountain side is hidden beyond vibrant trees and a calming mist. Billowing clouds encompass the distant mountains, allowing for a soft and diffused glow over the scene. The aspen represents a source of renewal and sonder, while its presence evokes a deep sense of rootedness and strength within the piece. The painting is on canvas using oil as the medium. This creation was done in memory of my best friend, who was a resilient fighter and always stood tall.

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O11 Verbal Overshadowing Effect: Beyond Crime Scenes and Lineups

Jana Norris Oliver
Haley McCoy
College of Natural Sciences
Oral Presentation

The Verbal Overshadowing Effect (VOE) is a kind of memory interference. Schooler and Engstler-Schooler (1990) define it as impaired recognition performance after one has verbalized the appearance of previously seen visual stimuli. In VOE studies, a complex scene or event is observed and memory of it is tested via a recognition task, generally choosing a face from a line-up. Many VOE studies compare one group who records details of an event to a separate group who does not record any details of the event. The no-detail group may record other information or participate in unrelated writing activities. Common results from VOE studies indicate that participants struggle with recalling specific details of the witnessed event, i.e. faces of those involved, if they have written about the stimulus in the interim between the stimulus and recall. Many studies use crime scenes as the VOE stimulus, but the current study aims to remove the stressor of viewing and reporting on a crime scene; instead, participants will watch a non-crime-centric scenario. Like other studies (Baker & Reysen, 2020; Monzel et al., 2024), the randomized groups will perform a writing task between the stimulus and the recognition memory task, with one group writing about the scene and one group writing about their plans for the evening. This study will add to the VOE literature a new take on the common stimulus of a crime scene and determine if the VOE extends to other types of stimulus and recognition, such as a comedy scene.

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96 Zephyr: How polluted is that air you are breathing?

Nathan Orwick, Everett Lewark, Brenna Wolf
Shrideep Pallickara
College of Natural Sciences
Research Poster

Air quality presents one of the biggest environmental risks to human health and has the potential to impact every organ. In fact, it is second only to communicable diseases in the risk that it poses to public health. Air pollution contributes to reduced lung function, oxidative stress, and immunosuppression among other adverse health risks. Those suffering from chronic and acute respiratory diseases are especially at risk. Poor air quality contributes to more than 100,000 premature deaths in the United States each year, and 8.34 million excess deaths internationally each year.

Accessible and continuous access to air quality is the first step to educating citizens and, eventually, legislative changes. The EPA has many outdoor air quality monitoring sensors that harvest data regarding an extensive range of airborne pollutants, including particulate matter (PM2.5 and PM10), ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, and lead. We have designed a browser-based tool, Zephyr, that allows users to

interactively analyze longitudinal (starting in 1980) air quality data tracking criteria pollutants. An added feature of Zephyr is integration with 2020 US census data to explore how socioeconomic factors correlate with exposure to poor air quality. Zephyr also overlays infrastructure data regarding coal and gas fueled power plants allowing users to assess how power plant proximity impacts air quality. Finally, we have incorporated support for animating pollutant-specific variations so that users may assess air quality changes over time during transient, but often prolonged, events such as wildfires. The tool is available for experimentation by anyone at https://urban-sustain.org/services/zephyr

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67 Structural Determination of Vanadium Anti-Cancer Complexes via NMR Analysis

Raley Patch
Dr. Debbie Crans
College of Natural Sciences
Research Poster

Non-innocent Schiff base Vanadium catecholate complexes hold pharmaceutical promise for treatment of specific cancers. Specifically, these complexes are efficacious against human chondrosarcoma (SW1353) bone cells, T98G glioblastoma cells, and aggressive mesenchymal-like MDA-MB-231 cancer cell lines.1 Through intratumoral injection, these complexes can treat cancerous cells and quickly break down into less toxic components. The structures of these complexes are critical for their success rate and understanding the active species. The sterically hindered catechol derivatives and the high hydrophobicity of these complexes allow for their efficacy in these cancer cell lines.1 Vanadium Schiff-base catecholate complexes are notoriously difficult to recrystallize, so nuclear magnetic resonance (NMR) is the analytic tool utilized to determine the 3D structure and conformations of these complexes. Since these complexes form isomers in solution, we can use various NMR techniques to determine the major isomer in solution. 1H-1H 2D COSY NMR spectra are used to determine the through bond interactions of protons through cross peaks which elucidates the connectivity of the complexes, while 1H-1H 2D NOESY NMR spectra show key proton interactions up to 5 Å of length. These spectra give insight into the 3D structure by showing through-space interactions and allow for complex structure of the major complex isomer to be determined. In this work, we will show these spectra as well as the elucidated structure for several highly active anti-cancer complexes and modelling their 3D structures using ChemBioDraw 3D.

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131 Characterization of Biogenic Amine Receptors in Two Decapod Crustaceans

Madison Pelletier
Talia Head
College of Natural Sciences
Research Poster

Crustaceans undergo the process of ecdysis to shed their exoskeleton so that the

organism can grow and repair structural damage. This process is directed by an intricate signaling pathway. Both the Y-organ (YO) and X-organ (XO) are the two main regulating organs of the molting process. The YO functions by producing molting hormones called ecdysteroids. Ecdysteroid synthesis in the YO is suppressed through the production of molt-inhibiting hormone (MIH). MIH is synthesized and secreted by the XO. The production of ecdysteroids is regulated by an extensive number of ligands. One proposed group of ligands contributing to the production of ecdysteroids are the biogenic amines. This study focuses on the impact of biogenic amines on ecdysteroid synthesis. In crustaceans, biogenic amines function mainly as neurotransmitters, neurohormones and neuromodulators. In the YO of the blackback land crab, *Gecarcinus lateralis*, there have been 3 serotonin, 2 dopamine and 1 octopamine putative biogenic amine receptors discovered. This project seeks to continue the work of characterizing the expression of serotonin receptors in even more tissues using samples from both *Gecarcinus lateralis* and *Carcinus maenas*. Using PCR and gel electrophoresis, expression of these biogenic amine receptors in the YO, ESG, brain, gills, claw muscle, hepatopancreas, midgut, hindgut, and thoracic ganglia was determined for both *G. lateralis* and *C. maenas*.

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113 Knocking out the VDL-1 gene in *Nannochloropsis Oceanica*

Courtney Pimentel
Tessema Kassaw, Graham Peers
College of Natural Sciences
Research Poster

Previous observations of the model organism, Nannochloropsis oceanica, a marine stramenopile alga, have identified the gene encoding for the violaxanthin de-epoxidase-like (VDL) proteins to be involved in the formation of light harvesting carotenoids. We utilized the CRISPR/Cas9 approach to knock out the VDL1. Our goal was to investigate its impact on cell growth, photophysiology and biomass productivity. In the future, we plan to validate gene function, through transformation of one of the mutant strains with its native VDL1 gene and assess the transformant for restored wild type phenotype. Because VDL1 knockout strains have reduced antenna size and light harvesting capacity, we plan to optimize the photosynthetic efficiency in these knockout strains for large scale cultivation in the bioreactor for biofuel production.

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92 Visual Working Memory and Dysexecutive Functioning

River Roberts
Mickey Rice
College of Natural Sciences
Research Poster

Visual working memory (VWM) enables active manipulation and retention of visual stimuli. Previous studies have linked VWM performance to cognitive control,

encompassing inhibition, mental control, and attention. Executive functioning (EF) involves planning, problem-solving, decision-making, multitasking, abstract thinking, and emotional regulation. Our study explored the relationship between EF and VWM performance, two cognitive processes crucial for daily functioning. We hypothesized that higher levels of EF will be related to improved VWM performance. To investigate this, seventy-nine participants completed self-assessments of EF using the Dysexecutive Questionnaire (DEX) and engaged in a computerized task measuring VWM performance. We broke the DEX into three subscales to measure EF: behavioral-emotional self-regulation, metacognition, and executive cognition. Additionally, we hypothesized that individuals scoring lower on metacognition and executive cognition would demonstrate increased accuracy in VWM tasks. Our results demonstrated that, when controlling for age and gender, none of our factors for EF were found to be related to VWM. Specifically, behavioral-emotional self-regulation was nonsignificant (β = -0.16, p = 0.18), metacognition was nonsignificant (β = -0.06, p = 0.60), and executive cognition was nonsignificant (β = -0.10, p = 0.44). Our findings suggest that self-reported EF does not significantly predict VWM performance, necessitating further investigation. Our study underscores the complexity of cognitive processes, suggesting that despite the nonsignificant relationship found, it's essential to explore VWM and EF independently. Implying skills like problem-solving and abstract thinking may not directly impact the retention and manipulation of visual information.

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50 Vanadium and Manganese Species Effects on Mitochondrial Reactive Oxygen Species

Lilliana Rose
Debbie C. Crans
College of Natural Sciences
Research Poster

Numerous metals are necessary in trace concentrations for physiological function, some exhibiting promising therapeutic potentials. However, accumulation can incite toxicity and is associated with neurodegenerative diseases. Vanadium, an emerging trace minerals, has increasing interest as a therapeutic for the treatment of cancer. Its proximity to Manganese, notorious for inducing Parkinson's like symptoms, questions the safety of Vanadium. A comparative study of Vanadium and Manganese was conducted to observe their effect on mitochondrial reactive oxygen species (ROS). Mitochondria are a locus for metal-associated oxidative damage, responsible for nearly 90% of cellular ROS within cells. Isolated mitochondria from mouse cardiac cells were treated with physiologically relevant oxidation states of these metals to evaluate their influence on ROS and release of hydrogen peroxide. High-resolution respirometry (Oxygen O_2K) facilitated real-time observations of mitochondrial respiratory function and hydrogen peroxide release. Additionally, the interaction of these metals in isolation from mitochondria with hydrogen peroxide was assessed via resorufin-based fluorescent plate assays. Results varied amongst metals, with Vanadium demonstrating a propensity to

quench hydrogen peroxide and mitigate the generation of ROS. Conversely, Manganese exhibited no quenching capabilities and increased ROS. Metals are capable of stealing electrons or interfering with the protein complexes of the electron transport chain. To understand the mechanisms of these metals, mitochondria swelling assays. The metals were compared to Calcium because it is known to induce mitochondrial swelling and apoptosis. Additionally, metal speciation was calculated for the salts at a physiologically relevant pH.

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202 Determining The Essentiality of DeoxyuridineRepair Enzymes In *Thermococcuskodakarensis*

Christopher Sanders
Alex, Alon
College of Natural Sciences
Research Poster

DNA encodes the proteins needed to preform daily cellular functions to sustain life in all living organisms. Under different types of stress conditions DNA is prone to damage, which, if left untreated prior to replication, can pose lethal consequences for the cell. A frequent form of DNA damage is spontaneous deamination, which is accelerated under high temperatures and converts the nitrogenous base deoxycytidine (dC) to deoxyuridine (dU). Hyperthermophiles provide a unique window into genome maintenance because they do not accumulate dU in their genomes despite living in extreme heat conditions.

Thermococcus kodakarensis (*Tko*), is a hyperthermophilic archaeon, that not only survives, but thrives at ~85˚C (~185˚F). To maintain genomic integrity, *Tko* encodes several complementary and redundant DNA repair pathways (EndoQ, EndoMS, UDG) that respond to and resolve dU damage. However, it is not understood which pathway(s) are most kinetically active and critical for repair of dU *in vivo*. We have generated a series of strains lacking dU repair enzymes in various combinations. Only deletion of all three dU repair components resulted in a severe growth defect, highlighting the redundancy of dU repair enzymes for survival in extreme conditions. Using a novel sequencing platform, RADR-seq, we can determine location and quantity of dU damage in mutant strains. The combined studies will provide insight into the coordination of dU repair components in extreme conditions.

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117 The Role of USP48 in Regulating H2A C-terminal Ubiquitylation Catalyzed by BRCA1/BARD1

Rean Savi
Tingting Yao
College of Natural Sciences
Research Poster

Post translation modifications to the H2A C-terminal tail of histones is important in signaling for a variety of cellular functions including double stranded break repair. BRCA1/BARD1 is an E3 ligase that is responsible for ubiquitylating the lysines at

K125, K127, and K129 of the H2A C-terminal tail. This ubiquitylation signals for progression down the homology directed repair pathway for double stranded breaks. A possible enzyme for the deubiquitylation of this site has been identified in vitro to be USP48. Using a live sensor system the real time H2A C-terminal tail ubiquitination can be measured in a USP48 knock-out cell line therefore giving insight into the role of USP48 as a site-specific deubiquitylating enzyme for the BRCA1/BARD1 ligase in vivo.

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101 Synthesis and Infrared Spectroscopy Characterization of Bioactive Vanadium (V) Schiff Base Catecholate Complexes

Emma Scurek
College of Natural Sciences
Research Poster

In recent years, vanadium(V) Schiff base complexes have been investigated as therapeutic agents for the treatment of cancer. Specifically, those with hydrophobic backbones and sterically hindered catecholate ligands have been found to have anti-cancer properties against human glioblastoma (T98G) cell lines. Within this family of compounds, those of most notable activity contain a sterically hindered catecholate ligand, such as 3,5-di-tertbutylcatechol. This has been shown to increase hydrolytic stability and lead to better activity in cell culture conditions. It has also been recently demonstrated that a pyridine ring on the ternary Schiff base ligand increases compound stability, specifically when a 5-membered ring is formed with the vanadium center. Compounds containing the moiety described previously exhibit enhanced stability and increased activity in cell culture media. In this study, a series of complexes were synthesized containing a novel SALIMP backbone functionalized with an ethoxy group (where SALIMP stands for N-(salicylideneaminato)-2-(2-aminomethylpyridine)). The synthesis of these complexes will be discussed in addition to the results of the new functionality and connectivity insights gained by infrared spectroscopy (IR) studies.

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72 What Do Today's Philosophers Believe?

Jacob Shankles
Dr. Aaron Nielsen
College of Natural Sciences
Research Poster

This poster presents a Shiny web application developed to explore the insights gathered from a PhilPapers survey conducted by David Bourget and David Chalmers. This survey solicited responses from over 1700 English-speaking philosophers worldwide on a variety of philosophical dilemmas. Developed using R and deployed on Shinyapps.io, the app offers users an interactive platform to explore philosophical perspectives across diverse demographics.
The app features a home page with multiple graphs showcasing broad demographic information from the participants, as well

as 5 interactive pages where users can sort responses by different demographic categories to explore modern day philosophers' views on over 90 controversial topics.
To address privacy concerns, the raw data is not directly uploaded to Shinyapps.io alongside the app. Instead, it is accessed from a private Google Sheets using a Google API. This approach ensures users can interact with the data while safeguarding its confidentiality.

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109 Investigating the Timing of Mexican Free-tailed Bat Emergence at Different Habitats

Sam Simon, Meredith Nash-Martin
Yuting Deng
College of Natural Sciences,Warner College of Natural Resources
Research Poster

Insectivorous bats play important roles in the ecosystem, as they serve as bioindicators for habitat quality and provide ecosystem services in the form of pest population control. The largest population of Mexican Free-Tailed Bats (*Tadarida brasiliensis*) resides in South-Central Texas, where tens of millions of individuals migrate here and use it as maternity roosting sites. Large aggregations of these bats emerge at night allowing radar stations to detect them. Our study examined the timing of nightly bat emergence at natural and anthropogenic colonies at a larger scale relative to past studies spanning across 23 years (2000-2022).

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76 Directed Evolution of Bismuth Cloneable Nanoparticles

Courtney Solomon
Rachel Cohen and Chris Ackerson
College of Natural Sciences
Research Poster

Electron microscopy allows for high resolution imaging of biological macromolecules in their native environment. However, the similar electron densities of biological macromolecules make it difficult to distinguish them from the background. Cloneable nanoparticles (cNPs) are inorganic particles synthesized by an enzyme. Since enzyme sequence is encoded within DNA the properties of the nanoparticle are cloneable. By fusing a cNPs to a protein of interest, it is possible to distinguish the protein of interest from the biological background.

My research aims to improve biological imaging in electron microscopy by improving cNPs. The current generation of cNPs use large and complex enzymes (e.g., ~100 kDa, 2 domains) which perturb the native cell environment and protein of interest in a myriad of ways. Arsenate reductase is a small enzyme (16 kDa) with potential to make bismuth cNPs (which have low toxicity and high contrast). Bismuth and arsenic are pnictogens sharing similar chemistries. Natively, arsenate reductase reduces arsenate to arsenite via a 3-electron transfer. We used spectroscopic assays to detect initial enzyme activity for

bismuth. For use as a cloneable tag, the metal specificity of arsenate reductase will be optimized for bismuth reduction. We are designing a directed evolution experiment to optimize bismuth reduction by arsenate reductase to form bismuth cNPs. Dynamic light scattering and scanning electron microscopy will be used to measure the cNP product size and the evolved variants of arsenate reductase will be assessed by monitoring cell growth and nanoparticle production with optical-based assays.

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83 Components of Executive Functioning Involved in Prospective Memory Performance

Rob Spenceley
Deana Davalos
College of Natural Sciences
Research Poster

Prospective memory (PM) requires setting the intention to perform a task and remembering to execute the task, which is an imperative process for college students to manage meetings, submit assignments, and maintain a social life. Many components of executive function are related to PM abilities, and it is unlikely to have one without the other. One model that attempts to explain this relationship, the Preparatory Attentional and Memory Process (PAM) model, suggests that executive functioning abilities must be activated before the presentation of a PM cue to successfully perform an action. We performed a factor analysis on the Dysexecutive Questionnaire (DEX), composed of the following factors: interference management, inhibition, intentionality, planning, and social regulation. We expected higher scores on DEX factors would predict reduced PM performance. Specifically, we hypothesized that inhibition and interference management scores would be inversely related to PM.
79 participants reported their executive functioning skills via the DEX and completed a computerized PM task. The results demonstrated that, when controlling for age and gender, higher inhibition scores were significantly associated with lower PM accuracy at a trend level (β = -.20, p = .094). We found no other factors of the DEX were related to PM. Overall, our findings support the idea that executive functioning is a part of the PM process to some extent, specifically inhibition. Similarly, these findings support the role of the PAM model in PM, suggesting that the PM process may need to be uninterrupted to be committed to memory.

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48 Engineering a Heterotrophic Alga

Brianna Terry
Tessema Kassaw
College of Natural Sciences
Research Poster

Understanding photosynthesis mechanisms in algae is important in being able to engineer plants to photosynthesize more efficiently. ***Phaeodactylum tricornutum*** is one of many species of diatoms, a group of ecologically important microalgae. We

designed a transgenic strain of *P. tricornutum* expressing the human glucose transporter gene - GLUT1 - that should be able to grow in **heterotrophic conditions (glucose only)**. There was an observed growth difference between wildtype and transgenic strains that **transgenic strains show better heterotrophic growth** in the presence of glucose.

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58 Evaluation of Optical Flow Based Methods for Temporal Satellite Imagery

Jackson Tobin
Jason Apke
College of Natural Sciences
Research Poster

Optical Flow (OF) algorithms are the "distributions of apparent velocities of movement of brightness patterns in an image" (*Horn and Schunck 1981*). OF retrievals are enabled for most cloud and water-vapor motions by the Geostationary Operational Environmental Satellite (GOES)-R Advanced Baseline Imager (ABI) spatial and temporal resolutions. Dense (every image pixel) OF retrievals enable temporal interpolation of CONUS (the continental US) imagery and accurate estimations of winds from cloud motions. Accurate temporal interpolation provides unprecedented proxy fine temporal resolution imagery over much larger domains than native ABI alone. Temporal interpolation also improves image compositing algorithms which blend imagery from multiple instruments scanning at different times.

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62 Minerva: A Tool For Analyzing Social and Environmental Vulnerability

Jackson Volesky, Emilie Beck, Marlowe Lankford
Shrideep Pallickara
College of Natural Sciences
Research Poster

Individuals often have very little agency in where they live; these choices are primarily driven by socioeconomic factors. But where individuals live also exposes them to social and economic vulnerabilities that exacerbate and perpetuate iniquities. Often marginalized communities find themselves in proximity to hazards and away from access to healthcare and other emergency services. For example, such communities often live close to highways and high traffic roads that contribute to increased exposure to particulate matter (especially PM 2.5) that is known to cause neurological, respiratory, and cardiological problems including early onset of chronic diseases. And PM 2.5 is just one such hazard. Often such communities are exposed to multiple, cascading hazards.

We have designed a browser-based tool, Minerva, from the ground-up that allows users to interactively explore several dimensions of vulnerabilities and identify spatial locations that are especially susceptible. Our methodology allows users to explore diverse datasets encompassing demographics, income, infrastructure, environmental, and ecological aspects among others. Crucially, users can

graphically compose queries as clauses that could be used to explore vulnerabilities, exposure, and hazards that can be used to characterize risks. We posit that this is a first step to mitigating such vulnerabilities by identifying better interventions, subsidies, and targeted funding. Our tool is available for experimentation at https://www.urban-sustain.org.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63713

66 Investigating the DNA Replication Stress Response

Sophi Ward
Mollie Uhrig, Neelam Sharma, Claudia Wiese
College of Natural Sciences,College of Veterinary Medicine and Biomedical Sciences
Research Poster

DNA replication during cell division is a critical mechanism for the survival and proliferation of all organisms. However, there are many internal and external factors that are harmful to this process. Decreases in replication accuracy lead to mutations that can cause harmful and sometimes life threatening diseases. This generates a need for a greater understanding of the replication stress response, which can be accomplished through the DNA fiber assay in experiments carried out in the laboratory. This procedure begins with exponentially growing human cells that are sequentially labeled with CldU and IdU, two thymidine analogs. The cells are harvested, dropped on a positively charged slide, and lysed. Next, the slide is tilted at a slight angle, allowing the DNA to spread via gravity. To visualize the DNA, we use immunostaining followed by fluorescence microscopy. The measurements obtained from these images are used to evaluate the speed and stability of DNA replication. As such, the DNA fiber assay provides insight into the processes and proteins that cells use to maintain accurate DNA replication and prevent disease causing mutations during DNA replication.

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44 Discovering Africa's Biodiversity Through Acoustic Data and Machine Learning

Eryn Wheeler
Dr. Nathaniel Blanchard
College of Natural Sciences
Research Poster

The field of bioacoustics is a branch of science that is used with a variety of applications where the study of animal behavior, diversity, and commercial use is through the sound production of living organisms. A popular usage of bioacoustics is animal identification, especially in birds. However, there is a gap in the field where there are acoustic identification models for other animal species such as mammals. A lack of identification in different animal species and in different locations around the world can lead to less attention to research, and conservation efforts for animal species and ecosystems in need. Addressing the gap in bioacoustics in South Africa is the first step to handling the lack of identification. Africa is facing a rapid loss in

biodiversity and cascading effects on its ecosystems. Factors that lead to this rapid loss are deforestation, natural habitat loss, direct exploitation of wildlife, and more. In this ongoing project, our goal is to assist in collaborative research on Africa's biodiversity by training a machine-learning model(s) to identify animal species using their acoustic data. This model will not identify only bird species, but also amphibians, bats, and mammals. We conclude with current works and our next steps in this project.

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64 Revised Mechanism for Hydroxyurea Induced Replication Stress and an Improved Alternative.

Jackson Whitted
Grant Schauer
College of Natural Sciences
Research Poster

Hydroxyurea (HU) is commonly used in yeast to induce replicative stress through the inhibition of dNTP synthesis, leading to activation of the S-phase checkpoint. The mechanism by which this is accomplished involves disrupting the function of the enzyme Ribonucleotide Reductase (RNR) through quenching of a catalytic tyrosyl radical. However, research into archaeal systems that have RNR enzymes which do not possess a tyrosyl radical have still shown susceptibility to HU inhibition. HU has also been shown to only partially deplete dNTP levels but did not deplete them completely. Additionally, we have observed cell cycle arrest at G1/S independent of the Mec1/Mrc1 pathway during HU treatment. A potential alternative source for the observed replicative stress can be found in reactive oxygen species (ROS) like H2O2, which is produced from HU in yeast. H2O2 has the potential to disrupt replication by acting on [4Fe-4S] clusters found in the catalytic domains of eukaryotic replicative polymerases α, , ε. Here, we demonstrate that polymerase activity, binding, and stability are susceptible to inhibition by ROS via [4Fe-4S] clusters. We propose a system based on the easily implemented auxin inducible degradation of RNR, which is able to produce replication stress through depletion of nucleotide pools without the unintended production of damaging ROS.

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57 Characterization of modes and kinetics of mutation accumulation in *Saccharomyces cerevisiae* through the analysis of defined cellular lineages

Mackenzie Wienke
Juan Lucas Argueso
College of Natural Sciences,College of Veterinary Medicine and Biomedical Sciences
Research Poster

Gradualism is the primary and most supported mode of mutation accumulation in biology, where mutations steadily accumulate throughout an organism's lifetime. Another model that has been observed in several cell types, such as heterogenous tumors, is punctuated

equilibrium (i.e., bursts) where multiple mutations accumulate within a few cell cycles during periods of systemic genomic instability (SGI) before returning to a period of stability. We hypothesize that mutation bursts can arise within small lineages and that these events are not as rare as previously thought. We constructed a hybrid yeast diploid containing ~55,000 heterozygous single nucleotide polymorphisms (SNPs) along with two gene reporter cassettes, *ADE1-CAN1* and *ADE2-$_{kl}$URA3* inserted near the end of chromosomes 13 and 15, respectively. We use loss of heterozygosity (LOH) tracts to model mutation accumulation events. Phylogenetic experiments were used to infer the timing of these burst events. LOH events at either locus were detected by screening for red colonies. Red colonies on plates containing phylogenies of up to 6 cell divisions were whole genome sequenced (WGS) to search for additional LOH events. When additional LOH tracts were found, the remaining colonies on the corresponding plate were PCR-genotyped via restriction fragment length polymorphism (RFLP). Our results showed that bursts do indeed arise in single-cell lineages as multiple independent LOH tracts accumulated within one to two cell divisions. Through the screening of over 5,000 single-cell lineages, we have been able to classify phylogenies with both gradual and burst events, determining the relative frequency of each mutation accumulation mode.

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O3 Novel application of chain transfer agents for generation of high value polymers during mechanical recycling.

Gwen Wilusz
Megan Hill
College of Natural Sciences
Oral Presentation

Polymeric materials, and specifically plastics, are indispensable in everyday life and are integral in products ranging from clothing to tires. Plastic consumption has increased drastically in the modern era, and this inevitably leads to an increase in plastic waste. While recycling was historically proposed to minimize plastic waste build up, the combination of the heating and shearing forces innate to this process leads to the formation of highly reactive, short-lived radical species that can induce chain degradation of polymers. This decreases the overall molecular weight of the material, inevitably resulting in lower-value products. This work proposes improvements that will increase the mechanical recyclability of polymer waste by introducing accessible functionality to the degraded polymers through mechanoradical capture. Trithiocarbonate chain transfer agents (CTAs), typically used in controlled radical polymerizations, have the unique ability to stabilize and capture radicals. Thus, introducing these small molecules during the mechanical recycling process are shown to capture the mechanoradicals formed, effectively functionalizing the waste polymers, and thus allowing them to be employed as macroinitiators for controlled polymerization. This novel method generates higher molecular weight materials akin to virgin polymers and offers a promising path toward reducing plastic waste.

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223 Peripheral *Mycobacterium tuberculosis* Infection Results in Neuroinflammation and Accumulation of Misfolded Proteins in Non-Human Primates

Isla Anderson
Amanda Latham
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Tuberculosis (TB) is a bacterial infection caused by *Mycobacterium tuberculosis* (Mtb) and affects approximately ten million people each year worldwide. TB primarily infects the lungs inducing a robust peripheral immune response of cytokine producing cells. Epidemiological studies show associations between TB and increased risk for neurodegenerative diseases, including Parkinson's Disease (PD) and dementia, as well as decreased cognition in patients co-infected with TB and HIV. These correlations exist without diagnoses of central nervous system Mtb infection or tuberculosis meningitis. We have previously shown using guinea pigs, a pathologically relevant model of human disease, that peripheral Mtb infection results in neurological changes. This includes glial reactivity, neurotoxic protein aggregation, and neuronal loss. Guinea pigs are a relevant animal model for Mtb, however, non-human primates (NHP) are considered to have greater translational potential, because they share similar genetics, anatomy, and physiology to that of humans. In our current study, brains from NHPs peripherally infected with two common laboratory strains of Mtb were examined. Our preliminary data shows that animals exposed to Mtb display a neurotoxic brain phenotype compared to uninfected controls, including increased microglia and C3/S100b positive activated astrocytes as well as accumulation of hyperphosphorylated tau. Through this data, we demonstrate the translational capacity of our previous findings, supporting our hypothesis that TB disease may contribute to long-term cognitive decline in human patients. Further analysis of these NHP brains will also deepen our understanding of how the peripheral immune response affects the brain.

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136 Gene-targeted mice expressing cervid prion protein propagate CWD to brain and extraneural tissues

Zoe Atkinson
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College of Veterinary Medicine and Biomedical Sciences
Research Poster

Prions are proteinaceous infectious agents that cause fatal neurodegenerative diseases of animals and humans. The central event of all prion diseases is the templated conversion of host-encoded prion protein, PrP^{C}, by its pathogenic conformation, PrP^{Sc}. While all prion diseases feature accumulation of infectivity in the central nervous system (CNS), prions may also replicate in non-CNS tissues in certain diseases, leading to efficient prion shedding from infected hosts and consequent environmental contamination. Prion

peripheralization is a feature of chronic wasting disease (CWD), a rapidly spreading disorder in wild and captive cervids in North America (NA), Europe, and Asia. CWD prion strains have varying potentials to replicate in the lymphoreticular system (LRS), and it is postulated that this feature underscores the highly contagious nature of NA CWD. Gene-targeted (Gt) mice that express elk or deer PrP^C under the control of regulatory elements of the endogenous mouse PrP gene recapitulate the lymphotropic properties of CWD prion strains. Here, Gt mice were peripherally challenged with NA CWD isolates, and peripheral tissues were collected for immunohistochemistry and histoblotting analysis. We observed that the CWD prion depositions in the LRS and skeletal muscles of Gt mice were comparable to those observed in naturally infected cervids. The success of cervidized Gt models in replicating CWD prions in extraneural tissues warrants the examination of additional natural prions in Gt models expressing other mammalian PrP^C.

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110 The cutest frog in the swamp: How to be delicious to a mate and not a predator

Cameron Badger
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College of Veterinary Medicine and Biomedical Sciences
Research Poster

Communication styles differ across species and are used to convey important information for things like reproduction and predation. Therefore, being understood is imperative to the continuation of a species. While we know animals adjust their call behavior strategies with the environment, there is still a mystery to uncover regarding the vocal repertoire of a little south American tree frog, *Boana pulchella*. Male tree frogs strategically adjust vocalizations depending on their environment. Further discoveries into their species-specific communication patterns will help inform the continued exploration of how humans and other animals use language and modify speech patterns to convey different meanings. We are interested in how *B. pulchella* males modify their vocal patterns as their social environment changes. Here, we investigate how mating competition in the frog's local community impacts male calling behavior when responding to a neighboring frog. We presented playbacks of *B. pulchella* calls to males captured in the field, recorded their responses, and analyzed the call response characteristics of five males. These characteristics were categorized and compared to the stimulus type they heard. Our analysis unearthed a behavioral trait where males rapidly adjusted their vocalizations in response to changing stimuli. Furthermore, when males heard recorded calls of increasing complexity, they responded with a greater variety of call types. This level of call adjustment implies the local social structure has a profound influence on vocalization choice in males. In a greater context, their flexibility in vocalization implies strategy for higher mating success and therefore, unique characteristics ensuring species survival.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/64134

129 Modeling HIV-1 Clade C-Derived SHIV-C109 Viral Replication Dynamics and ART Efficacy in Humanized Mice

Ella Barnett
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Research Poster

SIV viruses have been extremely useful in the study of HIV pathogenesis in nonhuman primate (NHP) models. However, NHP models cannot sustain infection with HIV. Simian-Human Immunodeficiency Viruses (SHIVs) are hybrid viruses containing HIV viral envelopes and accessory genes incorporated into SIV backbones to better model HIV infection in NHPs. Most SHIV studies have focused on HIV-1 clade B, while HIV-1 clade C has been significantly understudied despite its predominance in low-resource regions outside of North America. In this regard, SHIV-C109 was created by combining the SHIVHXBc2 P3.2 backbone with an R5-tropic HIV-1 Clade C envelope sequence. We sought to evaluate SHIV-C109 infection dynamics and anti-retroviral therapy (ART) induced viral latency in the hu-HSC humanized mouse model for the first time. Hu-HSC mice from multiple immune cohorts were inoculated with SHIV-C109 and monitored for a prolonged period to determine the persistence of viremia and $CD4^+$ helper T cell decline. Our results showed successful infection and sustained viremia above the limit of detection (1,000 viral RNA copies/mL) for >45 weeks via qRT-PCR. Viral suppression was achieved in all treated hu-HSC mice for >1 week by the incorporation of anti-retroviral drugs Bictegravir, Emtricitabine, and Tenofovir Alafenamide into their diets for 11 weeks. Potential CD4+ T cell decline, immune system activation and viral distribution in various organs including brain are also being evaluated. Based on our findings, SHIV-C109 infection in the hu-HSC mouse model has the potential for use in pre-clinical therapeutic studies relevant to HIV-1 clade C viruses.

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159 Evaluating the presence of Chronic Wasting Disease in free-range White-tailed deer in Arkansas

Lauren Bennett
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Research Poster

Chronic wasting disease (CWD) is a prion disease affecting free-range and captive cervid populations in North America, Europe, and Asia. CWD is the result of an accumulation of misfolded, pathogenic prion proteins within lymphoid and neural tissues. The deposition of prions in the brain ultimately leads to vacuolation, spongiosis, and death. CWD is of significant concern as the precise route of transmission is unknown. Understanding the pathogenesis of CWD will fill in gaps in our knowledge about the nature and mechanisms of CWD transmission. Terminal tissues are collected from cervids to determine the progression of CWD prions throughout the body, providing information about early vs late-stage disease. It is

known that CWD pathogenesis infects peripheral lymph nodes before central nervous system involvement. To better understand the disease progression of free-ranging cervids, terminal tissues were harvested from 36 white-tailed deer in Arkansas. To date, 21 paired samples of retropharyngeal lymph node (RPLN) and obex have been analyzed by immunohistochemistry (IHC) for the presence of PrPcwd deposition. Our findings demonstrated 14 of 21 (66%) RPLN and 11 of 21 (52%) obices were positive. Of these samples, 11 of 21 (52%) paired samples (RPLN/obex) were both positive, indicating a late disease stage. None of the tested pairings contained a negative RPLN and positive obex. Future studies investigating the PrPcwddeposition within all paired tissue samples will be conducted to better establish disease progression for each deer. Completed tissue analysis will provide wildlife officials with prevalence rates to better assist with management strategies.

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231 Selective cholinergic activation prevents hippocampal hyperexcitability, memory loss, and the *in vivo* growth of amyloid plaques in Alzheimer's disease

Ellison Black
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Research Poster

Alzheimer's disease (AD) is the most common form of dementia with no known cause and cure1. Studies suggest that one of the main causes of AD is disruptions in synaptic activity of GABAergic inhibitory interneurons by beta-amyloid peptide (Aβ). This in turn decreases inhibitory activity to increase excitation in pyramidal excitatory neurons in the hippocampus, resulting in network hyperexcitability. Hyperexcitability in the hippocampal network also promotes Aβ secretion and accumulation, leading to the formation of amyloid plaques, a central pathology of AD. This suggests that the Aβ-induced reduction of hippocampal inhibition is a crucial trigger for the development of AD. Therefore, enhancing hippocampal interneuron activity is thought to be neuroprotective against AD. We thus hypothesize that Aβ-induced hippocampal hyperexcitation promotes the *in vivo* rapid growth of amyloid plaques, which can be reversed by increasing hippocampal inhibition. To activate hippocampal inhibition, we injected drugs to stimulate α7- and α4β2-nicotinic acetylcholine receptors (nAChRs) into 5-month-old amyloid pathology model (5XFAD) mice. hippocampal sections from these mice were stained with Thioflavin S to visualize amyloid plaques. We found that *in vivo* co-stimulation of α7- and α4β2-nAChRs significantly reduced the total area and average size of amyloid plaques in the 5XFAD hippocampus when compared to the control hippocampus. This suggests that co-activation of these two receptors significantly reduces the growth of amyloid plaques in 5XFAD mice by preventing hyperexcitation in hippocampal pyramidal cells.

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167 Evolution of multiple substrains during propagation of Norwegian moose prions in CWD-susceptible gene-targeted mice

Hannah Bodrogi
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Research Poster

Prions cause transmissible neurodegenerative disease of animals and humans. They arise due to the misfolding of cellular prion protein (PrP^{C}) into its infectious counterpart (PrP^{Sc}). Chronic wasting disease (CWD) is a prion disease affecting cervids including elk, deer, and moose. CWD is endemic to North America (NA), and in recent years has emerged in northern Europe. While NA CWD prions replicate in lymphoreticular as well as central nervous systems (LRS and CNS) of affected animal, prions causing CWD in Norwegian moose and red deer replicate only in the CNS. Gene-targeted (Gt) mice expressing physiological levels of deer PrP^{C}, referred to as GtE and GtQ, recapitulate the variable strain characteristics of CWD prions including lymphotropism. During transmission studies of Norwegian moose isolate (M-NO2), we discovered that prions acquired lymphotropic properties, predominately in GtE mice. Here we described additional examples of acquired lymphotropism during passages of Nordic CWD isolates. These mutational events are important since contagious transmission of NA CWD is thought to be related to lymphotropic strain properties. Our finding therefore has relevance to the potential for continued infectious spread of CWD among cervids in Northern Europe.

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139 Fruit Flies and Human Disease: How Gene Overexpression Increases Muscle Activity

Andrew Bollegar
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Research Poster

All chemical synaptic transmission is dependent upon fast, synchronized neurotransmitter release mediated by the presynaptic protein synaptotagmin. Calcium binding initiates vesicle fusion and the subsequent release of neurotransmitter. In the past decade, non-progressive motor neuropathy has been linked to synaptotagmin at the human neuromuscular junction. In one family, a subtype of congenital myasthenic syndrome (CMS) has been linked with a proline to leucine (P-L) point mutation to the C2B calcium binding domain of synaptotagmin. A recent study has demonstrated a causative relationship between the presence of this mutation and the expression of CMS-like symptoms in drosophila *in vivo*. Here, we show how the overexpression of wild type synaptotagmin in the P-L heterozygous background recovers the deficits previously observed. To do this, we developed 4 critical genotypes: wild type, wild type with overexpression, P-L mutant, and P-L mutant with wild-type overexpression. Using *in vivo* voltage clamp electrophysiology, we found that flies heterozygous for the P-L mutation

and expressing a third, wild type copy of *syt* demonstrate the same, if not greater, levels of neuromuscular excitability when compared to flies with two copies of wild type *syt*. These findings provide preliminary support for gene therapy as a potential long-term treatment option for individuals suffering from not only synaptotagmin-related CMS, but other synaptotagmin related diseases.

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171 Using artificial intelligence-based image analysis to quantify dopaminergic neuron pathology in a pesticide exposure model of Parkinson's disease

Aidan Briggs
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Research Poster

Parkinson's disease (PD) is a progressive neurodegenerative disorder characterized by the loss of dopaminergic neurons in the substantia nigra pars compacta (SNpc) . While the exact etiology of PD remains elusive, research demonstrates environmental factors may contribute to the development of PD. One such toxicant, the organochloride pesticide dieldrin, has been correlated with PD risk, and demonstrated to induce oxidative stress and degeneration of DA neurons. We hypothesize dieldrin alters DA metabolism, leading to the accumulation of reactive metabolites and further neurodegeneration. To analyze the effects of dieldrin, 8-week-old C57/Bl6 wild-type and aldehyde dehydrogenase 1 and/or 2 (ALDH1/2) knock-out mice were dosed daily with dieldrin (0, 1, or 3mg/kg) via oral gavage for 6 weeks. The number of DA neurons in the substantia nigra pars compacta (SNpc) were visualized and quantified using immunohistochemistry, hematoxylin and eosin staining coupled to scanning microscopy, and AI-based deep learning analysis. Results demonstrate that dieldrin exposure led to a dose-dependent loss of DA neurons in the SNpc. Curiously, ALDH1/2 knock-out showed reduced neurodegeneration compared to their wild-type counterparts, indicating the loss of ALDH1/2 provided a level of protection against dieldrin-induced loss of DA neurons. This work may serve as a model for the neurotoxic effects of dieldrin on PD pathology. Further research will quantify oxidative stress and the concentration of DA metabolites. Determining the mechanisms behind dieldrin neurotoxicity may help guide preventive strategies and therapeutic interventions for this debilitating neurodegenerative disorder.

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247 Tau proteins' impact on epileptic behavior and interneuron morphology in mice

Liam Burns
Madeleine Moseley
College of Veterinary Medicine and Biomedical Sciences
Research Poster

In the US, ~4 million people are affected by epilepsy, a condition characterized by

spontaneous seizures of varying severity. Temporal lobe epilepsy (TLE) is the most common focal epilepsy and accounts for most of drug-resistant epilepsy cases, indicating the need for a new therapeutic target to treat seizures and/or modify the development of acquired TLE. Microtubule-associated protein tau has been highlighted as a potential target. Suppression or deletion of tau can suppress seizures in genetic epilepsy models, but the role of tau in the development of acquired TLE has not been adequately described. Acquired TLE often develops after an injury where the hippocampal circuit becomes rewired toward an increased probability of unprovoked seizures. To study how tau modifies development of TLE, we used the intrahippocampal kainate (IHK) model of TLE in mice lacking native tau (tau -/-) and wildtype controls (C57BL/6J). The IHK model was used to induce status epilepticus (SE) and after a delay, development of TLE with spontaneous seizures occurs. Here, mice were monitored on video and convulsive seizure behavior was noted and characterized by severity and frequency. Preliminary results are consistent with the hypothesis that tau -/- mice display decreased seizure frequency and severity, relative to wildtype mice. Preliminary fluorescent microscopy data suggests altered interneuron death. Interneuron death has been speculated to contribute to seizures in model of epilepsy, as interneurons inhibit the activity of other neurons and their absence leaves neuronal activity unchecked, eventually reaching a state of uncoordinated firing, the cause of a seizure.

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173 Antagonism of UGT8: How dengue viruses gain an advantage over an antiviral lipid metabolic enzyme

Kaitlyn Dirks
Rushika Perera
College of Veterinary Medicine and Biomedical Sciences
Research Poster

The flavivirus life cycle is intimately associated with cellular membranes. Infection has been shown to alter host cell lipid metabolism to support the extensive membrane morphological changes viral proteins induce for viral replication and assembly. Ceramide, a sphingolipid involved in both the structure of membranes and intracellular signaling, has been shown to be upregulated in both human and mosquito hosts and also enriched at sites of flaviviral replication. Studies from our lab has shown that UDP Glycosyltransferase 8 (UGT8), which catalyzes the addition of galactose onto ceramides to form galactosylceramides, is antiviral. We aim to understand how dengue virus affects expression of this enzyme to gain an advantage over the host during infection. We hypothesize that dengue virus decreases the expression of UGT8 to maintain pools of ceramides within the cell to support viral replication. Using qRT-PCR, we have shown that the transcription of UGT8 is modulated during DENV infection. There is a decrease in UGT8 mRNA expression early in infection. We have also shown that UGT8 protein expression is decreased during infection. We are currently investigating the mechanisms behind viral control of this enzyme.

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245 Generation of an antigen specific Cytometric Bead Array for *Mycobacterium tuberculosis*

Elizabeth Dorst
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Research Poster

Flow cytometry is a highly quantitative technology that is often used to phenotype and quantify cells from disassociated primary tissue and cell culture. Flow cytometry can also be used in non-cell-based assays, such as a cytometric bead array (CBA) which is an immunoassay that can detect and quantify proteins of interest. CBAs work by assigning beads of assorted sizes that have attached antibodies or proteins that bind to the analyte of interest. Cytokine CBAs are the most common immunological CBAs. Another type of CBA commonly used in immunology are immunoglobulin CBAs, which measure classes – IgM, IgG, IgA, IgE, and IgD– and subclasses of antibodies which have different functions.

In our study, we have generated an antigen specific CBA for mice by modification of a commercially available kit. This CBA identifies IgG1, IgG2a, IgG2b, IgG3, IgA, and IgM immunoglobulins that circulate in the blood of mice and bind to an antigen of interest. As proof of concept, we vaccinated mice with Bacille Calmette-Guerin (BCG) and collected blood for plasma at days 0, 4, 7, 14, 21, and 39 to measure antibody antigen cross-reactivity with fluorophore conjugated *Mycobacterium tuberculosis* (Mtb) whole cell lysate using our antigen specific CBA protocol. Our antigen specific CBA is a tool that can be used by researchers to easily screen, measure, and monitor the humoral immune response to Mtb vaccines and experimental Mtb infections. Our antigen specific CBA is not limited to Mtb – as the Mtb antigen can be switched with an antigen from any other pathogen.

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179 Battle of the Sexes: The Effect of Sex on Mycobacterium tuberculosis Infections

Holland Eddy
Karen Dobos
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Around the world and across species, viral and bacterial infections commonly have greater effects on males than females. Specifically regarding *Mycobacterium tuberculosis,* males typically have longer infection times, greater side effects, and higher mortality rates as opposed to females. Additionally, the BCG vaccine (Bacille Calmette-Guérin) appears to be more effective in females than males. This is believed to be the case due to females generally having higher levels of the cytokine, TNF-α. This cytokine is largely responsible for inflammatory responses that assist in fighting off infections such as *Mycobacterium tuberculosis.* This research studies *Mycobacterium tuberculosis* in

guinea pig hosts and its effects in relation to the sex of the guinea pig. Twenty female and twenty male guinea pigs were studied, with ten of each sex in a vaccine and control group. Throughout the study, serums were taken at the beginning of the study, after vaccination or control injection, after being challenged with *Mycobacterium tuberculosis*, forty days post-challenge, and at eighty days post-challenge. These serums are now undergoing Albuvoid filtration to deplete the albumin in serums, as well as run through a BCA assay to prepare them for proteomics. Proteomic Mass Spectrometry will then be run to determine which cytokines can be identified as candidates for studying the differences in immune responses regarding the sex of the individual.

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102 Macrophage Stimulation with TLR Agonists Induces a Pro-Inflammatory Tumoricidal Response

Kayla Fairweather
Dr. Nicole Ehrhart
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Research Poster

Lung metastases remain a primary cause of death in patients with osteosarcoma warranting the need to investigate novel immunotherapy treatments. Tumor-associated macrophages (TAMs) are one immune cell population of interest due to their role in the immunosuppressive tumor microenvironment (TME). Stimulating TAMs with Toll-like receptor (TLR) agonists has the potential to reprogram these macrophages to adopt an anti-tumor phenotype. We hypothesized that AMJ alveolar macrophages stimulated with various TLR agonists would secrete significantly more pro-inflammatory cytokines and chemokines than unstimulated macrophages and that interferon-gamma (IFN-γ) would synergize with the TLR agonists to further enhance the pro-inflammatory response. It was also hypothesized that the stimulated macrophages would have a heightened anti-tumor effect when co-cultured with DLM8 metastatic osteosarcoma cells. Consistent with our hypothesis, AMJ alveolar macrophages stimulated with TLR agonists secreted elevated levels of nitric oxide and pro-inflammatory cytokine IL-6. Furthermore, several TLR agonists synergized with IFN-γ to significantly increase secretion of IL-6. IFN-γ alone promoted the secretion of chemokine CXCL9, but overstimulation with this cytokine resulted in macrophage cell death when co-cultured with osteosarcoma cells. Macrophages stimulated with various TLR agonists alone appeared to have the strongest inhibitory effect on osteosarcoma cell growth. This work provides an important baseline for assessing the impacts of TAM stimulation with TLR agonists on macrophage polarization and tumoricidal behavior in the context of osteosarcoma.

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163 Exosomes and their uses in Research and Medicine

COLLEGE OF VETERINARY MEDICINE AND BIOMEDICAL SCIENCES

Aidan Flanagan
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College of Veterinary Medicine and Biomedical Sciences
Research Poster

Neurodegenerative disease is an ever-present issue, especially in a rapidly aging population. Neurodegenerative diseases such as Parkinson's, Alzheimer's, and Dementia affect over 15% of the global population and there are no cures for the diseases themselves, just treatments for the symptoms. One of the largest hardships when it comes to treating diseases of the central nervous system (CNS) is crossing the blood-brain barrier. 98% of medicines cannot cross this threshold meaning that even treating the symptoms of neurodegeneration is difficult. Recently it has been discovered that extracellular vesicles small enough can cross this blood-brain barrier. They are found transporting all types of cargo in and out of the brain. Exosomes therefore can either be used as a biomarker to detect neurodegeneration or as a medium to deliver medicines to a diseased brain.

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To find the enemy: Phage display genetic approaches to identify *Mycobacterium tuberculosis* homing peptides

Ana Fonseca
Gregory Robertson
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Tuberculosis (TB) infections, caused by *Mycobacterium tuberculosis* (Mtb) can promote the formation granulomas. Granulomas are inflamed tissue that limit pathogen growth, but also serve as a survival niche for the bacteria and may shield the pathogen from the full effects of certain antibiotics, making TB infections difficult to treat. Disease-specific vascular-homing peptides, identified using agnostic peptide phage biopanning, can be used for precision delivery of therapeutics to the site of infection to increase potency and mitigate side effects. Using a phage-display genetics platform, we propose to develop new technology based on peptides that (i) specifically recognize and home to the Mtb bacilli, (ii) penetrate the tissue barriers protecting the bacilli, and (iii) are capable of delivering a drug cargo to the site of infection. To accomplish this, a screen for new peptides with high affinity to Mtb was completed by biopanning a CX7C phage-displayed peptide library on cultured bacilli. Consensus peptide sequences enriched following three successful rounds of *in vitro* biopanning and subsequent phage amplification will be identified by next generation DNA sequencing of the enriched phage pool. To confirm specific interaction, we will use clonal phage expressing the target peptide(s) of interest and synthesize high priority peptides coupled to a fluorophore, to visualize Mtb binding by immunofluorescence in vitro. If successful, next would be to test homing in vivo (and macrophages),first with the FAM-peptide and next with peptide-functionalized silver nanoparticles to show the peptides can deliver the cargo to the site of infection.

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125 DNA Extraction Methods for Nanopore Whole Genome Sequencing

Ashley Freedman
Dr. Carolina Mehaffy
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Identification of new antimicrobials produced by environmental bacteria, as well as surveillance of antimicrobial resistance is essential to combat the emergence of multidrug resistance bacteria. Whole genome sequencing (WGS) is a plausible method to identify novel antimicrobials and survey antimicrobial resistance. WGS relies on the ability to purify high quality DNA. In addition, specific WGS technologies, such as the Nanopore requires high quality and high molecular weight DNA. Environmental samples manifest a variety of bacterial species and finding a DNA extraction method that is feasible for most species is an important precursor to WGS. The objective of this study is to identify a DNA extraction method that would meet standards needed for Nanopore sequencing using the MinION device. The Zymo research Quick-DNA HMW MagBead Kit was compared to the Qiagen DNeasy UltraClean Microbial kit. Pigment producing species along with the ESKAPE pathogens were used to mimic the diversity of an environmental sample. DNA was extracted from each sample using both kits. The concentration and quality of the DNA yields will be compared. Preliminary results indicate the Zymo research kit yielded low quality for three different pigment producing species, and no high molecular weight DNA for *Pseudomonas chlorophis subsp. chlorophis*. Thus, the kit is not ideal for the desired later applications of Nanopore sequencing. We expect to determine the best kit for DNA extraction for future applications of Nanopore sequencing and bioinformatic analysis of antimicrobial and antimicrobial resistance.

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198 A Comprehensive Bioinformatics Approach to SARS-CoV-2 Sequencing Analysis: Low-Frequency Variant Calling

Michelle Galvan
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Research Poster

Many nonhuman animals are susceptible to SARS-CoV-2, particularly members of the family Felidae. However, the evolution of SARS-CoV-2 in nondomestic felids has not been deeply investigated. In fall of 2021, an outbreak of SARS-CoV-2 occurred in animals housed at the Denver Zoo in Colorado, USA. Eleven lions, two tigers, and four hyenas displayed a range of symptoms, prompting nasal swab collection to be evaluated by real-time PCR. Every individual tested positive for SARS-CoV-2 at least once, except for two hyenas. Of 114 samples, 50 were classified as “inconclusive” (not definitively positive or negative), with a majority collected toward the end stages of infection after multiple positive tests. To investigate SARS-CoV-2 within-host evolution, we screened the “inconclusives” for potential whole genome sequencing. Six (12%) contained sufficient DNA for library

preparation and next-generation sequencing. Quality control and low-frequency variant calling were performed using the Nextflow nf-core/viralrecon pipeline, which can detect mutational changes as low as 3% in frequency. QC evaluations determined each sample had mean quality scores >30 and high depth of coverage recovered from the viral genome. All six samples were classified as AY.20, a sub-lineage of Delta with a worldwide prevalence of

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144 Circadian Rhythms in PrP-associated Transgenic Mice Through qPCR

Emily Gasowski
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Research Poster

Circadian rhythms are biological changes an organism experiences within a 24-hour cycle. It is important to understand how circadian rhythms contribute to regulating the genome, which is performed by a family of transcription factors (the molecular clock) acting upon downstream targets (clock-controlled genes). The prion protein (PrP-C; gene *Prnp*) exists in all mammals and has not had a clear identification in its function, however, correlation with circadian rhythms has been previously reported. The purpose of this study is to analyze cellular circadian rhythms in transgenic mice linked to the prion protein, (PrP-C, gene *Prnp*). Spleens were harvested from three different types of mice; C57bl6/j (wildtype), FVB-KO (*Prnp* knockout), and Tg (CerPrP-E226)5037 (*Prnp* overexpression, which will be referred to as 5037), at various times throughout a circadian day and the RNA extracted. The levels of *Prnp* and the molecular clock components expression were analyzed for each strain by qPCR. The molecular clock genes assessed here include *Clock, Bmal1, Period (1,2), Cryptochrome (1,2),* and *Rev-erb (a,b)*. The results of the data showed that a general trend in prion protein expression in the spleen was a heterogeneous mix of maintained rhythms, disrupted rhythms, and lost rhythms. Research does indicate a relation between the prion protein and circadian rhythms, but more research needs to be done to fully understand the correlation of how prion protein expression in the spleen affects the circadian clock in an organism.

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107 The Use of Nanopore Technologies for Sequencing and Diagnostic Testing of Feline Immunodeficiency Virus

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Research Poster

Nanopore sequencing, by Oxford Nanopore Technologies, is a third-generation technology that may improve gene sequencing, specifically in veterinary virology. Feline immunodeficiency virus (FIV) is a retrovirus found in domestic cats. FIV's high mutation rate adds significant

challenges for whole genome sequencing. This has resulted in challenges in differentiating between within-host variations, mutation identification, and diagnostic testing. Nanopore sequencing offers a solution with real-time, long-read sequencing including full-length strands. There has been limited research on nanopore sequencing's potential for FIV genome research. Through this literature review, we analyzed the current research of nanopore technologies and viral sequencing, specifically considering their relevance to FIV. Commercial use of nanopore technologies for diagnostic testing is limited. Due to its novelty, there are natural hurdles to implementing it on a commercial scale. In addition to this, the relatively high error rate poses challenges. However, the cost and portability of the technology make its application inviting for circumstances where accessibility is low. Current research for diagnostic testing with nanopore sequencing uses it in a secondary approach. Where traditional diagnostic paths struggle (i.e., next-generation sequencing or culture), nanopore has been shown to succeed in detection. It serves well in situations where low frequency or structure of genes poses challenges for traditional techniques. The current research on nanopore shows convincing evidence that it can be used to further variant knowledge of FIV in addition to future uses in diagnostic testing.

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147 Does an Insect Infecting Partitivirus Modulate the Host Immune Response?

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Research Poster

Galbut virus is a double-stranded RNA virus known to ubiquitously infect wild *Drosophila melanogaster*. Little is known about the biology of insect infecting partitiviruses like galbut virus, especially regarding persistent infections. The role of galbut virus RNA segment 3 is unknown as the nucleotide and protein coding sequences are not closely related to any known sequences. We hypothesize that RNA 3 encodes a viral suppressor of RNAi (VSR), allowing the virus to modulate the insect's innate immune response and remain dominant in wild *D. melanogaster* populations. RNA interference (RNAi) in insects serves as an innate anti-viral defense mechanism triggered by dsRNA. When dsRNA is detected, it is cleaved by Dicer-2 into small interfering RNAs which are incorporated into the RNA-induced silencing complex (RISC). Argonaute-2 (Ago-2) can then recognize complementary RNAs to cleave and therefore interfere with viral replication. We aim to test our hypothesis by expressing the galbut virus RNA segments with copper-inducible luciferase plasmids. This will measure the ability of galbut virus dsRNA to interfere with the RNAi pathway. Luciferase activity will be measured using the dual-luciferase reporter (DLR) assay, which quantifies Firefly and *Renilla* luciferase. High ratios indicate RNAi suppression. If data suggests suppression of RNAi, additional assays and experiments can be done to determine which step of the RNAi pathway is being targeted. This study will ultimately allow for better understanding of how viral infections can

modulate the host immune response to remain persistent.

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161 Does acute metabolic stress impair estrous cyclicity in female mice?

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Research Poster

During episodes of acute stress, many species respond by disrupting reproductive function, partially mediated by suppression of gonadotrophin secretion. One such clinically relevant stressor, acute hypoglycemia, has been demonstrated to pause reproductive function through the suppression of luteinizing hormone (LH). However, the effects of insulin-induced hypoglycemia on estrous cyclicity are not understood. Building off previous research, we hypothesized that administering treatment for acute hypoglycemia would interfere with the estrous cycles of female mice. To test this hypothesis, we assessed estrous cyclicity with daily vaginal lavages before and after metabolic stress or control treatment. Female mice were given an injection of either insulin or saline, followed by daily vaginal lavages. Before treatment, all mice were observed to be cycling normally. After treatment, the estrous cyclicity of the control mice remained the same while no change was observed in the estrous cyclicity of the acute hypoglycemic treatment group. These data demonstrate that acute hypoglycemia does not impair estrous cycles in female mice. In future work, we will expand other metabolic stress models to better understand the effects of stress on reproduction.

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116 "Not in our backyard": public perceptions of bat research before and after the COVID-19 pandemic

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Research Poster

The COVID-19 pandemic impacted how society perceived science and scientific research. These changes created new challenges in science communication about zoonotic disease research, which has become prescient post-COVID. The Fort Collins community—where a new bat research facility is being built following over 30 years of bat-borne pathogen research—provides a case study by which public perceptions can be understood. We used a phronetic iterative qualitative approach to develop a codebook and characterize dissenting public narratives of the new bat research facility on the CSU Foothills campus, which began construction in October 2023. We compare perceptions surrounding the CSU facility to perceptions of a pre-COVID bat-borne disease project at Montana State University. Preliminary findings reveal a high incidence of lab-leak narratives, distrust in authority, and proximity narratives in post-COVID sources. These findings provide insight on how

universities and researchers can communicate about zoonotic disease research in a way that helps relieve anxieties about research and build positive connections with diverse publics.

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138 Evaluating Neuropathology Characterization Methods for Chronic Wasting Disease Strains.

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Glenn Telling
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Research Poster

Prions are infectious proteins which cause fatal, transmissible neurodegenerative diseases of humans and animals including chronic wasting disease (CWD) in deer and other members of the cervid family. CWD is endemic in North America (NA) and has recently emerged in several Nordic countries. The strain properties of Nordic CWD, including the neuropathological features of disease, differ from those of NA CWD. Assessing the location and severity of neuronal vacuolation in the central nervous system is the most common method of characterizing the neuropathological features of prion strains. An alternative technique measures differences in the deposition patterns of the disease-associated form of the prion protein (PrPD). Here we evaluated the utility of these two approaches to distinguish neuropathological differences between NA and Nordic CWD strains in CWD-susceptible gene-targeted (Gt) mice. Although we detected neuronal vacuolation in the hindbrains of Gt mice infected with NA and Nordic CWD prions, NA CWD prions produced more severe lesions. Patterns of PrPD also differed, with NA CWD characterized by amyloid deposition and Nordic CWD characterized by more diffuse deposition. Our data suggest that a combination of vacuolation and PrPD profiling provides an accurate method for differentiating CWD strains.

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193 Development of a Sheep Brain Atlas

Evan Hurtado
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Research Poster

Sheep are an important model for understanding neuroendocrine function. However, compared to mice or rats there are no complete atlases of the sheep brain. An atlas aids in understanding the complex relationships of structures within the brain and allows for more precise targeting of structures for neurosurgical procedures. Existing diagrams of the sheep brain are limited to drawn diagrams of only specific areas and offer incomplete annotations. Our goal is to create a high-definition atlas with more complete annotations of the whole sheep brain. Constraints of this approach relate to the large size of the sheep brain; it is difficult to prepare, section, and mount tissue of this size. Going forward, we plan to implement new preparation protocols to overcome the

challenges previously mentioned. Achieving an evenly frozen brain is a critical step in preparing tissue, however conventional methods do not scale with size, so alternatives are needed. Similarly, sectioning and staining large tissue presents several issues such as bunching or tearing of the sections during the cutting and staining processes. Overcoming these obstacles will be useful for our lab and other labs who use sheep as a model for future research in neuroendocrinology and other neuroscience fields.

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183 Exploring the Role of Non-Canonical Myosin Motors in Caenorhabditis elegans

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Research Poster

Myosin motors are a large class of motor proteins that have diverse molecular functions and play crucial roles in cellular functions. Some non-canonical myosin motors are linked to various human conditions and disease. For example, mutations in the non-canonical class VI retrograde myosin MYO6 cause congenital deafness, familial hypertrophic cardiomyopathy, and prostate/ovarian cancer in humans. Currently, we know that MYO6 is involved in cellular processes including endocytosis, protein secretion, autophagy, and actin filament regulation. However, the exact role MYO6 plays in these mechanisms is unclear. C. elegans are useful in understanding MYO6 function because it is conserved in C. elegans as HUM-8. So far, HUM-8 has been shown to transport various protein cargo and sense muscle tension. To further understanding of MYO6/HUM-8, we studied a loss-of-function (lf) hum-8 mutant to explore if/how HUM-8 impacts motor function, sensation, and learning in C. elegans using well-characterized behavioral assays. While assessing motor function, we observed that hum-8(lf) were uncoordinated and moved in a spastic manner. They also appeared to have sensory defects as the mutants had dampened responses to mechanical stimuli (nose touch and vibration). To address learning in hum-8(lf), we trained C. elegans to associate an attractive odor with starvation, but hum-8(lf) mutants failed to avoid the odor after training. Taken together, our data suggest that HUM-8 has diverse functions that are required for normal motor function, mechanosensation, and associative learning. Further study is needed to validate these results and determine why MYO6 mutations cause an array of human conditions and diseases.

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140 NPY intracranial ventricular injection suppresses LH pulsatile secretion in adult female mice

Kyla Jacobs
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College of Veterinary Medicine and Biomedical Sciences
Research Poster

Stress inhibits reproductive function through suppression of luteinizing hormone (LH) secretion. LH pulses support steroidogenesis and gametogenesis in mice and humans. Many signaling molecules have been identified in hypothalamic nuclei involved in LH pulse regulation, one of which is neuropeptide Y (NPY), which has been shown to centrally suppress feeding behavior and increase glucocorticoids. The objective of this study was to determine if central NPY is sufficient to suppress LH pulsatile patterns in adult female mice. These wild-type mice were tail-handled for 5 weeks and ovariectomized 10 days before the experiment. Blood samples were taken every six minutes for 1.5 hours, followed by freehand intracranial ventricular (ICV) injection of NPY (500 pmol) or saline (3 µL) into the lateral ventricle while under anesthesia. After 30 minutes, blood samples were taken once again every six minutes for 1.5 hours. An ultra-sensitive ELISA was utilized to determine the concentration of LH in each blood sample. It was found that all animals exhibited LH pulses pre-injection and all saline-treated animals had LH pulses post-injection. NPY-treated animals displayed a split response: some had a dramatic decrease in LH pulses and some had pulses post-injection (likely due to injection not into the ventricle, so their data have been omitted from analysis). NPY-treated mice exhibited a marked decrease in mean LH between pre- and post-injection as compared to saline-treated mice. These results support our hypothesis that NPY is important for LH pulse suppression in mice, which presents new avenues of research into fertility disorders.

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78 Isolation of Bacterial Extracellular Vesicles from *Mycobacterium tuberculosis*

Pareese Jalal
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Research Poster

Extracellular vesicles (EVs) are small membrane-bound structures released by various organisms, playing a crucial role in intercellular communication. They transport bioactive molecules, influencing diverse physiological processes and disease states. Specifically, bacterial EVs exhibit unique compositions and functions, serving as mediators in microbial interactions, virulence, and host-pathogen communication. Understanding bacterial EVs offers insights into infectious disease mechanisms and potential therapeutic interventions. This study aimed to compare the efficacy of two protocols optimized for isolating human exosomes in their ability to isolate EVS from *Mycobacterium tuberculosis*: ExoQuick, utilizing immunoaffinity and binding to components in human vesicles, and CaptoCore, employing filteration and size exclusion chromatography (SEC). It was hypothesized that Captocore would yield a purer sample with higher EV concentration due to the SEC, which can remove small impurities and allow a variety of EVs to be collected. Additionally, ExoQuick, uses interactions with components in human exosomes precipitate out the exosomes from human biofluids. To begin, culture filtrate protein (CFP) aliquots derived from *M. tuberculosis* were concentrated, and each protocol was

applied. After conducting the protocols, a Microbicinchonic acid (MicroBCA) assay measured protein concentration, Nanoparticle Tracking Analysis (NTA) characterized EV size, and a Western blot qualified protein markers for contaminants. The MicroBCA indicated a higher protein concentration in the ExoQuick sample, yet NTA showed more particles in the CaptoCore sample. Western Blots are still being conducted. Findings will help shed light on optimal EV isolation strategies which could be used to obtain bacterial EVs for downstream applications in diagnostics, therapeutics, and research.

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108 Field Friendly Detection of the Causative Agent of Leprosy in Clinical Samples

Ritika Janapati

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Research Poster

Diagnosing leprosy is based on three cardinal signs: skin lesions, nerve thickness, and identifying *Mycobacterium leprae*. A quantitative polymerase chain reaction (qPCR) targeting the repeated region RLEP is currently the most sensitive method for pathogen detection. However, this qPCR requires a molecular laboratory setting and refrigeration for reagents. Moreover, leprosy occurs in communities without immediate access to laboratories. This leaves a need for rapid testing in the field. Biomeme has developed a portable thermal cycler that doesn't require a direct power source, is controlled by a smartphone, and uses unrefrigerated lyophilized reagents. This project aims to validate the qPCR assay using Biomeme reagents and machinery with the same quality as the gold standard qPCR assay. We optimized the qPCR assay with Biomeme reagents using a positive control DNA extracted from clinical samples. The efficacy of the Biomeme qPCR assay was determined using a standard curve showing a 100%, similarity to the gold standard. To validate the assay, we used the Qiagen kit to extract DNA from 194 skin biopsies from 6 endemic countries. qPCR was performed using the CFX Biorad instrument and the Biomeme instrument. Among them, 58 were negative for both assays and 117 were positive. The linear regression showed a R2 0.99. The data suggests that the Biomeme RLEP qPCR is as effective as the gold standard assay. The optimized conditions were used to manufacture the final lyophilized assay containing primers, probe, and buffer. We are currently working on optimizing the DNA extraction method to be field Ffriendly

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126 Glucocorticoid Receptor Signaling Mediates High Altitude Adaptations in Skeletal Muscle, but not Heart

Anna Johnson
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Research Poster

Our lab has recently demonstrated that Glucocorticoid Receptor (GR) signaling is required for improved exercise performance and skeletal muscle adaptation to chronic hypobaric hypoxia (HH). This stated, the impact of GR signaling on HH-induced cardiac adaptation remains unclear. To investigate, male F344 rats were exposed to 15 days of HH equivalent to 17,200 feet above sea level or to normoxia (Fort Collins altitude; 5,003 feet) with or without pharmacologic GR blockade via RU486. Graded treadmill exercise tests were performed both before and after exposure. After sacrifice, Right Ventricle (RV) and Left Ventricle (LV) tissue weight was assessed and the protein abundance of GR, Hypoxia Inducible Factor 1*a* (HIF-1*a*), and Very long chain acyl-CoA dehydrogenase (VLCAD) were analyzed by immunoblotting. Chronic HH induced RV hypertrophy occurred irrespective of RU486 treatment. Protein quantification of GR revealed no statistically significant differences across altitude or drug groups. However, we observed a strong trend for greater abundance of HIF-1*a* protein after chronic HH and significantly lower VLCAD protein in HH exposed rats independent of GR blockade. Contrary to skeletal muscle, this data suggests that key cardiac adaptations to chronic HH occur independent of GR signaling and that HIF-1*a* stabilization may play an important mediating role.

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134 Gut microbial products, m-tyrosine & 3-(3-Hyrdoxyphenyl)-3-hydroxypropionic acid, trigger inflammation in autism-like cell model

Sydney Johnson
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Research Poster

Autism Spectrum Disorder (ASD) encompasses a group of developmental disorders associated with repetitive interests and impacted social behaviors. With the rising diagnosis rates of ASD, and limited therapeutic intervention, there is a growing emphasis on researching its underlying causes. Surprisingly, children with ASD exhibit dysbiosis, an imbalance in gut microbial composition; presenting with a higher concentration of *Clostridium histolyticum* than those not diagnosed with ASD. Upon treatment with a *Clostridium*-targeting antibiotic, ASD-associated psychological symptoms decrease, suggesting that ASD may emanate from the gut. *C. histolyticum* metabolizes phenylalanine into m-tyrosine (m-tyr), a known analog for the dopamine precursor, L-DOPA, further metabolized by bacteria to form 3-hydroxyphenylpropionic acid. When 3-hydroxyphenylpropionic acid undergoes beta-oxidation, it becomes 3-(3-hydroxyphenyl)-3-hydroxypropionic acid (HPHPA). Additionally, it's shown that HPHPA levels are elevated in urine samples from children with ASD, further suggesting that the cause of ASD not only originates from the gut but that this bacterial species plays a substantial role in disease progression. Thus, we hypothesize that the *C. histolyticum* metabolites, m-tyr and HPHPA, lead to peripheral inflammatory response mediated by innate immune cells, macrophages, which exacerbate neuronal

dysfunction in ASD. To test this hypothesis, we exposed a macrophage, murine cell line, RAW 264.7, to both m-tyr and HPHPA and measured viability and pro-inflammatory gene expression. Additionally, we measured neuronal viability upon treatment with macrophage-conditioned media to determine whether HPHPA/m-tyr exposed macrophages release neurotoxic mediators. Taken together, these data points demonstrate novel targets for more effectively treating ASD.

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196 Dietary Inclusion of Rice Bran Increases Functional Food Properties of Meals and Snacks

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Research Poster

Rice bran is a functional food that has been shown to control and prevent metabolic disturbances and inflammation involved in chronic diseases, such as obesity, diabetes, cardiovascular disease, and colorectal cancer. This study identified the nutritional and metabolomic composition of five meals/snacks (baked pasta marinara, Margherita pizza, blackberry cobbler, caraway crackers, and strawberry-pineapple smoothie) used in a human clinical trial. Each meal/snack contained 15g of heat-stabilized rice bran (control foods had 0g of rice bran for comparison). Nutrient, metabolite, and bioactive profiles were analyzed using an integrated food and nutritional metabolomics approach, to evaluate the nutrient profiles to determine if adding rice bran enhanced the nutritional content and to document the presence or absence of specific metabolites that may be linked to improving gut health. The relative abundance of 22 distinct metabolites was higher in meals/snacks containing rice bran compared to control. Nine of these 22 metabolites have reported evidence to prevent or control the progression of diabetes in the literature. Nutritionally beneficial Linoleic acid and fiber levels were higher in foods with added rice bran. 10 of the 22 metabolites were impacted by cooking methods or the presence of microbes. Pizza Margherita contained yeast and strawberry-pineapple smoothies contained L. acidophilus that diminished food metabolite composition. These findings enhanced our understanding of the functional food properties of rice bran incorporated into meals/snacks and can inform future development of food products for use in clinical trials that may have benefits for chronic disease control and prevention efforts.

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127 Extracellular Vesicles from Oviductal Organoids Capacitate Bull Sperm Enabling Fertilization *In Vitro*

Marcie Jung
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Research Poster

Frozen semen is successfully used in the cattle industry using artificial insemination (AI). However, variable results are seen for vitro fertilization (IVF). Cryopreservation damages sperm membranes, increases membrane fluidity, changes sperm binding to the zona pellucida, and induces premature acrosome exocytosis, which reduce sperm viability. Extracellular vesicles (EVs), in seminal plasma and oviductal fluids, affect sperm via their cargo, enhancing sperm motility, acrosome reactions, and capacitation. This study investigated how EVs produced by reproductive tract epithelium affected frozen-thawed bull sperm function. EVs were collected from male and female bovine reproductive tracts: Seminal plasma (SP), Estrus oviducts (EO), Diestrus oviducts (DO), and Organoids (OO). We hypothesized that SP and DO EVs would inhibit, while EO and OO EVs would stimulate sperm capacitation. Sperm capacitation (evaluated by an increase in plasma membrane fluidity, phosphorylation of certain proteins and acrosomal status) was measured using flow cytometry. The capacity for sperm binding to the zona pellucida was evaluated using a perivitelline membrane assay and fertilizing potential was determined by in vitro fertilization. SP EVs reduced sperm acrosome reactions and membrane fluidity, compared to control cells (p0.05), but a trend existed for higher fertilization rates by EV-treated sperm (67 vs 76%; p=.13). Moreover, OO EVs increased protein phosphorylation associated with sperm capacitation. In conclusion EO and OO EVs may capacitate bull sperm effectively in vitro and increase IVF fertilization rates.

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124 Prionemia in free-ranging white-tailed deer in West Virgin

Cristian Kellum
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College of Veterinary Medicine and Biomedical Sciences
Research Poster

Chronic wasting disease (CWD), a fatal neurodegenerative prion disease, has been demonstrated in captive and free-ranging deer, elk, and moose (cervid) populations in North America, Asia, and Scandinavia. There is an urgent need for effective antemortem detection and monitoring methods as the geographical distribution of CWD continues to spread. Prions have been detected in the blood of cervids, sheep, cattle and humans. Yet, detecting bloodborne prions has proven to be a challenge, due to low concentration or presumed inhibitors present in blood components. We have developed modifications to the Real-Time Quaking Induced Conversion (RT-QuIC) assay, a sensitive prion amplification assay, to detect hematogenous prions in blood. With our colleagues from the Southeastern Cooperative Wildlife Disease Study (SCWDS), University of Georgia, we are assessing buffy coat cells collected from free-ranging white-tailed deer populations in West Virginia; populations known to have high rates of CWD prevalence. Blood samples collected by SCWDS underwent processing and RT-QuIC analysis at Colorado State University. We have detected prionemia in free-ranging white-tailed deer, streamlining the detection and diagnosis of CWD at various stages of disease progression in living, infected subjects. These findings provide an effective detection strategy to help mitigate the

spread of CWD and safeguard the health of cervid populations worldwide.

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133 Inactivating probiotic-based rotavirus vaccine to study effect of lactic acid on immunoprotection

Paris Kiehl
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College of Veterinary Medicine and Biomedical Sciences
Research Poster

Rotavirus causes a diarrheal disease that kills over 200,000 children every year. Despite the availability of several live attenuated vaccines, morbidity and mortality remain high in low- and middle-income countries, which may, in part, be due to a disruption of the host's intestinal microbiome. *Lactobacillus* species are important members of a healthy intestinal microbiome and are often used as probiotics. In addition, *Lactobacillus* species that are genetically modified to express foreign proteins are emerging as promising vaccine vectors. We have constructed a novel rotavirus vaccine using a recombinant *Lactobacillus acidophilus* (rLA) bacterium that expresses rotavirus' VP8 capsid protein. Recent literature has shown that lactic acid secreted by *L. acidophilus* triggers anti-inflammatory immune pathways, including increased T-regulatory functions, reduced pro-inflammatory cytokine expression, and anti-inflammatory cell differentiation. These anti-inflammatory effects may decrease the desired pro-inflammatory stimulation of the rLA vaccine. To study the effect of lactic acid secretion on vaccine efficacy and induction of rotavirus protection, we eliminated lactic acid production by inactivating rLA using Mirasol Pathogen Reduction Technologies from Terumo. Inactivation was confirmed using an agar growth test, alamarBlue metabolic assay, and flow cytometry viability assay with Propidium Iodide. We hypothesize inactivated rLA will increase immune cell activation and production of antibodies against rotavirus. The outcomes of this experiment will help guide the development of a vaccine that is more effective at inducing immune protection against rotavirus.

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143 Investigating the RNA decay pathway in bats through the generation of a novel CRISPR-knockout cell line

Sophie Kiehl
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Research Poster

Flaviviruses, including viruses such as dengue and West Nile, pose significant public health risks to humans but are harbored asymptomatically in bat populations. During infection, flaviviruses exploit host RNA decay pathways by containing decay-resistant structures, leading to attenuated RNA segments known as subgenomic flaviviral RNA (sfRNA) that increase cytopathicity. To study the role of RNA decay pathways in bat flaviviral infections, we are using CRISPR gene editing

technology to knockout DXO, an RNA decapping enzyme that can be used to initiate flaviviral RNA decay, in primary *Artibeus jamaicensis* bat cells (AJ6 cells). We have developed plasmids containing guide RNAs (gRNAs) targeting DXO and transfected them into AJ6 cells to induce specific cleavage of the DXO gene sequence. We are currently selecting and will clonally isolate successfully transfected DXO-knockout cells to generate cell lines. Next steps include infecting the knockout lines with flaviviruses and evaluating the host cell response, sfRNA production, and viral replication and pathogenicity. This research has implications for understanding the mechanism by which flaviviral infections in bats interact with the RNA decay pathway.

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177 Profiling the cytokine immune response in the guinea pig model of tuberculosis

Lea Maristela
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Research Poster

The guinea pig model of Mycobacterium tuberculosis (Mtb) offers distinct advantages compared to conventional mouse models. Namely, the guinea pig model develops circumscribed granulomas with central necrosis which most closely resembles that of human granulomas. However, a limitation of this model is the availability of reagents to characterize the Mtb immune response. To better leverage this representative model, we evaluated a set of rabbit monoclonal antibodies produced through molecular cloning of the B cell receptor from antigen-specific B cells in the peripheral blood of rabbits immunized with full length recombinant guinea pig cytokines generated in HEK293 cells. Antibodies were produced through molecular constructs transfected in HEK293 cells. We have established stimulation conditions for primary guinea pig cells, including PBMCs, splenocytes and bone marrow-derived macrophages, capable of producing specific cytokine profiles. Antibody specificity for the detection of native protein was determined by immunoprecipitation followed by MS-MS sequence confirmation, prior to the validation of functional antibody pairs to be used in capture ELISA and ELISpot techniques or evaluated individually as reagents for flow cytometry. Utilized in a low-dose aerosol model of Mtb in the guinea pig, these reagents will provide a more comprehensive understanding of immune kinetics, vaccine response, and comparative immunology across Mtb model species.

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O4 Investigating the effects of temperature change on oviposition and progeny viability of *Aedes aegypti* and *Culex tarsalis* mosquitoes

Olivia Martinez
Dr. Rebekah Kading
College of Veterinary Medicine and Biomedical Sciences
Oral Presentation

Temperature is known to affect the transmission efficiency of mosquito-borne viruses, particularly those spread by *Aedes aegypti (Ae. aeqygpti)* and *Culex tarsalis (Cx. tarsalis*) mosquitoes. Investigating how environmental changes impact *Aedes aegypti* and *Culex tarsalis* fecundity will inform future action for vector control and subsequent disease mitigation. Our preliminary data has shown impaired egg deposition when Rift Valley fever virus-adult *Ae. aegypti* mosquitoes were exposed to temperatures varying from typical environmental conditions. Therefore, we are investigating the relationship between altered temperatures, oviposition rates, and progeny viability within uninfected blood-fed *Ae. aegypt*i and *Cx. tarsalis* mosquitoes. We hypothesize that temperature variation will negatively impact egg viability, deposition rates, and offspring development. Blood-fed female mosquitoes (n=50) will be housed individually at lower (18°C), standard (28°C), or higher (32°C) rearing temperatures. Egg production will be assessed by quantifying deposited eggs in comparison to withheld eggs, obtained by ovarian dissection. Deposited egg hatch rates will be recorded to determine offspring viability. Data collection is ongoing, but preliminary data showed increased developmental rates in *Ae. aegypti* at 32°C when compared to standard temperature. In contrast, *Culex tarsalis* mosquitoes showed impaired egg-laying behavior and developmental rates at 32°C. Understanding the relationship between mosquito fecundity and temperature is of great importance for anticipating infectious disease dynamics in a complex and shifting global environment.

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153 Bacterial Inactivation: Mycobacterium smegmatis with M3+ Sprayer

Dayton McGrail
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College of Veterinary Medicine and Biomedical Sciences
Research Poster

Mycobacterium smegmatis is an acid-fast bacteria found in moist environments. It is classified as a member of nontuberculous mycobacteria (NTM). NTMs are physiologically similar to diseases such as Tuberculosis and Leprosy but are not as much of a hazard to work with. This makes *M. smegmatis* an excellent organism for preliminary studies regarding Tuberculosis, such as this one.
The HTX M3+ sprayer is often used to prep samples for MALDI analysis via matrix deposition. This experiment utilized the sprayer to ensure that the reagents covered the samples evenly. The HTX M3+ sprayer can aerosolize any organic compound and lay a mathematically even layer over a sample.
The purpose of this experiment is to help elucidate the scientific community on whether the M3+ sprayer can be used to successfully inactivate bacteria within the *Mycobacteria* genera. This would allow for the study of mycobacteria-infected tissues without requiring γ-irradiation and freeze-thaw cycles. This could help further elucidate how lipid composition is affected by mycobacterial infections directly after necropsy in BSL-2 conditions.

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128 Incorporating Diverse Scientists in the Microbiology Curriculum Through Scientist Highlights

Mitchell Meyers
Carolina Mehaffy
College of Veterinary Medicine and Biomedical Sciences
Research Poster

This project aims to assess the impact of diverse representation in STEM classrooms on student's ability to relate to scientists and on the formation of their science identities. This study evaluated the impact of highlighting diverse scientists in General Microbiology, as diverse scientists aren't typically discussed in STEM courses. The study included completion of surveys taken before and after completing General Microbiology, over three different sections. One section showcased "scientists highlights" throughout the semester where diverse scientists were presented to the students. The other two sections of this course were controls. The survey had both quantitative and qualitative components. The quantitative portion consisted of Likert scale questions, and the qualitative portion consisted of open-ended questions that sought to assess students' perception of and relatability to scientists. The qualitative data further assessed the students' responses by allowing them to explain their reasoning for the quantitative component. Preliminary analysis of the qualitative data indicates that students are better at identifying scientists they can relate to after completing the scientist highlight activities. Additional analysis of students in control sections is ongoing. In conclusion, this study highlights the importance of representation and diversity in STEM classrooms and informs teaching practices in STEM courses.

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181 The Use of Glycopeptidolipids as a Diagnostic Biomarker for Detection of Non-tuberculosis Mycobacterial Infections in Cystic fibrosis Patients

Katie Moore
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College of Veterinary Medicine and Biomedical Sciences
Research Poster

Non-tuberculosis mycobacteria (NTM) produce glycopeptidolipids (GPLs), a class of glycolipids present on the cellular membrane. GPLs are responsible for the differentiation between rough (R) and smooth (S) colony morphologies, among other virulence factors, with smooth colony morphologies producing higher amounts of GPLs than their rough colony counterparts. Among these NTM species, *Mycobacteria abscessus* is an emerging, fast-growing pathogen that causes diverse clinical manifestations ranging from cutaneous to pulmonary infections. This makes Cystic fibrosis patients especially vulnerable to infection due to the compromised ability to fully eradicate pulmonary pathogens. Additionally, *M. absc* infections require therapeutic cocktails and are often associated with treatment failures, making early identification paramount. Our

objective here is to determine whether GPLs can serve as a molecular biomarker for NTM infections. Fundamentally, this research is looking for a minimally invasive, non-culture-based assay for early identification of non-tuberculosis mycobacterial infections.

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118 An In-Vivo exploration of the impact of the IKK Kinase complex on prion-induced inflammation

Genova Mumford
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Research Poster

Prion diseases are rare, fatal neurodegenerative disorders characterized by the aggregation of misfolded prion protein in the central nervous system, whose transmissible agent causes conformational changes in the normal prion proteins in the nervous tissues. These conformational changes cause inflammation and spongiform changes in the nervous tissue due to neuronal loss. There is currently no cure for prion diseases, necessitating a greater understanding of their pathogenesis. The IKK kinase complex is the foundation of the NFκβ cascade, which causes the upregulation of pro-inflammatory genes. Better understanding its role in the pathogenesis of prion diseases contributes to finding treatments for these conditions. Our hypothesis is that the mice lacking the IKK complex will reach a terminal diagnosis sooner than those with it. To address this hypothesis, we used a mouse line that does not possess functional IKK kinase complexes in their microglia (IKK KO). We compared the pathogenesis between experimental IKK KO mice and wild-type controls. Mice were monitored throughout, and histological analysis was performed, quantifying the degree of neuroinflammation present using immunohistochemical staining. Our results show that IKK KO RML mice have an increase in astrocyte and microglial counts compared to controls, and changes in astrocyte morphology. IKK KO RML mice have a reduction in the number of neurons and presented terminal sooner. Thus, preliminary data does support that the IKK kinase complex and the associated immunological pathways that it induces do play a significant role in the pathogenesis of RML prion disease.

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233 Susceptibility of Jamaican fruit bats wing punch cells to Cedar virus

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Research Poster

Bats are reservoir hosts of a variety of RNA viruses, including paramyxoviruses. Cedar virus (CedPV), a negative sense RNA virus in the *Paramyxoviridae* family, was isolated from pteropid bat urine pools and is closely related to Hendra virus (HeV) and Nipah virus (NiV). However, CedPV is not known to cause disease, unlike NiV and HeV, which

causes lethal infections in humans. The purpose of this study was to determine if Jamaican fruit bats (*Artibeus jamaicensis)* wing punch (AJWP) cells were susceptible to an infectious clone of CedPV. The AJWP cells were inoculated at different MOIs of 0.01, 0.1 and 1. Media were collected at various time points and photos were taken using the Revolve ECHO microscopy. The results show that AJWP cells were susceptible at all MOIs but only the MOI of 1 produced infectious virus. Cells showed signs of CPE, principally syncytia, which is common among paramyxoviruses. The data suggests that a primary bat wing punch cell line can be maintained and can produce infectious virus. Future direction for the experiment involves separating different cell types in the AJWP to determine what factors may be affecting the production of infectious CedPV in the cell line.

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155 Understanding Perceived Asthma Triggers and a Participant's Ability to Control their Asthma Symptoms

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Research Poster

There is an increase in severity and frequency of precipitation related events in the United States. Severe storms and natural disasters can damage and destroy homes. Damaged homes can provide optimal environments for bacteria and fungi to grow despite remediation efforts. These microorganisms are known to be triggers for asthma symptoms and can impact one's ability to manage their symptoms effectively. Using a dataset from a NIEHS-funded study that concentrates on the asthma health effects of Hurricane Harvey, participant survey results were reviewed and summarized to obtain a better understanding of the participants' ability to control their asthma and what their perceived triggers are. Survey results related to an individual's rescue inhaler use were then compared with field data collected by a metered dose inhaler developed by Propeller Health. Responses indicate that few participants have an effective asthma control plan and the triggers perceived to have the greatest impact were cigarette smoke, tree pollen, exhaust fumes, certain intensive odors, and grass pollen. When survey responses related to rescue inhaler usage were compared to field data, results were inconsistent where participants approximated usage appropriately, overestimated, or underestimated. The insight provided from these responses will help direct further analysis of the data collected from metered dose inhalers provided to participants.

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114 The Use of St. John's Wort and Major Depressive Disorder.

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Research Poster

Natural mood supplements have been used to improve the mental wellbeing of many individuals. Supplements such as St. John's Wort has been researched by many to investigate whether or not they are effective in fighting against mental illnesses such as Major Depressive Disorder. St John's wort has been suggested to act similar as Selective Serotonin Reuptake Inhibitors (SSRI). SSRIs increase the availability of neurotransmitters such as serotonin, dopamine, and norepinephrine. The deficit of these neurotransmitters are associated with Major Depressive Disorder. This research project focuses on pre-existing research on St. John's Wort intervention with Major Depressive Disorder. According to the research done, St. John's Wort is effective in treating mild to moderate Major Depressive Disorder just as effectively as prescription SSRIs such as Sertraline and Fluoxetine. This project also dives into the sociological impacts of prescription SSRIs and how the future of St. John's Worts can be used to help communities where prescription SSRIs are not as common.

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106 Establishing molecular mechanisms of glial-mediated response in a chronic pain in vitro model

Emily Perkins
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College of Veterinary Medicine and Biomedical Sciences
Research Poster

More than 1 in 5 adults in America experience chronic pain (CP), often concomitant with other health conditions ranging from cancer to fibromyalgia, to rheumatoid arthritis. Although the understanding of pathological pain is improving, many findings revolve around neuronal mechanisms. Recently, non-neuronal cells, such as microglia, the macrophage of the brain, have emerged as key players within neuropathological and CP mechanisms demanding further examination. Gliosis or glial activation, characterized by neuroinflammation and activation of the transcription factor, NF-kB, accompanies chronic pain recapitulated in in vivo models, however, a better-defined in vitro model of CP is warranted to aid in further interrogation of key cellular mechanisms associated with CP. Thus, we hypothesize *that treating murine glial cells with Complete Freund's Adjuvant (CFA) will establish a novel in vitro model of CP, in which we will characterize neuroinflammatory response and NF-κB-dependent signaling like that seen in well-established in vivo models of CP.* To test this hypothesis, we propose to measure inflammatory expression in RAW 264.7 cells, a macrophage cell line, as well as primary glia treated with CFA. Here, we show a dose-dependent increase in cell viability upon CFA exposure, necessitating interrogation of pro-inflammatory gene expression consistent with CP. Furthermore, we will expose neurons to glial- and RAW- conditioned media from glial and RAW cell experiments, respectively, to measure the role that NF-kB plays in glial-derived mediators and their neuroprotective or injurious role. Taken together, these data reveal important therapeutic targets to inhibit chronic pain

involved in a multitude of debilitating disorders.

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130 Are NE and NKB cells in the brainstem activated during the preovulatory LH surge?

Kimmie Pham
Richard McCosh
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Norepinephrine (NE) and Neurokinin B (NKB) play important roles in the generation of the preovulatory LH surge, which initiates ovulation. However, it is not known which population of NE cells in the brainstem are activated during the LH surge, or if NKB cells in the brainstem are activated at this time. There were twenty ewes with synchronized ovarian cycles, and they were randomly assigned for tissue collection in three groups: luteal phase, early follicular phase, and mid-LH surge. Then, the fixed neural tissue was collected and sectioned using a microtome in a freezing stage. The plan for the next couple of months is to perform immunohistochemistry and imaging to detect NKB, Tyrosine hydroxylase (TH, enzyme that produces NE), and c-Fos (a marker of neuronal activation) in brainstem tissues. The subsequent analysis will involve quantifying the number of TH cells, NKB cells, c-Fos cells, percent of TH cells that have NKB, percent of NKB cells that have TH, percent of TH cells that have c-Fos, and percent of NKB cells that have c-Fos; these data will then be compared between the three groups. The hypothesis posits that TH and NKB cells are activated during the LH surge relative to other groups.

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185 Semaglutide Attenuates Macrophage-Induced Glial Inflammatory Response in an In Vitro Murine Model

Quinn Pogge
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Research Poster

Semaglutide, also known as Ozempic, is a glucagon-like peptide 1 receptor agonists(GLP1-RA) increasingly prescribed to regulate blood glucose levels in Type II diabetics and body weight management. While Semaglutide is effective and generally safe, there are still uncertainties about its anti-inflammatory properties and the side-effects it can entail. Studies show that Semaglutide promotes macrophages to adopt an anti-inflammatory phenotype, resulting in reduced peripheral inflammation, suggesting that Semaglutide could address neurodegenerative disease-associated neuroinflammation, inflammatory response mediated by activation of the transcription factor Nuclear Factor-kappaB (NF-κB) in glial cells within the brain. Thus, we hypothesize that *Semaglutide treatment in an in vitro macrophage cell line reduces a model of peripheral inflammation and mitigates macrophage-mediated inflammatory responses in primary glial cells,*

underscoring its potential as a neuroprotective agent. To test our hypothesis, RAW cells are treated with lipopolysaccharide and varying concentrations of Semaglutide to assess changes in gene expression from inflammatory to anti-inflammatory states. Additionally, GLP1-R knockdown experiments conducted elucidate whether Semaglutide's anti-inflammatory effect is dependent on this receptor. Conditioned medium from RAW cells (RCM) applied to primary glial cells or Neuro-2a (N2A) neurons simulates peripheral inflammatory response on the brain, which will be measured for inflammatory and apoptotic responses. With Type II diabetes on the incline in America, celebrities and Western culture following trends of weight loss, Semaglutide use is not decreasing anytime soon. This makes it increasingly important to more completely understand the neurological effects of Semaglutide use that could potentially be affecting everyone taking Ozempic.

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225 Frontiers in Neuronal Networks:Cerebral Organoid Sensory and Motor Interfacing

Rachel Potter
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Cerebral organoids afford an innovative way to study neuronal networks, learning, and adaptation. To make them more akin to a living brain, my proposal introduces sensory stimulation via cameras, microphones, and somatosensory devices. These visual, auditory, and tactile cues are the same interactions and sensory experiences given to severely disabled patients via computer brain interfacing, restoring their sight, hearing, and tactile sensation. These cues are essential for neural development and learning in humans. To complete the feedback loop, the utilization of artificial intelligence (AI) models analyzes motor/output responses from the organoids in the form of interfaced light bulbs, vibration devices, and sound technology. This interdisciplinary approach bridges neuroscience, neurotechnology, and bioengineering leveraging cutting-edge technologies in an attempt to develop associative learning, communication, language, and basic interactions with cerebral organoids to assess the potential functionality of neuronal networks within these cultured systems. These three-dimensional cell cultures are derived from human pluripotent stem cells which self-organize into structures that resemble the early stages of the developing human brain. They are used to model disease and neurological disorder. Pharmaceutical companies use them for toxicology studies and drug screening. Cerebral organoids are a formidable player addressing ethical and disease modeling concerns brought about in animal studies. This proposal seeks to advance our understanding of cerebral organoids, neuronal networks, and plasticity to facilitate bioengineered neural systems in various applications, including but not limited to neural prosthetics, neurorehabilitation, and the integration of neural systems into artificial intelligence and computing technology.

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149 SARS-CoV-2 ORF 8 Protein Is Highly Conserved In Successful Variants

Logan Ridenbaugh
Alan Schenkel
College of Veterinary Medicine and Biomedical Sciences
Research Poster

SARS-CoV-2 ORF 8 has numerous known activities, primarily subverting the Type I anti-viral immune response by trapping the transcription factor Interferon Response Factor 3 (IRF-3) and MHC Class I inside the cell endoplasmic reticulum. The protein exists as a 240kDA dimer inside cells and is one of the highest expressed proteins made by the virus. ORF 8 may have other functions, such as increasing ER stress and/or inhibiting apoptosis. Currently we are exploring the effects of ORF8 in human A549 cells and will test the effects of pangolin and bat variant ORF8 in our cell lines. We hypothesize that the ORF8s will retain at least some activity against IRF 3 and MHC Class I.Despite many reports of mutations and deletions in the accessory protein ORF 8, we found that this protein had one or no mutations in any successful variants. Further analysis of Pangolin and Bat ORF8 from related viruses shows a similar extremely high conservation of the protein. Currently we have found that using Poly I-C to activate Interferon signaling on our reporter pGreenfire vector leads to cell poisoning and death. We have switched to recombinant Human IFN-B to stimulate a more physiologic response and are currently testing doses.

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142 Evaluating the Infection Dynamics of SIVrcm Virus in Human and Chimpanzee Blood Cells

Charlie Saeks
Ramesh Akkina
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Viral zoonosis is a phenomenon wherein an animal virus jumps a species barrier to infect humans. This problem is currently receiving increasing interest in the research community due to the still-evolving SARS-CoV-2 global pandemic, which occurred due to the zoonotic transmission of a bat virus. The human immunodeficiency virus (HIV) is another virus that originated due to simian immunodeficiency viruses (SIVs) crossing over into humans. Two different strains of HIV currently exist, both originating from two different species of non-human primates. HIV-1 evolved from chimpanzees and HIV-2 evolved from sooty mangabeys. SIVRCM from the red-capped mangabeys is another virus that has the potential to become zoonotic and cause human disease. To evaluate this question, our goal here is to test the potential for SIVrcm to infect human (Hu) and chimpanzee (CPZ) peripheral blood mononuclear cells (PBMCs) in vitro and compare the results. Another goal is to determine if and which human reactive antibodies specific for human white blood cells such as T cells and B cells cross-react with chimpanzee cells so that these reagents can be used to examine

the adverse viral effects on these cells. We infected human and chimpanzee PBMCs with both SIVrcm and HIV-1 to assess and compare the relative replication capacity. Infected cell supernatants were collected at different days and viral RNA was extracted. Viral titers were evaluated by q-RT-PCR assays on viral RNA. These results will provide insight into the potential for viral zoonosis of SIVrcm into humans.

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169 An integrated analysis of the transcriptomic effects observed following wildland firefighter relevant occupational exposures in the pre-frontal cortex of male mice

Emma Smith
Luke Montrose
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Research Poster

Wildfires continue to increase in frequency and intensity following trends of climate change across the globe. At the forefront of these extreme weather events are wildland firefighters (WLFF) who are exposed to several occupational factors (e.g., wildfire smoke, poor nutrition, sleep deprivation, etc.). These exposures are known to be associated with adverse cognitive and executive functions in model systems, especially in brain regions such as the pre-frontal cortex (PFC); however, little is known about the effects of combined WLFF exposures in a neurotoxic context. To address this, we examined the literature for bulk RNAseq datasets which originated from studies assessing WLFF-relevant exposures in CNS tissue. We identified 3 factors (wildfire smoke particulate matter, high fat diet, and psychological stress) with similar study populations (male mouse pre-frontal cortex) and performed an integrated analysis of the 8,367 differentially expressed genes (DEGs) as reported in each parent study. We found that 117 DEGs overlap between the three studies (6 consistently up, 13 consistently down, and 98 with directional discordance) which we further examined for functional enrichment and found significant differences in pathways relevant to synaptic transmission, specifically release cycles for common neurotransmitters. Additionally, protein-protein interaction network analysis revealed a central hub around axonal regulation. This is the first attempt to characterize molecular changes that are associated with multiple relevant exposures in WLFF by mining mouse model data. Together, these data suggest that modulation of neuroplasticity may underly occupational neurotoxicity in WLFFs and motivate subsequent prospective studies of these factors using multi-hit mouse models to tease out potential synergistic mechanisms in the context of WLFF occupational health effects.

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O5 Exploring Screen Inferiority Effect: Studying User Adaptation to Smartphone Displays

Isabelle Stevens
College of Veterinary Medicine and Biomedical Sciences

Oral Presentation

Exploring Screen Inferiority Effect: Studying User Adaptation to Smartphone Displays

The screen inferiority effect implies that using screens for learning negatively impacts reading comprehension, memory, and reading when compared to learning from paper materials. This effect is important currently as many classrooms switch to electronic learning (e.g., online reading, online assignments, etc.). The reason for this deficit is unknown, but research suggests it is due to attention issues and visual fatigue induced from screen time. Previous research has tested this effect by comparing computer screens and handheld devices like tablets and e-readers to paper. However, no research has investigated potential differences with smartphone screens (e.g., compared to bigger computer screens). Recent studies have disputed this previously widely accepted effect, showing participants remember more information when it was presented on a screen compared to on paper. The screen inferiority effect could be losing impact as individuals rely on their phones more and thus become more accustomed to phone screens. Given the pervasive use of phones, the attention issues and visual fatigue that are thought to be the cause of this effect could potentially have been overcome. To test this idea, research will be conducted to compare reading comprehension on material learned via paper materials or on a phone screen. This research may reveal whether people have adapted to reading on digital devices through comparisons between test results after reading an article on different mediums.

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175 The Effect of Beta-Glucocerebrosidases GBA1 and GBA2 on Dengue Virus Titer

Ryan Thompson
Rushika Perera
College of Veterinary Medicine and Biomedical Sciences
Research Poster

There are many factors that affect viral replication cycles, but few are as ever present as lipid metabolism. Lipids play key roles in countless biochemical processes that are all influenced during viral infection. Lysosomal and Non-lysosomal Beta-glucocerebrosidases (coded for by the GBA1 and GBA2 genes), which are involved in the breakdown of old lipid membranes and assist in purging the cytosol of potentially harmful contaminants, are predicted to play an anti-viral role in the replication cycle of Dengue. We intend to determine this using an siRNA transfection, in which the GBA1 and GBA2 genes will be inhibited, allowing us to examine what effect they have on viral titer in their absence. We will use four controls: Irrelevant siRNA, Dengue siRNA, Lipofectamine control, and a Cells only control. Our four treatments include: GBA1 siRNA, GBA2 siRNA, GBA1 and 2 siRNAs at half the normal volume for each, and GBA1 and GBA2 at normal volume for each. By following up our transfections with a viral infection and measuring the viral titer with a plaque assay we will be able to determine if this is a potential avenue for new treatment development in the fight against Dengue infections.

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165 Ketamine reverses chronic stress-induced mental disorders via the expression of Ca2+-permeable AMPA receptors in mice

Paige Vetter, Joshua Flowers, Evelina Bouckova, Mckennon Wiles, Maddy Wustrau
Seonil Kim
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Preclinical and clinical studies demonstrate that chronic stress reduces AMPA Receptor (AMPAR) subunit GluA1 levels in hippocampal synapses. There are conflicting results describing alterations in hippocampal GluA2 levels under chronic stress4. These results suggest that stress-induced decrease in hippocampal GluA1 levels is correlated with both weakened excitatory synaptic transmission and altered hippocampus-dependent behaviors in chronic stress. We have revealed that low-dose ketamine rapidly induces the expression of GluA1-containing, GluA2-lacking Ca2+-Permeable AMPARs (CP-AMPARs), a subtype of AMPARs have larger single channel conductance, in the hippocampus. We have shown that this ketamine-induced CP-AMPAR expression enhances glutamatergic synaptic strength in hippocampal neurons, allowing animals to exhibit less anxiety- and depression-like behaviors. Our new findings further demonstrate that low-dose ketamine treatment can reverse disruptions in hippocampus-dependent fear memory and social behavior caused by chronic restraint stress (CRS) in mice. Research also shows that ketamine-induced restoration of impairments of AMPAR-mediated synaptic transmission and behaviors in stressed animals is associated with an increase in synaptic GluA1 expression in the hippocampus. Notably, the hippocampus is one of the key brain regions controlling social behavior and learning and memory. Moreover, an increase in hippocampal activity reverses stress-induced memory impairment, social dysfunction, and mood disorder-linked behaviors. More importantly, a recent study shows that the hippocampus is selectively targeted by low-dose ketamine. These existing data and our findings show that ketamine at the low dose rapidly induces the expression of CP-AMPARs in the hippocampus, which in turn enhances synaptic strength to reverse hippocampus-dependent behavioral dysfunctions in chronically stressed animals.

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112 Getting High on Your Own Supply: Using Endocannabinoids and Psychedelics to Treat Neurodegenerative Diseases

Claire Vrooman
Kimberly Jeckel
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Neurodegenerative diseases are generally characterized by the progressive loss of a selectively vulnerable population of neurons. Parkinson's disease is the second most prevalent neurodegenerative disease

in the US, accounting for approximately 10-15% of the reported cases of neurodegenerative diseases. As far as treatment options for neurodegenerative diseases go, they are few and far between and often leave something to be desired. Currently, there are 5 classes of medications that have proven themselves useful in the treatment of Parkinson's disease, along with other more invasive procedures like deep brain stimulation. For decades now, the gold standard of care for Parkinson's disease patients has been L-dopa, a synthetic dopamine replacement medication. L-dopa, like many of the other drugs, falls short in several ways, particularly in that it fails to interrupt the progression of the disease process and exhibits a loss of efficacy in greater than 95% of patients after 15 years of use. Over the past several decades, as research on cannabis, the endocannabinoid system and other schedule 1 drugs has increased, the potential benefits of using psychoactive compounds and their derivatives as a novel approach to the treatment of neurodegenerative diseases has become more broadly accepted. In this review of current literature, we will discuss how cannabis, the endocannabinoid system and other psychoactive drugs (such as MDMA) and their derivatives or analogues could be used as novel treatment options, to identify a new pharmacological target or elucidate the mechanisms of neurodegenerative disease progression.

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120 Adults with Chronic Acquired Brain Injury have Similar Cognitive Abilities Despite Differences in Time-Since-Injury

Sophie Wasem
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College of Veterinary Medicine and Biomedical Sciences
Research Poster

Background: Acquired brain injuries (ABI) include both traumatic brain injuries (TBI) and non-traumatic injuries, like stroke. ABIs cause a disruption to normal brain functioning and often lead to long-term cognitive impairment. We recently conducted an intervention study with community-dwelling adults with chronic ABI, which was defined as individuals who were 6 months post-ABI. Because our population was heterogenous in time-since-injury, the current study investigated whether time-since-injury impacted baseline (i.e. pre-intervention) cognitive function in attention, inhibition, and working memory. **Methods:** We divided 23 participants with ABI into four groups based on time-since-injury: **Analysis:** We first used correlation analyses to assess whether time-since-injury (exact value in years) was correlated cognitive performance on any of the three measures. Next, we used a one-way ANOVA to assess if cognitive function was different between the four groups. **Results:** We found that time-since-injury was neither significantly correlated (all *p*-values > 0.66) nor significantly different between groups on any of the three cognitive measures (all *p*-values > 0.23). **Discussion:** In our sample of adults with chronic ABI, there were no baseline differences in cognitive function related to time-since-injury. This suggests that our

operational definition of chronic ABI was likely appropriate, which has implications for future studies.

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135 Urinary Tract *Escherichia coli* Infection as an Etiological Factor in Neurodegenerative Pathologies

Kristin Weninger
Julie Moreno
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Increasing evidence demonstrates the neurotoxic role of bacteria, with or without bacterial dissemination to the brain. These infections can induce a neuroinflammatory brain phenotype that degrades neurons and reduces the integrity of the blood-brain barrier. While inflammation is increased in the aged brain, Urinary Tract Infections (UTIs) are also common in elderly populations. These infections are known to cause a range of symptoms including fever and urinary incontinence, and can progress into one well documented, neurological effect: delirium. Clinical delirium has been reported in approximately 29% of elderly patients with a UTI (Dutta) and results in a lack of awareness, confusion, memory loss, and cognitive decline. Although the clinical signs of delirium have been described, little is known about the neurotoxic mechanisms that occur in the brain as a result of a UTI. To study this question, guinea pigs were infected with an *E. coli* induced UTI followed by treatment with antibiotics or vehicle or remained uninfected but received treatment of antibiotics or vehicle. Behavior tests such as the novel object recognition test and the open field test were performed and analyzed to determine spatial and non-spatial memory loss as well as anxiety in these animals. Cognition changes were correlated to pathological characteristics of neurodegenerative disease, including signs of glial inflammation and blood-brain barrier integrity. Through this data, we will better understand the contribution of UTIs in causing long term cognitive decline and neurodegeneration, as well as determine characteristics of peripheral infectious neurotoxicity that impacts neuropathology.

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146 Anti-Cancer Activity of Soil Bacteria Pigments

Jesse Wham
Dr. Carolina Mehaffy
College of Veterinary Medicine and Biomedical Sciences
Research Poster

In 2023, cancer was the cause of an estimated 609,820 deaths in the United States alone(SEER, NIH). While there are treatments available, they do not ensure survival. Many treatment options come with a host of adverse symptoms; chemotherapy and radiation being some of the better-known therapies. As such, there is a need for new and better treatment options. Many strains of bacteria have been found to produce pigments with anti-cancer activity, including families such as *Streptomyces* (El-Naggar and El-Ewasy,

2017), *Arthrobacter* (Afra et. al. 2017), and *Serratia* (Anwar et. al. 2022). This project looked to explore the potential anti-cancer effects of pigments isolated from *Arthrobacter* and *Janthinobacter* isolated from the soil around Fort Collins, CO. Pigments were isolated and suspended in methanol, and incubated with a cancer cell line provided by a Colorado State University lab. Preliminary data does not suggest significant anti-cancer activity in the pigment of these particular isolates; however, it is possible that further purification or different concentrations of pigment could reveal some anti-cancer properties. Otherwise, these pigments may hold the potential for application elsewhere.

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123 Ketamine's rapid antidepressant effects are mediated by Ca2+-permeable AMPA receptors

McKennon Wiles, Maddy Wustrau, Evelina Bouckova
Dr. Seonil Kim
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Ketamine is shown to enhance excitatory synaptic drive in multiple brain areas, which is presumed to underlie its rapid antidepressant effects. Moreover, ketamine's therapeutic actions are likely mediated by enhancing neuronal Ca2+ signaling. However, ketamine is a noncompetitive NMDA receptor (NMDAR) antagonist that reduces excitatory synaptic transmission and postsynaptic Ca2+ signaling. Thus, it is a puzzling question how ketamine enhances glutamatergic and Ca2+ activity in neurons to induce rapid antidepressant effects while blocking NMDARs in the hippocampus. Here, we find that ketamine treatment in cultured mouse hippocampal neurons significantly reduces Ca2+ and calcineurin activity to elevate AMPA receptor (AMPAR) subunit GluA1 phosphorylation. This phosphorylation ultimately leads to the expression of Ca2+-Permeable, GluA2-lacking, and GluA1-containing AMPARs (CP-AMPARs). The ketamine-induced expression of CP-AMPARs enhances glutamatergic activity and glutamate receptor plasticity in cultured hippocampal neurons. Moreover, when a sub-anesthetic dose of ketamine is given to mice, it increases synaptic GluA1 levels, but not GluA2, and GluA1 phosphorylation in the hippocampus within 1 hr after treatment. These changes are likely mediated by ketamine-induced reduction of calcineurin activity in the hippocampus. Using the open field and tail suspension tests, we demonstrate that a low dose of ketamine rapidly reduces anxiety-like and depression-like behaviors in both male and female mice. However, when in vivo treatment of a CP-AMPAR antagonist abolishes the ketamine's effects on animals' behaviors. We thus discover that ketamine at the low dose promotes the expression of CP-AMPARs via reduction of calcineurin activity, which in turn enhances synaptic strength to induce rapid antidepressant actions.

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157 The Use of a Multienzyme Cascade to Increase the Sensitivity of a Viral Detection Assay

Elizabeth Williams
Claudia Gentry-Weeks
College of Veterinary Medicine and Biomedical Sciences
Research Poster

The objective of this experiment is to create a multienzyme cascade that increases the sensitivity of a viral detection assay for SARS-CoV-2. An enzyme cascade that occurs naturally in the body was combined with a toehold switch that would undergo a conformational change in the presence of SARS-CoV-2 RNA. The result would end in the activation of a multienzyme cascade with a detectable signal.The main focus of this objective is to determine if the glycogenolysis multienzyme cascade chosen will work in vitro. The enzymes being used are commercially available, and to ensure that the cascade is functional, commercial kits are used to detect ADP and glucose created during the expected cascade. This study is ongoing and will benefit the world of viral diagnostics.

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137 Quantitative Assessment of Locomotor Deficits in the Rotenone Exposure Model of Parkinson's Disease

Nicole Yates
Ronald Tjalkens
College of Veterinary Medicine and Biomedical Sciences
Research Poster

Neurodegenerative diseases remain the leading cause of physical and cognitive disability worldwide and are expected to double over the next twenty years as a result of rising aging populations. Parkinson's Disease (PD) is the second most common age-related neurodegenerative disorder and is characterized by the degeneration of dopaminergic neurons (DAn) in the substantia nigra pars compacta (SNpc). Clinical motor symptoms include resting tremor, hunched posture, difficulties initiating movement, and a short shuffling gait. Exposure to environmental neurotoxins such as pesticides can recapitulate key pathological features of PD. Among such agents is the naturally occurring pesticide, rotenone, a mitochondrial complex I uncoupler that targets DAn in the SNpc, leading to aparkinsonian phenotype. However, it remains unknown how this toxin elicits gait disturbances throughout the course of exposure. In this study, inbred C57Bl/6 mice were exposed to 2.5 mg/kg/day of rotenone or respective vehicle control for 14 days, followed by a 7 day lesioning period. Using the Noldus CatWalk XT high-throughput gait tracking and analysis system, alterations in gait and locomotion were examined over the course of rotenone exposure and subsequent lesioning period. The resulting data demonstrates that rotenone exposure alters locomotion and induces behavioral changes in animals that progress even after the cessation of exposure. This suggests that rotenone-induced neurotoxicity causes a sustained inflammatory response in the brain leading to further degradation of neurological function, similar to that observed in patients with idiopathic PD.

COLLEGE OF VETERINARY MEDICINE AND BIOMEDICAL SCIENCES

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152 Development of an Automated Bone Transport Device

Chloe Brekhus
Benjamin Gadomski
Walter Scott Jr. College of Engineering
Research Poster

Distraction osteogenesis is a procedure used to heal severe segmental bone defects, which can result from high energy trauma injuries or surgical bone tumor excision in cancer patients. This procedure involves placing an external fixator around the limb and moving a segment of healthy bone across the defect. The middle ring (connected to the transport bone segment) is moved (i.e., distracted) across the gap by manual hardware manipulation. This bone transport process creates tension in the defect, providing mechanical signals to induce bone growth.
It has been shown that distracting the bone in smaller increments more frequently optimizes bone regeneration, which is difficult to achieve with the current method of manual distraction. Furthermore, manual distraction requires a high-level of patient compliance. In this study, a motor driven distraction device was developed to address these issues. The device uses two stepper motors attached to the transport ring to drive distraction, with a circuit to control the movement of the motors. At a specified time each day, the motors will distract 1 mm; if distraction is successful, the code will send an email to the user as a confirmation.

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154 Celebrating 40 Years with the Asian Pacific American Cultural Center (APACC)

Emika Buschow, Lilianna Nono
JoAnn Cornell
Walter Scott Jr. College of Engineering,College of Business
Research Poster

APACC reaches its 40th anniversary in November of this year. APACC, the Asian Pacific American Cultural Center, serves students identifying as SWANA, South West Asian and North African, and APIDA, Asian Pacific Islander Desi American. We are celebrating a center that has been a home for numerous students, allowing them to build connections and create a safe space. Throughout this project, we visited the university archives, interviewed fellow APACC members, and reviewed photos from over the years. At the archives, we scanned through scrapbooks, newspapers, posters, and documents. We interviewed the APACC staff, alumni, and students in order to create an insight on what APACC meant to each individual. We assessed photos that captured moments of time, allowing us to better understand how APACC supported students, such as community events. We have reviewed content from the beginning of APACC to its current self, watching its name change a total of three times but maintain its overall identity. All these components have shown us how APACC grew as a center and continues to fulfill its purpose of providing a community. In April, during Asian American Pacific Islander heritage month, we celebrate the center that has been home for several students identifying as APIDA or SWANA over the past 40 years.

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O9 Warm Turkey: An alternative method to quitting nicotine

Bradley Butler
Walter Scott Jr. College of Engineering
Oral Presentation

22% of the United States population currently uses nicotine products. Each year 55% of that population attempts to quit, but only 7.5% will succeed in their attempt. A large cause of the low success rates is the lack of effective methods towards quitting, with the most popular, and least successful, being the cold turkey method. This leads to nicotine withdrawal symptoms that force many users back into use. Warm Turkey is an attempt at making a vaporizer device that combats the barrier towards quitting nicotine. By lowering the amount of inhalations over time, as well as the nicotine content of each inhalation, the hope is to create a gradual decrease in nicotine that will remove the withdrawal symptoms and allow for an easier quitting experience.

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W5 Fantôme bleu

Aaliyah Escalera
Walter Scott Jr. College of Engineering
Written Work

Through the grievances we face sudden or not, it is a storm we must allow to pass. In this short excerpt we follow a woman who lost her love, and she finds herself back at their favorite spot as she tries to push onward.

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148 Using Coding-Based Modeling to Refine a High-Throughput Plasmid Assembly Pipeline

Mark Kappus
Sarah Hernandez
Walter Scott Jr. College of Engineering
Research Poster

The COVID-19 vaccine was rapidly developed to protect people during the pandemic. This is an mRNA vaccine which is synthesized from plasmids. However, mRNA is unstable at room temperature and can be difficult to manufacture. This work focuses on the use of plasmids. Plasmids are not only more stable than mRNA but can be more easily designed and manufactured. Historically, the process of vaccine design is slow, low-throughput, and expensive, where produced candidates are rarely successful. This research uses a modeling approach to identify potential candidates and simulate thousands of variants at one time. By focusing on the initial design, we can identify successful candidates prior to lab testing, allowing for a guided testing approach. The main goal of this research project is to design and produce multiple plasmids to speed up the front end of plasmid production more effectively and efficiently. The use of coding to influence

design is just one of many optimization measures that was used to guide the physical assembly and testing of plasmids.

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187 Fabrication of Bioreactor for Generation of Human Organoids

Forrest Kuhlmann
Dr. Kirk McGilvray
Walter Scott Jr. College of Engineering
Research Poster

Traditionally, cancer cell lines have been indispensable tools for lab-based studies in human biology, yet their inability to accurately replicate 3D tissue structures poses limitations. Enter organoid generation, a promising approach offering the potential to recreate human organs by employing specific stem cells and growth factors. This project aims to develop a 12-well plate bioreactor, sterilizable via autoclave and gas, and reusable for up to 1000 cycles. Constraints such as a 100 rpm spinning apparatus per well and material durability considerations were addressed. Validation efforts confirmed the functionality of 11 out of 12 well plates and successful autoclave sterilization. Material selection involved a transition from ULTEM to Formlabs Surgical Guide Resin, enhancing cost-effectiveness and performance. The resulting bioreactor, utilized by the Hollinshead lab for human placenta organoid development, received positive feedback, guiding iterative design improvements. Future steps include gear redesign for motor integration, material optimization for gas sterilization, and mass fabrication post-design iterations. This research underscores the potential of organoid-based approaches in advancing tissue research and offers insights for future biomedical applications.

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239 Stress Tolerance of Cyanobacteria

Samantha Kupfner
Darcy Hunstiger
Walter Scott Jr. College of Engineering
Research Poster

Algae are a promising carbon-neutral alternative to fossil fuels that convert sunlight into useful products like fuels, pharmaceuticals and more. However, the production of industrial algae requires large amounts of water and energy, leading to high harvesting costs and water sustainability concerns. One way to improve both the economics and water sustainability is growing the algae in sticky cell clumps of biofilms. Cyanobacterium, a type of algae, are readily genetically manipulated to make renewable products, but industrial strains do not readily form biofilms or tolerate the stress of a reduced water growth system. This project aims to better understand biofilm formation and its relation to stress tolerance within a model industrial cyanobacterium *Synechosystis* PCC 6803 (S. 6803). A recent study knocked out a certain gene in S. 6803 that caused increased cell-cell clumping – a hallmark of biofilms. The Peebles lab is taking this further by assessing whether this clumping is linked to increased stress tolerance. In addition to studying this knockout gene we

also overexpressed a sugar transport gene identified to be important for clumping. This decreased the clumping behavior but increased cyanobacteria survivability under drought stress. This presentation focuses on designing and transforming a sugar transporter overexpression-only plasmid to better understand this unexpected behavior. Better understanding the relationship between stress tolerance and biofilms in industrially relevant cyanobacteria will expand the potential for novel growth methods towards a more sustainable future through carbon neutral algal products.

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158 Human Cells in Data: Predictors for Nuclear Shape

Sebastian Lawton
Dr. Ashok Prasad
Walter Scott Jr. College of Engineering
Research Poster

Nuclear shape in human cells and those of other animals has been observed to be dependent on cell type and function. Many diseases, including cancer, change this distinct nuclear shape and subsequently alter its function. However, how the nuclear shape directly influences its function is still unknown, as are the processes for determining this shape and its regulation. Here, we investigate which factors may be primarily responsible for predicting nuclear shape in human induced Pluripotent Stem Cells (hiPSCs) by examining a large cell imaging database, courtesy of the Allen Institute for Cell Science, and applying machine learning approaches alongside linear regression analysis to create predictive models.
The database highlighted in this work contains 215,081 cells from the WTC-11 cell line. Each was gene-edited to produce a fluorescent protein tagging an intracellular structure such as the endoplasmic reticulum or Golgi apparatus. Spinning-disk confocal microscopes were used to image the cell colonies and later segmentation was achieved by AI to provide single cell images with distinct cell and nuclear membrane boundaries as well as the tagged structure.
A spherical harmonic expansion with 578 total coefficients was performed on the 3-dimensional shapes of the cell and nuclear membranes, and a principal component analysis (PCA) found 8 components which accounted for 70% of the variation of the interphase cells. These principal components created a shape space where a cell's position is defined by the standard deviations away from the average cell's principal components.

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O8 SARS-CoV-2 Antibody Capture on Nucleocapsid Surface Biosensor

Matthew Lynd
Dr. Kipper, Dr. Lear, and Dr. Countinho Madruga
Walter Scott Jr. College of Engineering
Oral Presentation

The SARS-CoV-2 virus hit the world hard, it is important to effectively know whether someone has the virus. The common swab

method takes a while to analyze, it cannot be used anywhere, and it can give false readings. A better method of detection would involve a biosensor since it is compact, able to be used anywhere, and can get meaningful results. This biosensor uses a local evanescent array coupling device combined with a silicon nitride surface chemistry. For preparing the surface chemistry, the binding occurred in the following order: an aminosilane, nucleocapsid protein with coupling buffer, then an antibody with dye. The nucleocapsid protein with the antibody and dye and that solution was analyzed in a plate reader to analyze the fluorescence of the dye that is attached to the antibody and the nucleocapsid protein. The presence of fluorescence was indicated by the presence of nucleocapsid and the virus. A serial dilution was used to make a calibration curve to help determine the concentration of the nucleocapsid protein from the cleaved solution assay. Results show that the nucleocapsid protein was removed through the use of a cleavage buffer. From the data collected, a concentration was obtained for the assay in the range of 1E-3 to 2E-3 mg/ml, and the mass per area was calculated in the range of 4E-3 to 2E-2 ug/mm^2. The biochemistry of the LEAC biosensor can accurately measure not only the presence of the nucleocapsid protein but the concentration of it as well for a person.

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200 Particulate matter reduction during the pre-ignition pyrolysis stage for wood

Mason Martinez
John Flynn, Prof Tami Bond
Walter Scott Jr. College of Engineering
Research Poster

The use of biomass wood as a fuel in homes is prevalent worldwide. However, the “pre-ignition” pyrolysis stage of burning releases most of the harmful aerosols and gases into homes and communities. As heat is introduced to the fuel the biomass breaks down via pyrolysis, releasing CO, CO_2, and particulate matter sized 2.5 µm, which greatly impacts air quality. Once ignition occurs, the release of PM2.5 is significantly reduced by the flame. Ignition occurs when a threshold of pyrolysis products can sustain a flame. By accelerating heat and mass transfer in the wood, the time-to-ignition can be decreased, reducing PM2.5. Our group is taking advantage of the capillaries that run parallel to the grain of the wood through which these byproducts of burning are released. Our experiments show that by increasing the amount of exposed end grain in the sample we observe a temporal shift in pyrolytic mass release which may reduce time-to-ignition. Our analysis uses a combination of mass loss data, CO, and CO_2 to determine when the sample has met ignition criteria. By understanding combustion and mass transfer principles our team can provide solutions for reducing particulate matter produced during the pre-ignition stage.

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235 Metabolic Engineering of the Shikimate Pathway in Synechocystis for Production of Trans-Cinnamic Acid

Hayley Stern, Marion Moore, Erin Johnson, Camille Angeles
Dr. Christie Peebles
Walter Scott Jr. College of Engineering
Research Poster

Trans-Cinnamic acid (tCA) is a chemical traditionally produced from fossil fuels that is used in many industries, including the pharmaceutical and cosmetic industries, and has the potential to make biofuels behave like diesel or jet fuel. It is also produced in bacteria like *Synechocystis* using the Shikimate Pathway with the addition of a phenylalanine ammonia lyase (PAL) gene. As natural tCA production levels are low, the use of metabolic engineering with multiple genomic targets can allow for an increase in production. The precursor to tCA, Phenylalanine, creates feedback inhibition in the pathway by acting on the enzyme aroG, however, we can create phenylalanine-resistant aroG mutants that have higher activity than wild type in both low and high concentrations of phenylalanine. We can also overexpress the *aroE*, *aroH*, and *aroL* genes to increase production of shikimate dehydrogenase (aroE), which is upstream of a rate-limiting shikimate kinase II (aroL). These combined approaches could lead to higher L-phenylalanine levels in *Synechocystis sp.* PCC6803 and higher tCA production when used with the PAL gene.

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243 Enhancing Clinical Outcomes: Utilizing Eye Tracking Technology to Analyze Doctor's Cognitive Load in Documenting Interactions

Michelle Vasquez
Steve Conrad, Dixie Poteet
Walter Scott Jr. College of Engineering
Research Poster

This study aims to increase the accuracy of electronic health records (EHR) and decrease the cognitive load of clinicians in emergency departments utilizing eye tracking data and Artificial intelligence (AI) aided analysis. Clinicians face high cognitive loads while providing patient care. Documentation can add to this load, particularly when sections are confusing or poorly placed. Cognitive overload can contribute to mistakes in records, which is detrimental to patient healthcare quality. Eye tracking can be used to estimate and detect patterns in cognitive loading by measuring indicators such as saccades and fixations. To examine EHR data entry, participants interact with a simulation for a prescription order set. Eye tracking data is collected with the Tobii Nano Eye Tracker or Tobii Spark Eye Tracker. Each eye-tracking data set captures metrics on over thirty indicators for every participant simulation including: gaze point coordinates, pupil diameters, validity, precision, and eye movement classification. With participant simulations lasting around ten minutes, the eye tracker collects large raw datasets that require condensing, filtering, and preparation. To streamline the data analysis workload, areas of interest (AOIs) from the on-screen simulation are determined and used to separate analysis groups based on on-screen location. Patterns in eye-tracking data from each AOI will help correlate attentionality to the EHR fields. AI can assist with identifying critical data entry fields.

The success of the pilot study will be an indicator of the viability of using AI to automate EHR documentation and support clinicians in completing their tasks.

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156 ATS Biofuel Viability in the Chesapeake Bay Watershed

Kay Willock, Ashley Ryland
David Quiroz, Jason Quinn
Walter Scott Jr. College of Engineering
Research Poster

Algal Turf Scrubber (ATS) systems have arisen as highly promising technologies for the post-tertiary treatment of point source effluents, concurrently offering a viable co-product for biofuels. The economic feasibility of algal biofuels currently faces market challenges due to the high production costs. Subsidizing production through nutrient credits, particularly in wastewater treatment plants (WWTP), offers a valuable strategy to lower the costs of algal biomass and increase the feasibility of algal biofuels. Within the Chesapeake Bay Nutrient Market, nutrient credits are accrued by point sources reducing their nutrient discharge below EPA standards, which are then sold to larger polluters to offset excess loading. This work uses Techno-Economic Analysis (TEA) to understand the nutrient credits that can be gained from the effluent treatments of twenty-two-point sources in the Chesapeake Bay Watershed and evaluate the increased viability of Algal Biofuels with ATS systems. A preliminary TEA was conducted to examine the Minimum Biomass Selling Price (MBSP) of ATS systems under three distinct phosphorous uptake targets: of 0.1 mg/L, 0.05 mg/L, and 0.01 mg/L. Results indicate a notable inverse correlation between the stringency of nutrient uptake standards and the associated MBSP, with was reductions in MBSP from $203.22, to $92.13, and $64.10 for the respective nutrient reduction standards. Initial conclusions support the potential economic benefits of subsidizing algal biofuel production through nutrient credits specifically in the Chesapeake Bay Nutrient Market could significantly increase the feasibility of ATS-based biofuel production while addressing environmental concerns.

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203 Influences of African Elephant Occupancy in North and South Kruger National Park

Leila Aburomia
Derek Fedak
Warner College of Natural Resources
Research Poster

Understanding the distribution of African elephant demographics across a landscape is crucial for insight into biodiversity conservation, ecosystem health, and habitat management. The landscapes of Kruger National Park (KNP) are split between its diverse vegetation and limiting water resources in the South and a semi-arid climate in the North. This study asks, Is the difference in elephant occupancy as detected by game camera, influenced by the availability of water and precipitation in the Northern and Southern regions of Kruger National Park during the dry season of 2023? Images from 5/12/23-7/23/23 were collected and processed with Timelapse from one game camera located at the Stevenson- Hamilton Memorial lookout in Southern Kruger and one camera located within the Ramsar Makuleke Wetlands in the northern Pafuri region of the Kruger. Occupancy probability modeling was completed to determine if a relationship exists between differences in elephant occupancy and water availability. Results demonstrated a preference for the southern site among elephant individuals, being 2.63 times more likely to occupy the site over 3 days; these findings align with my hypothesis. The results layout the complexity of species habitat preference and emphasize the importance of considering additional environmental variables when interpreting occupancy data from game camera surveys. Further research is needed to find the underlying mechanisms driving elephant distribution and their impacts across Kruger, which will enable more comprehensive conservation strategies for this species.

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172 Examining the Growth Climate Response of Ponderosa Pine in the Colorado Front Range

Rylee Aksamit
Josh Carrell
Warner College of Natural Resources
Research Poster

Tree rings provide insight on the relationship between climate and tree growth. In this study, we examined *Pinus ponderosa* growth across the Colorado Front Range using the standard dendrochronological sampling methods. Trees were sampled in sites with varying moisture availability. Tree rings were sanded, scanned, and time series growth chronologies were created using CooRecoreder and CDendro software. Using the R packages treeclim and dplr, climate growth responses were developed between tree radial growth and temperature, precipitation, and vapor pressure deficit (VPD) from 1895 to 2022. Variability in precipitation, temperature, or VPD are expected to impact tree growth. We anticipate that sites with high precipitation and low VPD maximums will have higher growth than sites with low precipitation

and high VPD. Temperature for all sites is expected to continue to increase over time. Understanding the climatic factors that have the greatest impact on tree growth is important for land managers to consider when determining management strategies as the climate continues to shift towards warmer temperatures and less precipitation.

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178 Wild horses in the west: Generating maps and learning modules for K-12 curriculum levels

Amelia Anderson
Dr Stacy Lynn ; Dr Sarah King
Warner College of Natural Resources
Research Poster

Wild horse conversations in the west are complicated and contentious. Between government agencies in charge of managing populations, private landowners, cattle ranchers, and animal advocacy groups, the opinions vary greatly on proper management options for wild horses and burros. While every argument has valid points, misinformation is effecting the efficacy of management. Wild horses can have detrimental effects to rangeland landscapes and their current population levels are threatening important western ecosystems. This project helps to develop K-12 curriculum to begin filling in the knowledge gaps that persist within this conversation by developing maps to display spatial data related to wild horse management and ecology in the western US. With four curriculum levels, K-2, 3-5, 6-8, and 9-12, this project focuses on the intersection of spatial data analysis, data communication, and environmental education. Supplemental lesson plans were also developed showcasing the practical usage of PopEquus, a model for predicting wild horse populations based on population management options.

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O7 Using Forest Management and Geospatial Information Systems to Mitigate Human-Wolf Conflict: Evaluating Colorado Aspen Forests for Elk Habitat

Michael Atkinson
Wilfred Previant
Warner College of Natural Resources
Oral Presentation

Grey wolf (*Canis lupus*) reintroduction has begun in Colorado, increasing the potential for negative human-wolf interactions and increased predation on Rocky Mountain elk (*Cervus canadensis nelsoni*). Maintaining elk populations will help prevent wolves from looking for other food sources, such as livestock, and maintain the critical role that elk play in Colorado's hunting, recreation, and tourism economies. This project identifies areas where quaking aspen (*Populus tremuloides*) stands, critical for elk habitat, can be improved through forest management practices. Using ArcGIS Pro spatial analysis of remote sensing and US Forest Service Forest Inventory and Analysis data, elk habitat, wolf habitat, and quaking aspen stand structure in northwest Colorado were identified. Based on those findings, areas with the greatest need for

improvement were identified. Preliminary results have shown that quaking aspen stands in northern Eagle County are old and at risk of being lost from the landscape, likely due to fire suppression throughout the 20th century. Based on the existing conditions, forest management prescriptions including thinning and prescribed fire can be used to increase the habitat quality for elk, bolstering their productivity. Offsetting hunting pressure on elk by increasing productivity will help prevent wolves from looking for other sources of food, decreasing the likelihood of negative human-wolf interactions.

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O6 Examining the Creation of Queer Counterspaces in Undergraduate Biology Fields

Elliot Batta
Sarah Eddy
Warner College of Natural Resources
Oral Presentation

Finding community is important for all people; this need becomes greater for those with marginalized identities. Perceived safe spaces become spaces to not only survive but to exist and thrive in ways that aren't welcomed elsewhere. These spaces can look like many things but are often focused on shared identities and sharing narratives that counter dominant cis- and heteronormative messaging. In theory, these spaces are commonly referred to as counterspaces. Queer counterspaces act as spaces of resistance for queer folk. There is a severe lack of safe spaces for queer-identifying college students in STEM. There is also a lack of data surrounding their experiences, but a lot of data on the lack of persistence of these students in STEM fields. Analysis of these spaces happens rarely in academic settings, and the creation of these spaces are often informally cited and have not been thoroughly researched. This study is part of a larger project in which several interviews were conducted with self-identifying queer students around the country to gain a further understanding of student's experience in biology fields; these interviews were then examined for mention of counterspaces and their impacts. The purpose of this study is to broaden the body of research on how queerness is treated at the collegiate level in biology fields, and to understand how students create their own pockets of change in counterspaces they've created.

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170 Evaluating *Cyprinus carpio* swimming performance in a rock ramp fishway

Isabella Bert, Christopher Georgalos
Warner College of Natural Resources
Research Poster

Fish passage structures like rock ramp fishways are being increasingly considered (or installed) to restore longitudinal connectivity for native fish species inhabiting transition zones and plains streams in Colorado and Wyoming. While such structures can allow passage of the target native fishes, they may also improve connectivity for nonnative fish species,

including potentially invasive ones, such as Common Carp (*Cyprinus carpio*). Our study focused on movement of juvenile Common Carp in a full-scale experimental cobble-bottomed rock ramp fishway to understand how differences in fishway slope affected their passage performance. We measured the effects of 4%, 6%, 8%, and 10% slopes on the passage success of PIT-tagged juvenile Common Carp (mean TL: 111 mm). Total passage success was defined as fish negotiating the full 6.1-m length fishway; partial passage success was determined using sequential PIT tag antennas installed at 2.03-m intervals. We hypothesized that as the slope of the rock ramp fishway increases from 4 to 10%, Common Carp passage success would decrease. Our results showed that all fish tested entered the fishway at each slope, but not all completed successful passage, with differences caused by both fishway slope and length. For the full 6.1-meter fishway, carp achieved passage at 4% and 6% slope, and no successful passage at 8% and 10% slope. Our results identified slope and length combinations that will inhibit juvenile Common Carp passage. We hope these results can better inform fisheries management decisions that involve developing and installing fish passage structures for fishes of regional conservation concern.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63990

College of Natural Sciences,Warner College of Natural Resources
Research Poster

Coral reefs are among the most biologically diverse ecosystems, providing habitat for countless marine species. The structure and density of coral reefs are prominent factors that influence the ecosystem's biodiversity. Previous studies have shown that coral cover and habitat complexity impact fish communities (Komyakova 2013). However, human activities such as anchoring, trawling, and recreation can directly damage coral reefs, resulting in decreased coral coverage (Gill 2015). Isla Espiritu Santo, located in the Gulf of California, is known for its coastal coral reef ecosystems, making it a popular ecotourism destination with heavy boat and human traffic. As part of our education abroad course, we completed a preliminary study investigating the percent of coral coverage nearshore from a beach on Isla Espiritu Santo from the tide line to 100 m from the beach. While on the island, we observed boats anchoring near shore, as well as activities such as paddle boarding, snorkeling, and swimming in the reef. We hypothesized that coral coverage would increase as the distance from the sandy shoreline increased, as most human disturbances we witnessed occurred closer

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63717

94 Preliminary Research of Coral Reef Coverage on Isla Espiritu Santo

Aubrey Bowlus, Hannah Mertz
Dee Dee Wright

O17 Measuring Climate Vulnerability in Houston, Texas

Madzie Boyles
Elizabeth Tulanowski

Warner College of Natural Resources
Oral Presentation

Differential vulnerability to climate change is the combination of social and climate factors that alter how climate change affects a population. Within urban areas, such as Houston, Texas, differential vulnerability leads to inequitable access of climate mitigation and adaptation resources and in some cases, climate migration, or the movement of people due to environmental factors. Understanding the justice and equity lens of climate vulnerability is necessary to create effective climate mitigation and migration plans. Past studies in climate vulnerability and climate migration do not provide data analysis at the city scale, and do not always include both climate and social data in their creation. This study addresses these gaps through the creation of a climate vulnerability index for Houston, Texas at the census tract level. Houston is very affected by sea level rise, extreme weather events, and drought due to climate change, prompting this studies' in-depth analysis of climate vulnerability. A climate vulnerability index was developed for each census tract in Houston, Texas through the weighted overlay of 39 social and environmental variables using geospatial analysis in ArcGIS Pro, resulting in three climate vulnerability models: one unweighted, one climate weighted, and one socially weighted. When weighted towards sociodemographic data, vulnerability values were statistically higher. This concludes that including social data and weighting it higher during the creation of a climate vulnerability index is important for a more robust understanding of differential vulnerability and a catalyst for climate justice.

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201 Using Otoliths to Estimate Age and Growth of Mottled Sculpin in a Flow Regulated River

Alexandra Brown, Travis Hackett
Yoichiro Kanno
Warner College of Natural Resources
Research Poster

Information on the natural history is scarce for Mottled Sculpin (Cottus bairdii) despite their ubiquitous distributions on the west slope of the Continental Divide in the Southern Rocky Mountains. In this study, we examined length-at-age of 531 individuals ranging in total length from 39 to 131 mm collected in the Lower Blue River, below the Green Mountain Reservoir in central Colorado. Mottled sculpins were collected in May, August, and October annually between 2021 and 2023 by backpack electrofishing, and sagittae were sectioned for aging by three independent readers. We found that this mottled sculpin population was characterized with slow growth rates, and we attribute this result to cold water temperatures (at this high-elevation river segment downstream of a hypolimnetic water release from the reservoir. We are also investigating whether summer growth patterns differed among the study years which included drought and wetter-than-normal years to inform flow and trout management at the study river.

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221 Managing Human-Black Bear Conflict in Yosemite National Park

Emma Burdick
Dr. Veronica Yovovich
Warner College of Natural Resources
Community Engaged Learning Poster

Human-Black Bear conflicts have been prevalent in Yosemite National Park since shortly after its opening. Despite efforts to mitigate conflict using proper food storage techniques and educational initiatives, visitors and employees of the park still find themselves experiencing negative encounters with black bears. Using information on how forage production influences black bear utilization of anthropogenic sources of food from a 2015 Colorado-based study and the 1987 research on altered plant communities in Yosemite National Park, I am proposing the managers of Yosemite National Park direct their attention to potential causes of human-black bear conflict outside of improper food storage and accessibility of human food to black bears.

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236 Coyote Frequency vs. Tree Cover on a Ranch in New Mexico

Kaidan Capossere
Rae Nickerson
Warner College of Natural Resources
Research Poster

Ever since ranching spread into the American west in the 1800s, cattle depredations from predators have been a huge issue and has led to the extirpation of many native predators. Recently, conservationists have been working with landowners to employ nonlethal methods to reduce depredations. Critical to this effort is finding out where on the landscape most depredations and where predators are most likely to be. Therefore, this project aims to study how coyote presence is related to tree cover. Prior research has shown coyotes to prefer areas with fewer trees to forested areas, but more research is needed on the sagebrush steppe ecosystem. This study takes place on an anonymous ranch in central New Mexico, which contains a mixture of forested areas and prairies. Camera traps placed around the ranch were analyzed for coyote presence and tree cover and then statistical tests were used to determine if there was a significant relationship. It is anticipated that coyotes will be found to prefer either treeless areas or open areas near tree line. Knowing which habitats coyotes prefer allows ranchers to focus nonlethal deterrence on these areas, ideally reducing depredations.

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43 Exploring Carnivore Species Richness Along Travel Routes in Central Utah

Emma Cokeley
Lindsey Engelbert and Rae Nickerson
Warner College of Natural Resources
Research Poster

The advancement of human developments, including recreation and infrastructure, increasingly intersects with carnivorous

species across the United States. Carnivores are forced to adapt to this presence, often leading to frequent encounters in within areas of high human activity. In order to understand the best management tools to address these human-wildlife interactions, it is first necessary to know where it is occurring. This study aims to explore the richness of carnivore species and the detection of carnivores along the travel routes taken in central Utah. Utilizing data from three camera-trap sampling sites across Utah with four distinct travel routes, this study analyzed the presence of carnivores using Timelapse Analyzer, MegaDetector, and RStudio software to assess overall species richness on two-track roads, hiking trails, game trails, and wash. The results found that there was no significant correlation between the detection of carnivores and travel routes, and carnivore species richness and travel routes. These results are likely influenced by this study's small sample size and time constraints. Future research should focus on carnivore species richness in respect to prey availability along travel routes to better understand why these specific paths are chosen and further the goal of human-carnivore coexistence.

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86 Interactions Between Carnivores and Humans and the Impact on Species Richness

Olivia DeVolin
Lindsey Engelbert and Rae Nickerson
Warner College of Natural Resources
Research Poster

Humans and animals have had to coexist on this planet for centuries, but they don't always have positive interactions. Our research project focused on the relationship between animals and humans, specifically how human activity affects the activity and presence of animals. Data was collected through trail cams, and the footage was analyzed via TimeLapse. This allowed us to see when humans and animals were the most active throughout the days and nights. We expect to find a decrease in species richness where human activity was more common and consistent.

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207 On the Pulse: Investigating Fish Temperature Tolerance

Riley Dils
Dr. Tawni Riepe
Warner College of Natural Resources
Research Poster

Anthropogenic changes to water systems are altering the temperature of water, posing a threat to native fish conservation. Western Slope populations of Bluehead Sucker, Flannelmouth Sucker and Roundtail Chub (referred to as the three species), have decreased by 50% likely due to non-native species and temperature changes. The past few years, studies have focused on developing temperature standards to better manage these populations. However, the current procedures for evaluating the optimal temperature ranges are lab-based studies using larval fish and do not encompass adult fish likely due to difficulty accommodating larger fish in lab-based

tests. The Colorado Water Quality Control Commission Policy 06-1 allows for cardiac output as a measure of temperature tolerance in adult fish. The development of an electrocardiogram (ECG) for fish is an opportunity to evaluate optimal temperature ranges of these species. Our study will involve adult fish collected from the Gunnison River to measure temperature tolerance based on cardiac arrythmia. Specifically, fish will be anesthetized and electrodes will be placed on the ventral surface of the fish to monitor heart rate as temperature of the water changes. The critical thermal maximum or minimum are determined by the temperature where the fish has an arrhythmia. Following testing, fish will be held for 24 hours then released. The ECG will provide data necessary to understand the temperature ranges of the three species. We have optimized the ECG with Rainbow Trout and are currently preparing for our first field season to test the three species.

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162 Understanding Space Use Patterns of Grizzly Bears and Livestock in Southwestern Montana

Peter "Jay" Finley
Matthew Hyde, Dr. Stewart Breck
Warner College of Natural Resources
Research Poster

The increasing range of grizzly bears (Ursus arctos) in Southwestern Montana poses challenges for coexistence with human activities on multi-use lands. In this study, we aimed to investigate the space use patterns of both grizzly bears and cattle in the Upper Ruby watershed to understand potential areas of overlap or separation. Using a network of 16 cameras installed over four months, we fit multi-species occupancy models to assess co-occurrence of grizzly bears and cattle. Our results revealed that, while there was some overlap in the land use of grizzly bears and cattle, the presence or absence of cattle had no effect on bear habitat use. We estimated grizzly bear marginal occupancy to be 0.63 ± 0.08 and detection probability of 0.16 ± 0.03. The conditional occupancy (e.g. indicates how the presence or absence of cattle influences occupancy) was estimated to be 0.66 ± 0.08 and was constant despite cattle presence or absence. Our study reveals that overlap between the two species does occur, but the presence of cattle does not influence grizzly bear occupancy. Understanding drivers of co-occurrence is essential for developing effective conservation strategies and reducing conflict on multi-use lands. Our study provides preliminary insights into the spatial interactions of grizzly bears and cattle in Southwestern Montana and underscores the importance of considering how landscape characteristics, such as water sources and vegetation, shape co-occurrence of species. This research provides valuable information to wildlife managers to identify hotspots of conflict between bears and livestock.

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188 Human-Tiger Conflict in India: A Review and Management Plan

Analiese Fullmer
Veronica Yovovich
Warner College of Natural Resources
Research Poster

Tiger-human conflict in India has been an ongoing issue for years. Most of this conflict occurs due to livestock predation and attacks on humans. Although most of India holds tigers in high esteem due to spiritual beliefs, fear for their safety is still a concern. Livestock owners struggle to trust compensation programs due to a lack in efficiency and receiving an appropriate amount of money. Many researchers believe that these conflicts occur because the reserves are too small for the tiger's large home range. Most of these human attacks occur accidentally because villagers have ventured into the forest for resources like fire fuel. With a growing population of tigers and people, a new management plan ought to be made.

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F4 Finding Balance Facing Death

Mila Garelle-Essam
Warner College of Natural Resources
Film

This film acts as a metaphor for everyday life and specifically our future in a rapidly changing climate. The images in the short film were captured near Moab, Utah at a high lining area called the Fruit Bowl. The theme is that facing ideas about our death and any fear, in general, can help us be free from them. It is commenting on how humans fear climate change and are somewhat paralyzed in action to fix it. It speaks to all humans that are alive now and feel a responsibility to improve life for future generations. Those who "feel like the future is in our hands" (a quote from the film) and aim to present hope and confidence in our species. Essentially, helping people feel a balance between humans being amazing and humans having destroyed their environment.

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211 Shifts in Population Distributions Leading to Net Reforestation in China and Turkey

Chase Glick
Anping Chen
Warner College of Natural Resources
Research Poster

Over the last several decades, the impacts of industrialization and population growth on the environment have brought deforestation to the forefront of ecological concerns. Previous research has provided evidence that deforestation is more likely to occur in countries with lower socioeconomic development; however, contrary to these findings, net reforestation has been observed in developing countries with significant shifts in population distributions. Therefore, we investigated whether socioeconomic development status is truly indicative of changes in forest coverage (1), and if population distribution provides a more accurate measure of net reforestation (2). To accomplish this, correlation tests between shifts in population distributions and net reforestation rates were conducted at a provincial scale for China (developing) and Turkey (developed). We found that

socioeconomic development status is not representative of forest cover change. Furthermore, our research provides evidence that both countries have strong correlations with net reforestation and changes in population distribution. Going forward, forestry agencies must consider shifts in population distributions and its effect on forest regrowth to better implement afforestation strategies.

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217 Wolf livestock coexistence on public land

Aspen Grady
Veronica Yovovich
Warner College of Natural Resources
Community Engaged Learning Poster

A human-wildlife conflict scenario I am proposing a management plan around would be livestock-wolf interaction within the state of Colorado's public land. There are currently a majority of plans revolving around private land scenarios, so I would like to present a public land scenario. Understanding that the reintroduction of carnivores on a landscape will at some point alter the ecosystem is an important foundation for this process. Analyzing the current condition of public land where livestock and carnivore habitats can overlap is an additional understanding of current ecosystem functions. Using a healthy environment as common ground from a county, state, or federal position will bring the two main stakeholders, livestock owners, and world advocates, into agreeance. This approach will lead to a more effective plan for management in preparation for a negative encounter to promote coexistence.

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199 Unpacking Bias: Student Reflections on Racism in Conservation Pedagogy

Gabriella Guerrero
Erin Weingarten
Warner College of Natural Resources
Research Poster

This project studies student response to learning about historic and current racism within the field of conservation. The goal of teaching this course and undertaking this study is a response to the calls by research scholars that have been working to dismantle racist and colonialist epistemologies, histories, and assumptions and decolonize the field of conservation. The conservation graduate students wrote three written reflections throughout the semester. The aim for these reflections was to track student response to learning about the course content. Codes and themes will be pulled out from the qualitative coding process and will be interpreted by our coding team. For this project we expect that the results will be representative of some sort of growth or change that students had gone through throughout the semester of taking this course. The results will ultimately suggest how learning about legacies of injustice and being taught to examine their own privilege and biases has impacted conservation graduate students. We expect the findings of this study to demonstrate the importance of teaching

historical context, community led conservation practices, and unpacking researcher positionality in order to practice ethical conservation.

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194 Evaluating irrigation assumptions in Ecosystem Biogeochemical models using remotely sensed and In-Situ data

Joel Hedrick
Avery Driscoll
Warner College of Natural Resources
Research Poster

Soil moisture is a crucial factor driving agriculture management decisions, crop productivity, and above-and belowground biochemical processes. Representations of soil moisture in biogeochemical models therefore underly model projections of crop productivity, carbon fluxes, nitrogen cycling, ecosystem water balance, and other important processes. Currently the model representations of irrigation are highly simplified, however, potentially compromising their ability to adequately capture soil moisture dynamics in irrigated fields. Throughout this research study we quantify the tangible data of accurate inputs of soil moisture variance in the use of biogeochemical models through aggregate data collection from multiple collection sources. Here, we evaluate biogeochemical model estimates of soil moisture concentrations using remotely sensed data in irrigated agricultural lands of Colorado. Specifically, we leverage in-situ soil moisture measurements from 39 irrigated croplands in Colorado and remotely sensed data of soil moisture concentrations from SMAP-HydroBlocks (SMAP-HB) to evaluate the model project accuracy of soil moisture variance. Ecosystem models are used to understand biogeochemical cycles and crop productivity in agricultural systems, failure to represent the soil moisture extremes in models may result in poorer representation of processes that are sensitive to soil moisture, such as crop stress, greenhouse gas emissions, and soil carbon storage. This research give insight into the suitability of SMAP-HB remotely sensed data for capturing soil moisture variance with future implications of these findings being scalable across all US agricultural lands.

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150 The Guardian of the Andes: Puma-Gaucho Conflict and Coexistence in Southern Chile

Seth Hibbard
Warner College of Natural Resources
Research Poster

Conflicts between pumas and humans date back to the era of settler colonialism in South America. With the successful recovery of the Patagonia puma (Puma concolor concolor), particularly within Torres Del Paine National Park in Chile, within recent decades, conflicts are also on the rise. As these majestic cats roam beyond park boundaries onto the vast sheep estancias, they sometimes prey on livestock, inadvertently igniting human-wildlife conflicts. While feral dogs cause more damage to livestock in these estancias and regulations established in the 1980s

aimed at protecting pumas, incidents of illegal puma killings continue—often as a sense of a last resort by the gaucho to protect their livelihoods, their sheep. This may resort to gauchos hiring trained puma killers named leoneros, who are adept at hunting habituated pumas that travel outside the national park. A single leonero might eliminate 75-100 pumas per year on just one estancia, yet the broader economic landscape suggests that coexistence is more beneficial to the gauchos.

Understanding the pressures faced by the ranchers is crucial. Many are stewards of the land with deep ties to their land and livestock. And while ecotourism offers a substantial and more sustainable income that can help mitigate the financial losses from puma depredations, which are significantly less than what is often paid to leoneros, it is not possible in all estancias. The expansion of puma conservation areas would be more plausible and due to the estancias size, immense, if the gauchos saw tangible benefits from living alongside pumas instead of seeing them as a threat. Thus, it is crucial to find common ground and a path towards coexistence between gauchos and pumas. This study aims to compile the works of ongoing research in Chile and evaluate stakeholder relationships to help bridge the gap between the gauchos and the puma and puma advocates, fostering a shared understanding that can lead to innovative solutions. The ultimate goal is a harmonious coexistence that honors the cultural and natural heritage of this iconic species, termed by the Guardian of the Andes.

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122 Aging Naturally: How Spending Time in Nature Affects Executive Functioning and Heart-Rate Variability

Joshua Hofecker, Jordan Rivera
Dr. Sara LoTemploio
Warner College of Natural Resources,College of Veterinary Medicine and Biomedical Sciences
Research Poster

As Alzheimer's disease and related dementias (ADRD) increase, preventative intervention is critical. Executive functioning (EF) is an important factor in ADRD and natural cognitive decline in older adults. Research done has shown that EF is one of the most important factors in cognitive decline, and healthier aging can be predicted through vagally mediated heart rate variability (vmHRV). In this study, we are particularly interested in the effect that nature, real world and virtual, has on EF and vmHRV. A studied technique to increase EF and vmHRV is nature exposure. Our study uses a 2(age) x 3 (environmental manipulation) design with the variables real-world nature, virtual-nature, and a control. We looked at two groups, younger and older adults, for this study. Participants were assessed for EF, HRV, and mood before and after a control of 10 minutes, then again after a 20-minute randomized intervention of either real world nature, VR nature, or indoor control environments. To evaluate EF, Trail Making Test B and the Repeated Battery for the Assessment of Neuropsychological Status were used. HRV was collected via electrocardiogram, and a chest belt recorded respiratory data. We measured vmHRV through Resting Sinus Arrythmia and Root Mean Square of the Successive Differences. Mood was recorded

via the Positive and Negative Affect Schedule, the abbreviated Profile of Mood States, and the Perceived Stress Scale. As suggested by our study so far, real world nature may be more beneficial in reducing perceived stress, while VR nature may be better for working memory.

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176 Plant Functional Trait Trends in the Canadian Tundra

Kendall Iida
Sandra M. Durán
Warner College of Natural Resources
Research Poster

Climate change is likely to disproportionately impact arctic tundra ecosystems. Vegetative communities in these regions both respond to and affect the magnitude of phenomena such as surface temperature and precipitation changes, permafrost melt, greenhouse gas release, and human activity. Shrub encroachment arising from fire suppression and shifting moisture regimes is one notable consequence of these interactions. We can use plant functional traits to link physiological and anatomical variation at multiple scales to this and other processes. Traits such as leaf mass per area, leaf dry matter content, equivalent water thickness, and others concerning leaf photosynthetic economy are particularly useful in this context. Our goal is to gain insights on these issues by examining variability in leaf traits across arctic tundra species, plant functional types (PFTs), and environmental factors. We sampled in July of 2023 from several tundra communities located near Trail Valley Creek Research Station, NWT, CA. We calculated leaf area from field photo scans using RStudio and the ImageJ analysis program and captured fresh and dry weights in situ. We also obtained leaf spectra and vegetation indices. Related projects will summarize trait statistics for species and across plant community types and relate these to site characteristics. Further analysis against factors such as topography, soil properties, and spectra will allow us to further our predictive capacity regarding PFT-climate interactions in the tundra.

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145 Impacts of Shifting Climate Variables on Nutrient Dynamics and Macroinvertebrate Abundance in Colorado Streams

Billy Johnson
Dr Carolina Barbosa
Warner College of Natural Resources
Research Poster

Surface waters are critical in preserving ecosystem functions, ecological systems, and macroinvertebrate health. Water quality parameters such as nutrient concentrations, macroinvertebrate biodiversity & abundance characteristics are critical indicators of ecosystem health. These parameters can be affected by climate change and land use changes. Our project seeks to investigate shifts in physio-chemical water quality parameters in 3 Northern Colorado study sites and attempt to correlate these shifts to changes in macroinvertebrate abundance observations. We retrieved water quality

and macroinvertebrate abundance data from the National Ecological Observatory Network (NEON) science database. We hoped to find significant correlations between climate variables and water quality parameters through statistical analysis. We also analyze the relationship between water quality variables and sensitive macroinvertebrate species abundance. Uncovering these patterns in our research could help shed light on the potential consequences of climate change on water quality and biodiversity in this region of the Rocky Mountains, and help inform land use and watershed management practices.

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224 Impact of Flow Volume and Demographics on Irrigation Extent in the Colorado River Basin

Graeson Lewis
Eva Kinnebrew
Warner College of Natural Resources
Research Poster

The Colorado River Basin (CRB) is facing increasing challenges due to declines in snowmelt, leading to more frequent droughts and irrigation failures. The water rights system exacerbates vulnerabilities, disproportionately affecting marginalized groups like Native American and Hispanic farmers. This study investigates the relationships between irrigation variation, flow volume from the Colorado River, and the proportion of white producers to non-white producers. Using R programming, we examined data on flow volume, irrigation extent, and demographics. Statistical tests were used to assess the relationship between these three variables. The results indicated that non-white producers do have more variability in irrigation extent which highlights racial inequities. This is concerning because variation in irrigation also connects to variation in crop production which directly impacts the economic livelihoods of these producers.

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219 Human-Wildlife Conflict Management Plan: Bats Entering Human Structures

Morgan Lynch
Veronica Yovovich
Warner College of Natural Resources
Community Engaged Learning Poster

A review of the Human-Wildlife conflict between property owners and bats in the New England area. Bats entering human structures pose risk of zoonotic disease transfer to humans and domestic animals, and can cause property damage. Simple removal/exclusion is not always possible due to federal protections some bat species have. This management plan looks to provide tools and methods to resolve the conflict.

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205 A Science-Based Business Plan Built on the Comprehensive Analysis of the Carbon Credit Market

Cole Martin
Dr. Ram Gurung
Warner College of Natural Resources
Research Poster

Amidst escalating concerns over climate change, my research delves into the dynamics of carbon credits, focusing on the existing gaps within protocols and proposing a science-based business plan to address these deficiencies and drive sustainable carbon offset solutions into mainstream practice. The problem my research aims to address is the carbon credit system flaws, gaps, and weaknesses that companies take advantage of, and to create a new business plan for companies that would not have these problems. Previously, there have been efforts to track carbon credits like the Chicago Climate Exchange established in 2003, that later shut down for many reasons, including that there was no incentive for big companies to voluntarily buy and sell credits in the market. Without these companies engaging in sustainable practices like the carbon market, big companies will have no reason to stop what they are doing which will have a massive impact on our climate because " 70.6% (rounded up to 71%) of global GHG emissions since 1988 are due to 100 companies" (Wagner). Through data analysis of our current market, I will address the gaps and create a new science-based business plan for companies to follow that will incentivize, and sometime require the help of companies to have complete and accurate data.

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166 Understanding our Plant & Animal Relatives Through an Indigenous Lens

Brianna Maxwell
Dr. Dominique David-Chavez
Warner College of Natural Resources
Research Poster

The Colorado State University Native American Cultural Center is being gifted a property near Livermore, Colorado. Since little is recorded about the location, this research aims to gather baseline data on riparian (river/stream) plant communities and wildlife that are a part of the landscape. As many traditional foods and medicines grow along bodies of water, the study focused on the riparian corridor (streambed). In doing so, we aimed to develop a protocol for data collection which supports engagement with Indigenous knowledges.
Methods for summer fieldwork were informed by my Michif-Anishinaabe cultural understandings in regard to seasonal timing (phenology) and 'honorable harvest' practices. Honorable harvest represents a widespread Indigenous practice that offers a model of receiving the gifts given by other living beings with respect and reciprocity. The landscape's knowledge was documented through numerous methods, including recording new blooms, GPS data, photos, site descriptions, plant harvests, and researching Indigenous names (Arapaho, Ute, Cheyenne, Lakota, etc.) available in public databases. Additionally, four camera traps were set up near the stream to document related wildlife activity.
Data findings presently include an herbarium of thirty-three unique plant individuals, along with a draft description of

honorable harvest protocol for future researchers. Building from this, we are in the process of consulting regional Indigenous knowledge keepers to verify and further contextualize Indigenous ecological knowledge and language understandings. I hope that the insights gained through this project can inform local ecological restoration efforts and provide education regarding Indigenous relationships with our plant and animal relatives.

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174 Evaluating Model Representation of Soil Moisture in Irrigated Fields

Kate McGill
Avery Driscoll
Warner College of Natural Resources
Research Poster

Models are an integral way for scientists, industry leaders, and policymakers to understand and predict greenhouse gas emissions. Nitrous oxide is a powerful greenhouse gas that is emitted from irrigated agricultural fields. Soil moisture is an important predictor of these emission rates, and as such, accurate and precise soil moisture modeling is important (Frolking, 1998). Here, we test the hypothesis that there is a significant difference in variance between in-situ soil moisture data collected on irrigated agricultural land in Colorado and soil moisture modeled by the Cycles ecosystem model, due to the model's simplified representation of irrigation inputs. After running a correlation test on the variance of the in-situ and soil moisture data, we found that Cycles underestimated the variation in soil moisture. Specifically, Cycles did not accurately capture high soil moisture periods. Failing to capture these highs periods can result in an underestimation of nitrous oxide emissions on irrigated lands. Further research into this issue can help improve estimations of greenhouse gas emissions from agriculture.

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234 Linking individual variation in movement with body condition and angling in Creek Chub

Sarah Jean McMackin
Dr. Yoichiro Kanno
Warner College of Natural Resources
Research Poster

Movement behavior varies greatly among individuals, but little is known about its correlates and how angling alters fish movement. In this laboratory study, we investigated whether body condition explained individual variation in movement and whether fish movement changed before and after angling using wild-caught Creek Chub *Semotilus atromaculatus*. Movement was defined as a full transition between two pools about three feet apart connected by a corridor equipped with a pair of PIT antennas. We repeated an approximately 3-week trial three times between April and October 2023 using Creek Chub of similar body sizes (73-100 mm TL) and fishing was conducted in the second week of each trial. We found that movement was only weakly correlated with body condition. The frequency of inter-pool movement decreased after angling versus

before angling in all trials, but this pattern was not consistently observed in non-angled fish, indicating that angling altered fish movement behavior. Fish movements occurred almost exclusively in a darkly simulated photoperiod. This study showed that some variation in individual movement can be explained by an internal factor (i.e., body condition) and movement can be altered anthropogenically (i.e., angling), which can inform fish conservation and management.

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213 Microclimate heterogeneity within solar arrays drives alterations to soil bacterial communities.

Shelby Mead
Alex Siggers
Warner College of Natural Resources
Research Poster

With solar expanding as the primary renewable energy source, large solar arrays are altering environmental inputs to underlying soils. These altered inputs impact soil microbes, which are key contributors to ecosystem functionality in nutrient cycling, productivity, and soil fertility. We sought to investigate if microclimates created by the solar panels drove heterogeneity in soil microbial communities beneath panels. Environmental data and soil was extracted at multiple microclimates under solar arrays at Northern Colorado Solar Farm during summer 2023. After DNA was extracted from soils, 16S and ITS amplicons were sequenced and assessed with multivariate analyses. Overall, bacterial communities were dominated by taxa that are representative of critical components of the nitrogen cycle systems like Nitrosospharacae Bacteria. Bacterial communities directly affected by the panel-driven redistribution of abiotic resources were unique from control and between panel ($p = 0.012$). These were driven by enrichment of taxa in outside plots including Planctomycetes, Chloroflexi, and Actinobacteria. Our study suggests the expansion of solar facilities will drive changes in soil microbial community structure with potential implications for belowground functionality. These changes may contribute to larger patterns of carbon storage, nutrient transformations, and other ecosystem services.

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14 Man, it's Hot! An Analysis of Energy Demand During Heatwaves in Maricopa County, Arizona

Liam Milton
Anping Chen
Warner College of Natural Resources
Research Poster

July 2023 was the hottest month on record ever since 1880, with extreme heat waves hitting many regions of the world including the western US. Heat waves create extra energy demand for cooling, resulting in more fossil fuel burning, carbon emissions and thus deteriorating climate change. Future projections state that heatwaves will

become more frequent and create higher energy and emission demands globally. To explore the impacts of heatwaves on energy use, we explored Maricopa County, Arizona with weather and energy use data. Integrating these two datasets, we explore the temporal shifts in energy demand and heatwave days. Our data analysis shows that during consecutive heatwave days are quite variable, and show no significant trend. We also find that during summer seasons (cooling season), energy demand and temperature are directly related. Of our 5 weather station sites, spatial differences did not impact this relationship. During fall/winter seasons (heating seasons), energy demand and temperature seem to have an inverse relationship. Energy demand overall is also found to increase during the analysis period of 2016-2023. These findings emphasize the need for future policy to prioritize adaptive energy efficiencies and further emission reduction targets. As cooling demand will increase as heatwave days increase, the clean energy transition is needed to meet further increases.

https://symposium.foragerone.com/csu-curc-showcase-2024/presentations/63961

O10 Analyzing Fuel Treatment Effects on Stand Structure and Wildfire Behavior in Montane Mixed-Conifer Forests of Colorado

Maddy Minard
Sarah Hart
Warner College of Natural Resources
Oral Presentation

Over the last half century, forest management efforts in Colorado have cited historic stand structure and fire regimes to support management decisions in montane mixed-conifer forests. With recent increases in uncharacteristic wildfires across Colorado and the impacts of anthropogenic climate change, it is important to consider the effects of these management decisions on ecosystem resilience. This study compares data from a historical 1860 forest reconstruction study done by the USDA Forest Service's Rocky Mountain Research Station and contemporary pre- and post-management forest inventory data from the Colorado Forest Restoration Institute. This data is used to understand how forest management and mismanagement has influenced forest density and wildfire risk in montane mixed-conifer systems of Colorado. Specifically, this study compared stand structure in pre- and post-management stands treated for fuels reduction with historical 1860 conditions. The USDA Forest Service Forest Vegetation Simulator was then used to compare fuel complexes and potential wildfire risk in pre- and post-management stands with the historical 1860 forest conditions. This study found that contemporary post-treatment stand structure was less susceptible to moderate and high severity wildfire behavior compared to pre-treatment conditions, but historical stand structure still had the lowest wildfire risk. Overall, this analysis further supports the importance of forest management and fuels treatments to lower the risk of uncharacteristic wildfire behavior in montane mixed-conifer forests of the Colorado Front Range. This reduction of uncharacteristic wildfire risk can aid in protecting lives and ecological resources that are put at risk during these events and promotes ecosystem health.

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186 A Qualitative Analysis of Wild Horse and Burro Affinity Organization Websites- Missions, Messaging, And Misinformation

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Sarah King and Stacy Lynn
Warner College of Natural Resources
Research Poster

The feral horse population in the US has a growing population of 300,000, ranging across private, federal, and indigenous landscapes. Currently the populations are growing at exponential rates, drawing in public attention and concern. Land degradation, animal welfare, and harm to private land are all issues posed by the current population size. The Borough of Land Management (BLM) was placed in charge of wild horse operations by the Federal Government and current strategies have sparked debate across wild horse advocacy groups. These stances are available to the public via websites or other forms of outreach and often influence public perception of how horse populations should be handled. To understand the messages advocacy groups are spreading, their websites will be assessed for statements regarding horse populations and their management. It is suspected that these advocacy groups have misled the public, altering public perceptions of why free-ranging horses are in the US and what form, if any, interference is needed to change management strategies. This project aims to analyze current advocacy groups, the messages they are spreading, and what is motivating them to share misleading information. Advocacy groups tend to uphold that animal welfare for the horses is of the upmost importance, but how to manage them safely is often where they disagree.

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192 Using Drones for Bison Conflicts

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Research Poster

The reintroduction of bison to the Yellowstone area has sparked intricate conflicts, intertwining ecological, economic, and social dynamics. While bison act as keystone species, their large populations can lead to overgrazing, posing challenges to vegetation regrowth and biodiversity. Economic tensions arise between conservationists advocating for restoration and concerns from ranchers, Native tribes, and tourism groups. Bison straying from Yellowstone encounter conflicts over forage competition, property damage, and disease transmission. Moreover, bison present safety risks during rutting season, prompting debates over management strategies such as culling or relocation. Socially, differing perspectives on bison's role fuel contentious debates among stakeholders, with Indigenous communities advocating for restoration. Navigating these conflicts necessitates collaborative approaches integrating ecological knowledge and stakeholder engagement. This management plan proposes employing drones with deterrents and GPS tracking collars to mitigate conflicts. Drones equipped with visual and auditory

deterrents aim to guide bison away from restricted areas while ensuring privacy and addressing stakeholder concerns. GPS tracking collars enable stress monitoring in bison during drone trials, informing adaptive management strategies.

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F2 DIY Music Communities of Fort Collins

Giovanna Paterno
Frank Boring
Warner College of Natural Resources
Film

In this documentary, Grayson Reed taps into lesser-known music communities that Fort Collins, Colorado has to offer. Including details about local support for music such as kids painting wooden banjos, it increases viewers' appreciation for music and the importance that it has in everyone's lives to express themselves, no matter the size of the audience. This documentary features Kneelan Boutte, Mark "Rooster" Austin, Michael Gormley "Blasti", Calvin "Cheyney" Cole and Colin Payne as prime examples of the central music focus that lies in Fort Collins.

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215 Black Bear Management Plan For Silverthorne, Colorado

Perla Rodriguez
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Research Poster

Black bear and human coexistence has been a conflict in mountain towns where property damage, safety, and the lack of understanding on black bear behavior are involved. Implementing different tools could alleviate the tension in these towns. Specifically I will be focusing on Silverthorne, Colorado where I grew up and have witnessed this coexistence issue first hand ranging from property damage to simple sightings. My management plan would include education, prevention, and mitigation. Mountain towns in Colorado all experience these issues with black bears; Summit County is a tourist area meaning short term residents might not have the proper education to understand the importance of disposing of trash appropriately. Knowledge gaps such as these and acknowledging them would improve relations with black bears. Addressing other knowledge gaps and implementing non-lethal management tools would benefit a wide range of stakeholders.

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74 From Forest to Faucets: A Hands-On STEM Kit Examining Hillslope Hydrology and Transmountain Diversions

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Research Poster

Colorado relies heavily on its freshwater resources. Residents of Colorado should understand where their water comes from and the basic hydrologic processes that

govern its movement. We have designed the Forest to Faucets STEM Kit to expose middle and high school students to hillslope hydrology and transmountain diversions. The goal of the kit is to guide students through an engaging, one-hour-long experiment through the lens of a hydrologist.

In the first half of the kit, students will explore the effects of disturbances in headwater areas on streamflow generation and rainfall partitioning. Using a laser-cut hillslope cross-section model, they will apply water to simulated old-growth, clear-cut, and burned forests and examine the separation of rainfall into a groundwater well and an overland flow well. In the second half, students will zoom out and investigate precipitation patterns across the state of Colorado, including the concepts of orographic lift and the Continental Divide. They will apply rainfall to a 3-D printed topographic model of Grand Lake, Estes Park, and the Alva B. Adams tunnel, a critical piece of the Colorado-Big Thompson Project. Furthermore, students will quantify the relative amount of water on Colorado's West and East slopes when the transmountain tunnel is closed and open.

Once the kit is completed, it will become part of the Education and Outreach Center's STEM Kit Lending Library. Teachers around the state of Colorado will be able to check out a set of fifteen kits, enough for thirty students, at no cost.

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164 Geospatial Assessment on Fuel Type's effects on Fireline Effectiveness during the 2022 Fire Season

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Research Poster

Fireline Effectiveness (FLE) is a new concept that wildland fire management are using to evaluate and study efficiency in the containment large wildfire incidents. Geospatially, fireline data can be found as far back as 2017, through the NIFC Open Data Site Operational Archive. This has been used to provide a framework in evaluation of effectiveness emplaced fireline from historic wildfires. So far fireline effectiveness has been used as a "report card" for historic large wildfire incidents in studying whether certain suppression/ containment strategies work. In this study fireline effectiveness will be used, however, to study factors such as fuel (vegetation) in why Fireline's failed or why it held. Fuel types and its characteristics (canopy cover, height, etc…) gathered from the LANDFIRE website to see what fuels, are Fireline's least effective. A fireline effectiveness assessment of eight case study wildfires, in the western united states during the 2022 fire season, were overlayed with LANDFIRE vegetation data (fuel type, height, and class). By conducting an overlay analysis on the fuels surrounding mapped attributed Fireline's we can understand what fuel types are prone to having wildfire break containment and causing "burned over" fireline. Vegetation was chosen to overlay over fireline effectiveness data since it is because it is the only part of the fire triangle that wildland firefighters have direct control over in containment. The

study found that Mixed-Conifer, Conifer-Hardwood, Hemlock, Tall Grass, and >30% grass cover has the highest burn over rate for fireline effectiveness. This study can help wildland firefighters and wildland fire management make decisions when determining placement, as well as size, of fuel breaks; as well as other Fireline's such as dozerline and handline.

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168 Investigating Seasonal and Experimental Drying Effects on Belowground Fungal Hyphae, Rhizomorph, and Rhizobium Activity across Four Panamanian Forests

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Research Poster

Tropical forests have some of the largest soil carbon (C) stocks on Earth, which result in part from high fine root productivity and rhizosphere dynamics. Roots host a wide range of microbes in the rhizosphere (i.e., the thin layer of soil surrounding roots), including bacteria and fungi. Little is known about differences in rhizosphere dynamics among different tropical forests and over seasonal changes in rainfall. To address this, we specifically assessed the behavior of fungal hyphae, rhizomorphs, and rhizobium in relation to seasonal differences across four distinct Panamanian lowland forests to 1.2 m depths. We hypothesized that the dry season would have less fungal growth than the wet season and found this to be true. There was a significant difference between the dry and wet seasons when it came to hyphae and rhizomorph growth across the four sites. During the wet season, there were larger hyphae and rhizomorphs in every site and the rhizomorphs were larger towards the soil surface. There was not a significant difference in fungal growth during the dry season between the sites, but site P13 had the greatest fertility and fungal diversity overall. These results show that rainfall stimulates fungal growth in these tropical forests, and climatic drying, including chronic drying and extended dry seasons, is likely to suppress fungal growth and activity. Because fungi fulfill key ecosystem functions, like decomposition and nutrient mineralization, these results have implications for tropical forest C storage and nutrient cycling.

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229 Grazing Grasshoppers in Tallgrass Prairie: Herbivory is Unlikely as a Mechanism for Community Change under Nitrogen Deposition

Matt Schmidt
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Research Poster

Grasslands are one of the most abundant ecosystems globally, are a biodiversity hotspot, a significant carbon sink, and provide numerous ecosystem services. Tallgrass prairie, however, occupies only 3-5% of its former range mainly due to agricultural development. In recent times, grassland community change can be partially linked to anthropogenic nitrogen

addition. There are many mechanisms nitrogen deposition causes community change, and one possible mechanism involves changing patterns of herbivory. Grasshoppers are studied due to their abundance, association with nutrient cycling, and increased biodiversity. Nitrogen deposition may result in higher forage quality and the possibility of increased grasshopper herbivory. Previous work has found a negative association between increasing nitrogen and a particular dominant grass, which encouraged us to explore grasshopper herbivory as a possible mechanism for community change.

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240 Decolonizing Conservation: The Impacts of DEI Education on Graduate Career Aspirations

Calvin Szulc
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Research Poster

The issues we are facing today due to climate change and increasing pressures on the environment call for a drastic shift in the way humans are interacting with the environment. This puts a greater pressure on the conservation field and environmental sector, which shifts our focus onto these sectors and emphasizes the importance of taking historical context, political motives, and longstanding effects of colonialism into the dominant framework of global conservation. As these narratives become more commonplace within conservation, it is important to understand how it affects people's career outlooks. Through qualitative analysis of graduate student reflections on a course related to these topics, codes were used to identify themes that pertained to the student's change in career outlook over the period of the course. Students were found to struggle with their perceptions of conservation and grew to understand their positionality within conservation as the course progressed. These realizations allowed students to feel more confident in how they would like to engage with conservation within their careers.

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209 Mitigation of Livestock and Re-Introduced Grey Wolf Conflict through Non-Lethal Means

Cameron Tolar
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Research Poster

Wolf reintroductions have been proposed and enacted in the mountain west region (MT, WY, UT, CO, and NM) over the last couple of years. One of the main concerns with these reintroductions is potential conflict between cattle and their ranchers with these new wolf populations. Using camera trap data placed on these ranches, we looked at cattle presence in relation temporally to other wildlife (specifically that of predator species such as wolves and coyotes). With this data sheet, we further analyzed the information on RStudio where code was generated that allowed for a time-lapse to be created. This new time-

lapse data column that was created would filter out times when cattle were spotted by cameras immediately followed by a coyote/wolf spot and generate the difference in times between these two pictures. The units of time that the code generated were in seconds. All the times recorded were within one day. Using this data, we can observe if there are any differences in time for cattle appearances and find if they avoid areas were wolves or coyotes appear.

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34 Assessing how rhino occupancy influences the occupancy of other species

Hanna Turk
Derek Fedak
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Research Poster

The rhino is known for its unique territorial behavior that influences the behavior of other species in the surrounding areas. Rhinos use dung to spread their scent across their territory to deter other species from entering the area. The purpose of this study is to analyze what species are impacted by the territorial behavior of rhinos by comparing what species are present or absent in relation to rhino presence. This will help manage the biodiversity of the Greater Kruger area and give insight to rhino and other species behavior. All data was collected prior to this study, via camera traps, set up through the Greater Kruger area in South Africa. Using Megadetector, Timelapse, and R coding software, each camera trap image was processed for species identification, number of individuals present, and time of image captured. Three sites total will be compared to determine occupancy, where two sites show rhino presence and one site has no rhinos present. The data shows that the presence of the rhino promotes symbiotic relationships with other species, and there may be a strong predator-prey dynamic. Following the conclusion of this project, these findings will provide insight on the conservation efforts of the rhino species, determine biodiversity data, calculate species abundance, and improve the management of Kruger National Park and the Greater Kruger area.

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184 Impacts of Shifting Climate Variables on Nutrient Dynamics and Macroinvertebrate Abundances in CO Streams

Gabriella Vieira
Dr. Carolina C. Barbosa
Warner College of Natural Resources
Research Poster

Surface waters are critical in preserving ecosystem functions, ecological systems, and macroinvertebrate health. Water quality parameters such as nutrient concentrations, macroinvertebrate biodiversity & abundance characteristics are critical indicators of ecosystem health. These parameters can be affected by climate change and land use changes. Our project seeks to investigate shifts in air temperature and precipitation patterns in 3 Northern Colorado study sites and attempts to link these shifts to changes in nutrient

concentrations and macroinvertebrate abundance observations. We retrieved water quality, precipitation, discharge, and macroinvertebrate abundance data from the National Ecological Observatory Network (NEON) science database and land cover data from the Multi-Resolution Land Characteristics (MRLC) consortium. Through statistical and data science analysis, we expect to find significant correlations between climate variables to discharge and nutrient concentrations, specifically a positive relationship between precipitation and nitrate concentrations. We also expect a significant relationship between water quality variables and macroinvertebrate abundance. Specifically, dissolved oxygen and chlorophyll-a will be positively correlated, and nitrate and discharge will be negatively correlated to macroinvertebrate abundance due to the macroinvertebrate field index indicating the species' tolerance to pollutants. Uncovering these patterns in our research could help shed light on the potential consequences of climate change on water quality and biodiversity in this region of the Rocky Mountains and can help inform land and watershed management practices.

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232 Growing Food Security at Colorado State University

Link Warren
Sylvia Lee
Warner College of Natural Resources
Community Engaged Learning Poster

As inflation and food prices have soared over the past few years, food banks are becoming a necessity for more Americans than ever before. From the summer of 2022 to the summer of 2023, Food Bank of the Rockies, Colorado and Wyoming's largest food bank, has seen a 40% increase in the number of people they serve. At CSU, the food pantry has also seen a similar increase in the number of students it serves. During the fall semester of 2021, the food bank served more than 1,500 students, faculty, and staff each month, almost double the number of people supported before the pandemic. Growing Food Security is an organization of students and faculty that has partnered with ARDEC South (a research plot at CSU), supportive farmers, and researchers to help those in our community that are struggling with food insecurity have access to fresh and delicious produce. Each year over the winter and spring, student volunteers work to plan and prepare for the growing season at ARDEC by purchasing seeds, growing seedlings, and transplanting them into the field. Throughout the summer, volunteers work on field maintenance and harvest produce to send directly to the Rams Against Hunger food pantry. Throughout the past four years, 24,000 lbs of produce (84,000 servings) have been donated to the food pantry through Growing Food Security. 20 to 50 volunteers help out with this program during the summer that supports about 9,000 (~30% of our student body) food insecure students on campus.

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182 The Effects of Public vs Private Management and Water Provisioning on Herbivore Occupancy in Greater Kruger

Layna Webb
Derek Fedak
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Research Poster

In the Greater Kruger, South Africa, land management takes form in a multitude of different ways, including the management of natural and artificial water points in Kruger National Park (KNP) and nearby associated private nature reserves (APNRs). The goal of this project is to analyze wildlife occupancy data at water points in KNP and the APNRs to determine how public vs private management impacts herbivore occupancy in the region. Data is collected through camera traps at sites throughout KNP and the APNRs and processed for species, number, sex, and age in Timelapse. After processing, the data is analyzed to get occupancy data through MARK. We predict that herbivore occupancy will be greater in privately managed APNRs compared to publicly managed land in KNP. This is expected because the privately managed APNRs have consistently maintained a higher density of artificial waterpoints that encourage wildlife to inhabit these areas, while KNP management has closed many artificial waterpoints to provide heterogeneous surface water access reflective of a systems-based management framework.

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237 Environmental drivers of continuation nesting patterns in black brant (*Branta bernicla nigricans)* in coastal Alaska

Riana Zinn
Caroline Blommel
Warner College of Natural Resources
Research Poster

Reproductive investment has a significant impact on population dynamics of long-lived species. If reproductive investment is highly variable, it is critical that we understand the underlying environmental processes that lead to this variation to maintain stable populations. Some long-lived waterfowl species exhibit variable reproductive investment in the form of continuation clutches - a phenomenon in which individuals continue to lay the remainder of a single clutch in a second nest after the initial nest was destroyed during laying. Analysis of a 28-year long dataset of individually marked black brant *(Branta bernicla nigricans)*, a long-lived goose species, nesting along the Tutakoke River in southwestern Alaska indicated at least one continuation clutch each season from 1990-2017 (excluding 1989). No research has been conducted on continuation nesting patterns in brant. We predict that early springs will increase the number of continuation clutches as more time becomes available for nesting. Additionally, we expect to observe more continuation clutches in years with increased arctic fox *(Vulpes lagopus)* presence as more nests are destroyed by predators. To analyze the relationship between the number of continuation clutches seen in the study site in a given year and these two environmental

variables, we will create two generalized linear models that estimate the relationships between the number of continuation clutches and spring timing or predation pressure. Our results will provide insight into the environmental drivers of brant reproductive investment after the initial decision to nest and could help inform current research on brant population-level response to environmental change.

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