Office Of Research

17TH ANNUAL MOUNTAIN LION RESEARCH DAY

December 12, 2025
12:00-4:00pm

Join us for the closing ceremony and award presentations at 3:15pm in Gallogly Events Center

UCCS University of Colorado Colorado Springs

Contents

Welcome!

Welcome to our 17th Annual Mountain Lion Research Day!

In this very special event, we come together to recognize the outstanding academic accomplishments of our students and faculty. One day is not enough to capture and celebrate all of the incredible research and creative activities happening across our Mountain Lion community. Research and creative activities are happening every day across our campus and continuously fuel innovation and meaningful change in our region and beyond.

We are incredibly proud of our vibrant research and creative community – students, faculty, and staff – who have made us the only research university in Southern Colorado. This cross-campus knowledge exchange and collaborative learning is at the heart of the UCCS mission. Thank you for being here today to share, celebrate, and learn together as a community.

Hillary Fouts, Ph.D. Acting Associate Vice Chancellor for Research

Follow the UCCS Office of Research on Instagram @uccs_oor or visit our website for events, workshops, and opportunities at research.uccs.edu!

Land Acknowledgement

The University of Colorado Colorado Springs (UCCS) commits to acknowledging the land on which we reside. We honor our Native Indigenous communities past, present, and emerging, and recognize the original inhabitants and traditional guardians of what is now Colorado Springs.

We honor this land as the ancestral home of the '*Nuuchiu*', which includes the Northern Ute, the Southern Ute, and the Ute Mountain Ute Peoples. The '*Nuuchiu*' originally referred to Pike's Peak as '*Tava-kaavi'*, or Sun Mountain, being the first peak of the Shining Mountains to see the sun's rays.

We also recognize the many Indigenous Peoples in this region, including the Apache Nation, the Arapaho Nation, the Cheyenne Nation, the Comanche Tribe, and the Kiowa Tribe, and their historical and continuing relationships as stewards of this land.

Land acknowledgments do not exist in the past or as historical context. Colonialism is a current and ongoing practice, and thus we remain mindful of its present impacts. As an institution of higher education, we share the responsibility to actively listen, reflect, and center the histories and lived experiences of Indigenous Peoples.

In community, we will work to dismantle the tragic and oppressive systems that displaced Native Peoples and commit to promoting Indigenous visibility and re-indigenizing our spaces.

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Anthropology Presentations

Presenters:	Taylor Castellon	Undergraduate Student	College of Letters, Arts & Sciences	Anthropology
Co-Authors:	Arden White, SairReese Gavzy, Susan Howell			

Title: Protected Primates: The Spatial and Behavioral Patterns of Geoffroy's Spider Monkey's in a Protected Area.

Abstract: Understanding the spatial ecology of Geoffroy's spider monkeys (Ateles geoffroyi) requires examining how behavioral patterns correspond to environmental features. This study analyzes 273 behavioral observations collected in July 2025 at La Selva Biological Station to assess associations between specific behaviors (foraging, climbing, sleeping, traveling) and two ecological variables: forest canopy layer (lower vs. upper) and water presence (visible vs. not visible). Chi-square tests of independence and standardized residuals were used to identify statistically significant patterns. Foraging behavior was significantly associated with the lower canopy ($\chi^2 = 4.238$, $p = 0.0395$), as was climbing ($\chi^2 = 5.907$, $p = 0.0151$), suggesting that food accessibility and vertical locomotion are concentrated in this forest stratum. Traveling behavior was significantly more common in areas where water was not visible ($\chi^2 = 4.504$, $p = 0.0338$), indicating a preference for drier or more traversable terrain. Sleeping and resting behaviors showed non-significant tendencies toward the upper canopy ($\chi^2 = 2.347$, $p = 0.1256$) and proximity to water ($\chi^2 = 3.439$, $p = 0.0637$). No statistically significant associations were found between behavior and forest type, including abandoned agroforestry, ecological preserve, and old growth areas (e.g., climbing: $\chi^2 = 2.348$, $p = 0.3091$; traveling: $\chi^2 = 1.714$, $p = 0.4244$). These findings suggest that spider monkeys adjust activity patterns in response to canopy structure and water availability, but not strongly in relation to forest management history or type, highlighting key elements of their ecological flexibility and habitat use.

Keywords: Protected Areas. Primates. Spider Monkey's. Behavioral Ecology. Primate Conservation.

Presenters:	Ava Neuharth	Undergraduate Student	College of Letters, Arts & Sciences	Anthropology
Co-Authors:	Dr. Karin Larkin, Dr. Tara Cepon-Robins			

Title: Parasites at the Garden: Identifying potential intestinal infections from an 1890s latrine in the Rocky Mountain West

Abstract: Parasitic infections were historically common in many parts of the United States, with most research focused in the southeastern region. Yet, limited data exists regarding the historic rates of parasitic infection in the southwestern and Rocky Mountain regions where the dry climate and soil quality do not mirror tropical regions where parasitic infections are frequently found. We present a parasitological analysis of soil taken from an excavated latrine from a historic oddities shop and trading post dating to 1892 at the entrance of the iconic Garden of the Gods park in Colorado Springs. This site was excavated by UCCS in collaboration with the City of Colorado Springs in May-June 2025. One liter of soil was collected in 10 cm intervals from three different test units from the latrine. From those samples, 3g of soil was measured, rehydrated in ultra-purified water, strained through nested sieves, mixed with glycerin, and dried on

microscope slides. Slides were analyzed using light microscopy at 100x and 400x magnification. Preliminary investigation of the privy/latrine at 175cm depth detected several Taenia sp. (beef or pork tapeworm) eggs and nematode (possible Ascaris lumbricoides [i.e., giant roundworm]) eggs. These results indicate that tapeworm infection (spread through contaminated beef or pork) and roundworm infections (spread through contaminated soil) were supported by the dry Colorado Springs environment and may have been common infections in the area during the early 1900's. This has important ramifications for our understanding of the likelihood of infection in the region today.

Keywords: Parasitology, anthropology, archaeology, Garden of the Gods

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Presenters: Arden White | Undergraduate Student | College of Letters, Arts & Sciences | Anthropology

Co-Authors: Susan Howell

Title: Howler Monkey Resource Use at La Selva Biological Station

Abstract: Understanding the ecological behavior of mantled howler monkeys (Alouatta palliata) requires examining how specific behaviors align with environmental resource distributions. This study investigates associations between howler monkey behaviors, specifically foraging and sleeping/resting, and three resource categories: canopy layer, forest habitat type, and water resource availability. We analyzed 273 behavioral observations collected at La Selva Biological Station in July 2025 using chi-square tests of independence and standardized residuals to identify statistically significant relationships. Foraging was positively associated with the lower canopy (residual = +2.67) and negatively with the upper canopy (–2.44), suggesting food resources are more accessible in lower strata. Foraging was also more common in ecological reserves and abandoned agroforestry zones, and less frequent in selectively logged forests, indicating sensitivity to forest disturbance. Sleeping/resting behavior showed a strong preference for the upper canopy (residual = +4.10) and avoidance of the lower canopy (–4.73), likely reflecting selection for safety or thermoregulation. These behaviors were also more commonly observed near major rivers (residual = +1.64), possibly due to favorable microclimates or reduced disturbance. These findings reveal a non-random distribution of behavior across habitats, highlighting a strong linkage between behavioral patterns and structural and hydrological features of the environment. Conservation strategies should prioritize maintaining vertical canopy complexity and protecting riparian zones to support behavioral diversity and long-term species persistence.

Keywords: Primatology, Anthropology, Water Resources, Howler Monkey

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Biology Presentations

Presenters:	Roger Bradford	Undergraduate Student	College of Letters, Arts and Sciences	Biology
Co-Authors:	Jessica Pacheco			

Title: Influence of Bacterial Infection (Serratia marcescens) on Nutrient Intake in Dubia Cockroaches

Abstract: This study examined whether infection from the bacteria Serratia marcescens alters food intake and growth in Dubia cockroaches (Blaptica dubia). S. marcescens is a Gram-negative, opportunistic pathogen known to infect many insect species and can disrupt nutrient balance and immune function. Sixty cockroaches were divided into infected and uninfected groups and provided either a standard or high-protein diet for one week. Food consumption and body mass were measured before and after the trial, and data was analyzed using ANOVA to test for significant differences between treatments. Infected cockroaches consumed less food relative to body mass, even with the high-protein diet, indicating that the infection may cause a loss of appetite or interfere with normal feeding. Weight patterns also differed, as infected individuals lost mass on both diets, while uninfected controls gained weight, especially with the high protein diet. These results indicate that S. marcescens infection negatively impacts feeding behavior and nutrient absorption in B. dubia. The findings contribute to the understanding of host-pathogen relationships and their role in diet and behavior.

Keywords: Serratia marcescens, Blaptica dubia, Nutrient Intake, Host-pathogen Interactions

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Presenters:	Ava Brandt	Undergraduate Student	College of Letters, Arts and Sciences	Biology
Co-Authors:	Emmerson Lindblom			

Title: Investigating the Effect of Dog Waste on the Growth Rate of Ocimum Basilicum

Abstract: With the growing population of pets, pet waste poses a serious environmental issue, as it can pollute waterways, contaminate soil, and release greenhouse gases when not disposed of properly. The purpose of this research is to explore the use of dog waste as a plant fertilizer to promote ways to recycle pet waste. We conducted an experiment to compare the use soil with and without added dog waste on the growth of Ocimum basilicum (sweet basil) over a 4-week period. Results show that the addition of dog waste in soil supported plant growth in leaf amount but didn't benefit in stem height or leaf length. This implies that dog waste is a potentially good fertilizer, but further research is needed to explore the limitations found in this experiment.

Keywords: Basil, fertilizing, dog waste

Presenters:	Grant Capen	Undergraduate Student	College of Letters, Arts and Sciences	Biology
Co- Authors:	Diamond Coursey-Gonzalez, Aidan Moore			

Title: Investigating the Role of Np_F3829 in the Hmp Chemotaxis System

Abstract: Nostoc punctiforme is a nitrogen-fixing cyanobacterium that has the ability to differentiate into three different cell types: akinetes, heterocysts, and hormogonia. Hormogonia are specialized motile filaments that allow for movement across surfaces. This enables N. punctiforme to reach optimal light for photosynthesis and establish symbiotic relationships with plants involving nitrogen-fixation. Motility is powered by type IV pili (T4P) and the activity of the motors is regulated by HmpF, which associates with and activates the T4P motors on one side of the cell to establish directional motility. Unipolar localization of HmpF is regulated by the Hmp bacterial chemotaxis-like system, but the exact mechanism of this control is currently undefined. Using transposon mutagenesis, Np_F3829 was identified to be essential for motility in N. punctiforme. Np_F3829 contains a response regulator domain (REC domain), which are known to be phosphorylated by chemotaxis-like systems, and a second domain of unknown function. Previous work indicated that 3829 was essential for type IV pilus extension in hormogonia, and preliminary protein-protein interaction and localization studies implied that Np_F3829 interacts directly with type IV pilus motors. These results lead us to the hypothesis that Np_F3829 is part of the Hmp chemotaxis system, and that the phosphorylation state of Np_F3829 is responsible for the unipolar recruitment of HmpF to the type IV pilus motors. In this study, a series of bacterial two-hybrid assays were performed to identify protein-protein interactions between Np_F3829, T4P, and Hmp system proteins. Subsequently, GFP-fusion proteins were utilized to determine how Np_F3829 influences the localization of several T4P and Hmp proteins. The results of these experiments strongly support the hypothesis that Np_F3829 is responsible for the unipolar recruitment of HmpF to T4P motors on one side of the cell to facilitate directional movement.

Keywords: Microbiology, molecular biology, chemotaxis, cyanobateria, nostoc

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Presenters: Kelly Eisenhart | Undergraduate Student | College of Letters, Arts and Sciences | Biology

Co-Authors: Sam Caldwell and Jayden Heukeis

Title: Phenotypic Changes Following CRISPR/Cas9 Knockout of the RTKN Gene in Chinese Hamster Ovary Cells

Abstract: The RTKN gene encodes for a conserved scaffolding protein called rhotekin, which plays a role in cytoskeletal organization and stress-response signaling across many mammalian cells. Rhotekin binds to RhoA GTPase, which functions as a molecular switch, regulating both actin stabilization and the NF-κB pathway (nuclear factor kappa-light-chain-enhancer of activated B cells). To observe the effects of RTKN on cytoskeletal stability and stress-response signaling, Chinese Hamster Ovary (CHO) underwent CRISPR/Cas9 mutation of the RTKN gene. These cells enabled us to observe the phenotypic changes between wild-type (WT) and mutant RTKN cells. CHO cells can survive in challenging circumstances, and they are similar to human cellular processes. After genome editing, wild-type and RTKN-mutant cells were compared using fluorescence microscopy with actin, tubulin, nuclear, and mitochondrial stains to observe morphological differences. In comparison to WT, the RTKN mutant cells exhibited reduced metabolic activity. However, we are currently analyzing both mutant and WT CHO cells to determine any phenological differences.

Keywords: CRISPR/cas9, Knockout of RTKN Gene, Chinese Hamster Ovary Cells, Fluorescence microscopy, metabolic activity

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Presenters:	Evren Fisher	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Author: Evren Fisher

Title: Identifying reproductive effects of the gene ARI26162 in Drosophila arizonae

Abstract: RNA is a conserved feature in male ejaculates but its function is unknown. Our lab previously found that Drosophila arizonae male RNA is translated into protein by females (male-derived, female-translated proteins; mdFTPs). We hypothesize that these mdFTPs may play a role in fertility, fecundity, and other aspects of reproduction. The gene ARI26162 is a mdFTP and is also the one of the most highly expressed genes in the female reproductive tract. To assess the functionality of ARI26162, we used CRISPR-Cas9 to perform a knockout (KO) of the gene. We compared reproductive success of KO and wild-type (WT) females mated to WT males. Although these assays do not directly test the effects of the male RNA/mdFTP on reproduction, knockout of the female protein provides general insight into how the protein functions in the female reproductive tract given, that the gene is highly expressed by females. Fecundity data showed no significant differences when comparing WT flies to KO flies. Currently, we are determining if there is any significant variation in fertilization success between WT vs. KO females.

Keywords: Drosophila arizonae flies, mdFTPs, seminal fluid, RNA

Presenters:	Clinton Green	Graduate Student	College of Letters, Arts and Sciences	Biology

Co-Authors: Jeremy Bono

Title: Drosophila arizonae ARI14664 Impacts Reproduction When Knocked Out in the Female but Not the Male

Abstract: Recent research has revealed that the composition of male seminal fluid is more complex than initially believed. Since our lab's discovery of RNA transcripts in the seminal fluid of Drosophila arizonae this has been confirmed in several other organisms, indicating RNA is a conserved feature of male ejaculates. Our current research aims to elucidate the function of this RNA in the reproductive process. We discovered the gene ARI14664 is passed to the female as one of these seminal fluid transcripts during copulation. Once received the female translates 14664 into a protein. The function of this protein is still unknown, but a CRISPR mediated knockout is expected to elucidate its function. Of its many possible roles, one of interest is the protein's potential involvement in the formation of an opaque structure that manifests within the reproductive tract of the female post copulation known as the insemination reaction (IR). To evaluate the reproductive function of this gene we performed three assays: IR size, fertility, and fecundity. To observe any phenotypic changes, mutant (M) unmated males were mated with unmated wild type (WT) females and compared to their WT counterparts. Additionally, this gene is expressed in the female, and these reproductive assays were performed in the reciprocal (M female x WT male). As predicted, we were able to establish that ARI14664 is involved in all reproductive stages measured when knocked out in the female. However, our assays lacked the power to demonstrate the role of this gene in reproduction as a seminal-fluid transcript.

Keywords: Genetics, Reproduction, CRISPR

Presenters:	Skyler Hane	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Co-Authors: Alaina Cargile

Title: Silver Wormwood

Abstract: Plants have been a source of pharmaceuticals for centuries, with many drugs derived from them for a wide range of uses. Alaina and I collected Silver Wormwood (Artemisia ludoviciana) and prepared a bulk extract using methanol. The plant material was chopped and weighed to 2 grams, then placed into a mortar and pestle with 3 mL of methanol and ground to produce the extract. We tested Artemisia ludoviciana for its antifungal properties—specifically, its ability to inhibit the growth of fungi—using dough and test tubes. We found that the plant interfered with the dough rising, suggesting that it may contain antifungal compounds. The plant extract was also tested using in vitro assays. Two tests were conducted: one with brine shrimp (Artemia) and another with water fleas (Daphnia). Two microplates were labeled and filled with various concentrations of the plant extract, along with food. The number of living organisms in each microplate was recorded at the start, after 20 minutes, and again after 24 hours. After 24 hours, the number of living organisms was significantly lower than the initial count. This result indicates that Artemisia ludoviciana contains chemicals that are toxic to small aquatic organisms, demonstrating that the plant extract has strong biological activity.

Keywords: Ethnobotanical Methods, Bulk Extracts, In Vitro Assays

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Presenters:	Albert Lara	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Co-Authors: Tebais Jones

Title: Influence of Neighbor Proximity on Germination and Root Growth in Basil (Ocimum basilicum)

Abstract: Plant spacing has been shown to influence competition, resource allocation, and growth in many species of plants. Previous research has shown that high planting density can increase total yield per area, but often reduces the individual plant sizes, revealing a trade-off between proximity and growth. To test how neighbor proximity affects basil growth under controlled conditions, we compared three planting configurations: clustered, spread, and isolated over a four-week time period. Each configuration contained 15 Genovese basil seeds planted 2.5 cm deep in a 1:3 mixture of Miracle-Gro potting soil and sphagnum moss and grown in an incubator set at 30°C under continuous white LED illumination. After four weeks, the total plant length from the primary root tip to the shoot apex was recorded, as well as the number of axial roots that grew from the apex. Mean values for each variable were compared among treatments using a Kruskal-Wallis test. Our results showed that root length was the only trait significantly affected by spacing, with spread plants producing the longest roots. Stem height, leaf size, axial roots, and leaf count showed no significant differences, indicating that early shoot growth remains stable across spacing treatments while root development responds more strongly to planting arrangement.

Keywords: basil, planting, biology, ecology, farming, planting, seeds, gardening

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Presenters:	Nylah Mirshafiei	Undergraduate Student	College of Letters, Arts & Sciences	Biology

Author: Nylah Mirshafiei

Title: Postmating-Prezygotic Reproductive Isolation and Ovarian Developmental Differences in Drosophila mojavensis

Abstract: Postmating–prezygotic (PMPZ) reproductive isolation, which occurs when male ejaculate and female reproductive physiology are incompatible, is increasingly recognized as a key barrier in early speciation. Drosophila mojavensis and D. arizonae provide a strong system for studying PMPZ isolation, hybridizing despite evident ejaculate–female incompatibilities. Previous RNAseq data shows that D. mojavensis females mated to D. arizonae males fail to upregulate chorion-associated genes at six hours postmating, whereas conspecific matings induce strong transcriptional activation, suggesting a disrupted ovarian response to heterospecific ejaculate. Our current research examines how heterospecific and conspecific ejaculates influence oogenesis and oviposition in D. mojavensis females. We hypothesized that the increase in chorion gene expression after conspecific matings results from an acceleration of oogenesis and egg-laying, whereas heterospecific ejaculates fail to elicit these responses. However, egg-laying did not differ among mating type, indicating that ejaculate composition does not alter oviposition. We next sought to evaluate whether differences in chorion gene expression could be explained by a reduction in egg chamber maturation rates in heterospecifically-mated females. This was done by evaluating maturing egg chambers (stages 10-14) in dissected ovarioles using fluorescence microscopy. Although more samples are needed to draw robust conclusions, preliminary data suggest no differences in egg chamber maturation rates among females mated to conspecifics, heterospecifics, or unmated females. Altogether, these data suggest that heterospecifically-mated females, and unmated females, may reduce investment in the egg chorion, a structure critical for fertilization success and embryo viability.

Keywords: Speciation, Postmating-prezygotic (PMPZ) reproductive isolation, Ejaculate–female incompatibility, Gene expression, Oogenesis, Oviposition

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Presenters:	Alyssa Daly	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Co-Authors: Emma Melendez, Khoa Nguyen, Paige Tupea

Title: Investigating the Roles and Impact of Neurotransmitter Receptors in Glia

Abstract: Neurotransmitters are known to play key roles in treating neurodegenerative and mental disorders like Alzheimer's disease and generalized anxiety disorder, while the role of the glial neurotransmitter pathway in these disorders is yet to be fully explored. Drosophila melanogaster is an ideal model organism to explore these pathways because of the diverse and sophisticated tools for genetic manipulation and the similar neurotransmitter pathways to humans. We are utilizing the Gal4/UAS system to disrupt the function of neurotransmitter receptors from the serotonin and GABA to elucidate the consequences on the overall neurological health of the animals. Our preliminary results indicate that animals with neurotransmitter receptor dysfunction perform poorly in behavioral tests compared to controls. Although glial dysfunction has been described in myriad neurological disorders, the function of these neurotransmitter pathways within glia has not been studied. Thus, the results of this study will have a significant impact in the field of neuroscience.

Keywords: Glia, Neurotransmitter, Drosophila, Melanogaster

Presenters:	Mallory Nightshade	Graduate Student	College of Letters, Arts and Sciences	Biology

Co-Authors: Estefania Elorriaga, Cathleen Ma, Lisa Hargest, Amanda Goddard, Steven H. Strauss

Title: CRISPR-induced floral gene mutation for genetic containment in poplar

Abstract: Modern genetic engineering enables the development of trees with enhanced traits such as pest resistance, herbicide tolerance, and disease resistance. However, public concern and strict regulation of genetically modified organisms largely stem from the risk of transgene escape into wild populations. Poplar trees, which disperse pollen over long distances, present a particular containment challenge. This research explores CRISPR/Cas9 gene editing as a strategy to prevent gene flow by inducing floral sterility. Two key floral regulators, AGAMOUS (AG) and LEAFY (LFY), were targeted to disrupt reproductive development. Edited and unedited control trees were grown in the field and evaluated for genetic changes, flower traits, and overall growth. DNA testing confirmed successful edits that caused sterility, while statistical analyses showed no significant differences in height or general performance compared to control trees. Sterility remained consistent across multiple flowering seasons, showing stable genetic containment. These findings demonstrate a practical, field-tested approach to preventing gene flow from genetically engineered trees.

Keywords: CRISPR/Cas9, genetic containment, floral development, LEAFY, AGAMOUS, poplar, reproductive sterility, forest biotechnology

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Presenters:	Michael Park	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Co- Authors: Jeremy Bono

Title: Assessing Fertilization Success of ARI\26162 Mutant Males in Drosophila arizonae

Abstract: Reproduction involves sperm insemination, migration, and storage within the female reproductive tract. This hostile, proteolytic environment imposes strong selection on male ejaculate components, exposing them to physical stress and oxidative damage. Consequently, coevolution between sexes occurs through conflict and cooperation. Previous research in our lab discovered that Drosophila arizonae males deliver mRNA to the reproductive tracts of Drosophila mojavensis females post-mating. These mRNAs are translated by the female into male-derived, female-translated proteins (mdFTPs). This finding raises the possibility that males regulate female reproductive processes via RNA delivery that is subsequently translated by the female. 166 mdFTPs were identified and traced to specific genes. This experiment investigates a single mdFTP, ARI\26162, which encodes chymotrypsinogen A, a serine protease precursor expressed in both sexes of D. arizonae. Although both sexes require proteolytic activity along their reproductive pathways, the role of this mdFTP is unknown. Since males transfer mRNA derived from this gene and not protein, functional knockouts in males allow us to evaluate the specific effects of the mdFTP on reproduction. We used CRISPR to establish a homozygous mutant line, and a fertilization assay was performed. Wild-type females were mated to either wild-type or mutant males, and fertility ratios are currently being compared between cohorts. We hypothesize that mdFTPs are important for reproductive success and that matings with mutant ARI\26162 males will yield lower fertilization success.

Keywords: mdFTPs, male-derived, female translated proteins, RNA transfer, fertilization, CRISPR, Drosophila, arizonae, reproduction, post-mating processes, fertility assay, gene knockout, male-female interactions, biology, ejaculate, DAPI, insect

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Presenters:	Marcus Portillos	Undergraduate Student	College of Letters, Arts, & Sciences	Biology

Co-Authors: Kody VanderPol

Title: Medical Activity of James' Buckwheat (Eriogonum jamesii var. wootonii)

Abstract: James' Buckwheat (Eriogonum jamesii var. wootonii) is a common plant found throughout the Southwestern United States and is used for xeric landscaping and has been used by different Native American Tribes for medical use such as analgesic aid, gastrointestinal aid, and sore treatment to name a few. The medicinal properties of Eriogonum species are typically attributed to the presence of saponins in plant tissues. Due to its plentifulness and its past use for medicinal aid, a study was conducted to determine its antifungal properties and its toxicity. The James' Buckwheat extract was made using a water-based extraction method. This extract was tested for its antifungal properties and toxicity. The extract was used to test if it inhibited the expansion of yeasted dough. The same extract was added to multi well trays with populations of Artemia and wells with Daphnia to determine toxicity. The extract inhibited the growth of yeast as well as showing signs of toxicity with regard to Artemia and Daphnia. Further biomedical testing would have to occur to determine potential therapeutic use for Erigonum jamesii

Keywords: James' Buckwheat (Eriogonum jamesii var. wootonii), medical activity, antifungal, toxicity

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Presenters:	Joyclyn Reed-Starr	Graduate Student	College of Letters, Arts, & Sciences	Biology

Co-Authors: Dr. Lisa Hines, Dr. Lisa Hollis-Brown, Dr. Amber Marean, Dr. Thomas Wolkow, & Jayden Heukels

Title: CRISPR/Cas9-Mediated Gene Knock-In Validates Homology-Directed Repair in Schizosaccharomyces pombe

Abstract: CRISPR/Cas9 has revolutionized gene knockout studies, but restoring gene function through precise knock-in remains challenging. Competing repair pathways favor error-prone mechanisms over homology-directed repair (HDR). Successfully integrated sequences also risk re-cutting by Cas9, preventing stable restoration. We adapted a knock-in strategy to validate HDR-mediated gene restoration in the fission yeast Schizosaccharomyces pombe (S. pombe), using avt5 as a proof-of-concept system with screenable salt-sensitivity phenotypes. Our approach integrated three components: an sgRNA directing Cas9 to the deletion junction, a 1.46 kb repair template containing the avt5 coding sequence flanked by 100 bp homology arms, and a silent mutation near the PAM sequence preventing Cas9 re-targeting. We transformed avt5Δ knockout cells with the pMZ379 Cas9 plasmid, repair template, and sgRNA across three independent biological replicates. Transformants were screened on salt medium to assess functional restoration. Knockout cells exhibited complete salt tolerance with 15/15 patches showing growth. Knock-in transformants showed restored salt sensitivity with 3/15 patches showing growth, matching wild-type phenotypes at 0/15 growth. Statistical analysis confirmed significant differences across strains ($\chi^2 = 35$, $df = 2$, $p < 0.001$). These results validate successful HDR-mediated chromosomal integration and functional complementation. This work establishes a reliable CRISPR/Cas9 knock-in methodology for S. pombe, providing a foundation for functional genomics applications

including essential gene characterization, pathway complementation studies, and targeted allele replacement.

Keywords: CRISPR/Cas9-Mediated Gene Knock-In Validates Homology-Directed Repair in Schizosaccharomyces pombe

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Presenters:	Nicole Ridley	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Co-Authors: Camille Smith

Title: Anchorage, Interrupted: How Fn1 Loss Drives CHO Cell Hyperproliferation

Abstract: Fibronectin 1 (Fn1) is a major extracellular matrix (ECM) protein that coordinates cell adhesion, cytoskeletal organization, and anchorage-dependent survival signaling through integrin-mediated pathways. Disruption of Fn1–integrin communication can alter proliferation, morphology, and the mechanical cues that regulate cell cycle progression. To investigate how loss of fibronectin influences cellular behavior, we used CRISPR-Cas9 genome editing to introduce a targeted mutation in the Fn1 gene in Chinese Hamster Ovary (CHO) cells. A guide RNA was designed to target an exon immediately upstream of a PAM site, enabling Cas9-mediated cleavage and repair by non-homologous end joining. This edit is predicted to generate a small insertion or deletion—likely four-base pair frameshift ten nucleotides from the PAM—resulting in a truncated or nonfunctional fibronectin protein. Following CHO cell transfection, genomic DNA was extracted, PCR amplified the targeted region, and the PCR product was analyzed by agarose gel electrophoresis to confirm editing. Phenotypic characterization was performed using light microscopy and manual cell counts.

Fn1-knockout cells displayed markedly increased proliferation and altered attachment dynamics relative to wild-type controls. These observations suggest that loss of fibronectin weakens integrin-dependent anchorage signaling, diminishing mechanical restraint on cell cycle entry while maintaining survival through compensatory ECM interactions. Together, these findings highlight CRISPR-Cas9 as an effective tool for functional genetic analysis in cultured cells, providing new insights into how Fn1 loss-of-function disrupts ECM signaling networks relevant to adhesion, wound healing, and proliferative disorders.

Keywords: Anchorage-Dependent Growth; Cell Adhesion; Cell Proliferation; CHO Cells; CRISPR-Cas9; Extracellular Matrix (ECM); Fibronectin (Fn1); Genome Editing; Integrin Signaling

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Presenters:	Taylor Roy	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Co-Authors: Ilene Robledo

Title: Light Pollution Effects on Vanessa cardui on a 24-Hour Versus 12-Hour Light Cycle

Abstract: Studies on light pollution (LP) have indicated that the increasing amount of artificial light due to urbanization has a detrimental effect on both nocturnal and diurnal insects. Our research investigated the effects of simulated LP on Painted Lady butterflies Vanessa cardui during their larva and pupa (i.e. caterpillar and chrysalis) phases. We hypothesized that V. cardui caterpillars exposed to continuous 24-hour light would exhibit comparatively increased stress, reduced mass, elevated CO2 respiration rates, and extended larval phases. Caterpillars were divided into two groups: a control group on a 12-hour light/dark cycle and an experimental group exposed to 24-hour LP. Caterpillars' mass (g) and CO2 respiration rates (parts per million of CO2 over 180

seconds) were measured. When they pupated, chrysalis lengths were measured (cm). Data supported that LP did not extend the larval phase, average masses of the two groups were not significantly different (though we noticed greater variation and presence of potential outliers in the LP group's masses), and the LP group's chrysalis lengths and appearances varied more than the 12-hour group's. The control group displayed higher CO2 respiration rates compared to the LP group, possibly indicating that the LP group did not respond to stress in an expected way, though further studies will be needed to confirm these findings.

Keywords: pollinators, Vanessa cardui, Painted Lady butterfly, caterpillars, light pollution, artificial light at night (ALAN), artificial light, urbanization

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Presenters: Berkley Segelke | Undergraduate Student | College of Letters, Arts and Sciences | Biology

Co-Authors: Maya Garcia – Sojo

Title: False Golden Aster

Abstract: False Golden Aster was found behind the Osborne building at University of Colorado Colorado Springs on the base of a hill near the roadside. The plant was collected and preserved by picking the plant from its roots to the leaves and flowers, these were saved to be used for further testing. Another sample of the plant was used to create a herbarium. Extracts were then prepared to be used in the assay for toxicity, hormonal activity, and antimicrobial effects. The plant extract was tested in Vitro Assay on Brine Shrimp (Artemia) and Water Fleas (Daphnia). The Artemia was combined with salt water and Roti-Rich for food, while the control used methanol. When adding the plant extract, this was done in increasing concentrations. The number of Artemia inserted was recorded and again after 20 minutes the amount of living and dead. The Daphnia were combined with freshwater and Roti-Rich for food. The control for the experiment was methanol. The plant extract was added in increasing concentrations. The amount started with was recorded then after 20 minutes the amount living and dead were recorded. The results for the Artemia showed very little toxicity due to how many were still living after 20 minutes. The results for the Daphnia showed zero deaths after 20 minutes with only one appearing injured or affected by the plant extract. Based on these conclusions, it was decided that False Golden Aster is not high in toxicity, and exhibits low short term toxicity.

Keywords: Flower, medical use, toxicity, medial ethnobotany

Presenters: Isabel Spann | Undergraduate Student | College of Letters, Arts and Sciences | Biology

Author: Isabel Spann

Title: Phosphorylation of Serine-537 in Ase1 and Its Role in G2-Microtubule Damage Response in Schizosaccharomyces pombe)

Abstract: The eukaryotic cell cycle comprises the G1-S-G2-M phases, during which microtubules drive the mechanical movement of replicated chromosomes during mitosis (M-phase). Eukaryotic cells can temporarily halt progression through the cell cycle in response to structural or DNA damage to ameliorate unfavorable conditions before replication proceeds, using the DNA damage response (DDR) complex, which depends on the regulatory subunit Rad26-ATRIP/Rad3-ATR. Student researchers in the Wolkow lab previously identified a novel G2-microtubule damage response pathway dependent on Rad26-ATRIP that functions independently from the DDR complex and screened a cDNA overexpression library of rad26Δ in Schizosaccharomyces pombe

to identify other proteins in this pathway, where a partial C-terminal fragment of microtubule bundling protein Ase1 was isolated (Doss et al., 2021). They reported that ase1Δ failed to delay mitotic entry as a result of thiabendazole-induced G2-microtubule damage, and investigations by Wilson-Grady et al. (2008) led to the development of my hypothesis that the phosphorylation of the 537-serine site of the C-terminal fragment of Ase1-PRC is crucial for G2-microtubule damage checkpoint activation. Site-directed mutagenesis, substituting S537 with an alanine (S537A), inactivated the G2 microtubule damage checkpoint because alanine lacks the necessary -OH group required for phosphorylation, which was confirmed with a fluorescence microscope by using GFP as a negative reporter. This was further supported by S537A cells failing to delay mitosis following microtubule damage, indicating the importance of S537A in this checkpoint pathway.

Keywords: CRISPR/Cas9; Checkpoint Signaling Pathways; Cell Cycle Regulation; Protein Phosphorylation; Yeast Model

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Presenters:	Amanda Trujillo	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Co-Author: Teneisha Ferguson

Title: Effects of Ozone-Exposed Food Source on Painted Lady (Vanessa cardui) Caterpillar Growth and Feeding Behavior as Adults

Abstract: This study is to identify whether the development of caterpillars reared on ozone-exposed food is affected and if they prefer the same or regular food in adulthood. We raised a total of 30 Painted Lady (Vanessa cardui) caterpillars (15 being fed ozone-exposed food and the other 15 being fed non-exposed standard food) to see if development was affected. The food was exposed using an air purifier that has an ozone generator that we set to “level 3”, which equates to approximately 2.00 ppm when cycle is running. As V.cardui matures and pupates, we tested their preference using banana samples that were exposed to ozone as well as non-exposed. Each adult V.cardui was individually tested to monitor preferences. It was found that there weren’t any associations between being exposed to ozone-contaminated food and their development. However, preferences regarding food choice showed that the ozone-reared butterflies didn’t have much of a preference where the standardized butterflies showed no preference in regards to them not feeding at all during the experimental time frame of 15 minutes. This could provide insight into how ozone may or may not have an impact into certain pollinators life cycle, such as V. cardui.

Keywords: Vanessa Cardui, ozone exposure, ozone

Presenters:	Natalie Young	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Co-Authors: Heidi Johnson, Cody Schieder

Title: The Effects of Keystone Species in Major Plant-based Ingredients in Popular Processed Foods

Abstract: Countless popular processed food items contain plant-based ingredients. Some of the most common families in these items include Fabaceae, Poaceae, and Amarylildaceae. Using quantitative ethnobotanical methods can reveal the usage of plants given a specific culture and prioritize species for conservation efforts. Utilizing the “Cultural Importance Index” for both the genus (GCII) and families (FCII) of plant-derived ingredients, scientists are able to understand the relationship between biological and cultural diversity. It was found that out of twelve total

snacks the most common cultural keystone families include Fabaceae and Poaceae. Identifying the most common culturally important botanical families in processed foods reinforces the need for conservation and preservation efforts for large crops of cultural keystone families.

Keywords: Plant-based, ingredients, Processed foods

Chemistry and Biochemistry Presentations

Presenters: Nicole Beitle | Graduate Student | College of Letters, Arts and Sciences | Department of Chemistry & Biochemistry

Authors: Nicole Beitle

Title: Optimization of boride reduction of 3,5-disubstituted isoxazoles

Abstract: A one-pot procedure for the preparation of 3,5-disubstituted isoxazoles was utilized. This reaction involved cycloaddition of hydroximinoyl chlorides with acetylenes in the presence of base to form isoxazoles. Two novel isoxazoles were synthesized by this method. The reduction of simple isoxazoles was tested through a transfer hydrogenation method. Transfer hydrogenation utilized hydrazobenzene in the presence of a copper on iron catalyst. This reaction is being optimized to perform the reductive ring opening of isoxazoles to enaminones. Experimentation showed that the excess hydrazobenzene over reduced the ketone to an alcohol instead of the desired enaminone. This reaction is being optimized with different solvents, molar equivalents, and transfer hydrogenation reagents. The research finds the reduction of 3-(5-subsituted) isoxazole(s)has not produced good yields of enaminones by transfer hydrogenation, or iron-mediated ring opening.

Keywords: Isoxazole reduction, N–O bond cleavage, ring opening, enaminone formation, β-enaminones, transfer hydrogenation, nickel boride reduction, $NaBH_4/NiCl_2$ system, copper-on-iron catalyst, hydrazobenzene reduction, heterogeneous catalysis, isoxazole ring-opening pathway, reaction optimization, TLC monitoring, NMR characterization, IR, heterocycle reduction, precursor to 3,5-disubstituted pyrazoles, scalable reaction design.

Presenters: Steven Duncan | Undergraduate Student | College of Letters, Arts and Sciences | Department of Chemistry & Biochemistry

Author: Steven Duncan

Title: Novel Hydrogel Formulation for the Purification of Single-Walled Carbon Nanotubes

Abstract: Polyvinyl alcohol (PVA) was functionalized with allyl glycidyl ether (AGE). Functionalization was verified via nuclear magnetic resonance (NMR). The functionalized PVA was used to create a hydrogel copolymer network with N,N'-methylenebisacrylamide (MBA) via radical initiation with sodium persulfate (NaPS) with varying starting material ratios. The hydrogel was blended to achieve a size distribution between 32-63 µm. Columns were loaded with each hydrogel for comparison against a column loaded with Sephacryl, a hydrogel with studied single-walled carbon nanotube (SWNT) interactions, and a control column with no hydrogel. The adsorption and elution of carbon nanotubes by each gel was assessed via UV/Vis spectroscopy. The adsorption and elution spectra were fit using Mathematica and known spectra from pure SWNT

to determine the amount of each species of SWNT that are absorbed and eluted by the hydrogels. It was determined that PVA-based hydrogels have strong irreversible adsorption interactions with all species of SWNT and do not exhibit the selectivity required to be a useful SWNT purification medium.

Keywords: carbon nanotube purification

Presenters:	Aidan Burke	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Co-Authors: David Weiss, Dalia Drew Vazquez, Najila Vasquez

Title: Different Courses, Different Impacts: Unequal Benefits of Learning Assistants in General Chemistry 1 vs. 2

Abstract: Learning Assistants (LAs) are widely used to improve student outcomes in introductory STEM courses, yet it remains unclear whether their impact is consistent across different course levels, such as between General Chemistry 1 and 2, or when combined with other academic support strategies. This multi-semester study directly compares LA-supported and non-LA-supported active learning sections of General Chemistry 1 and 2, taught by the same instructor at a public R2 university with a diverse student population. Student performance (exam scores, DFW/DF rates, GPA), affective outcomes (self-efficacy, belonging), and resource use (in-class LAs and drop-in tutoring) were analyzed using regression and ANOVA. Results show that LAs significantly improved GPA and reduced DFW rates in General Chemistry 1, but had limited effect in General Chemistry 2, where students were more academically prepared. While LA-supported students reported increased belonging, only self-efficacy significantly predicted course GPA, suggesting a more specific mechanism of impact. A layered support model—combining LAs with Science Center tutoring—produced the greatest gains for at-risk students in gateway courses. These findings indicate that LAs are most effective in first-semester, high-DFW contexts, and that building students' self-efficacy may be central to improving academic performance and persistence in undergraduate STEM pathways.

Keywords: Learning Assistant, General Chemistry, STEM Education, Self Efficacy, DFW Rates, Tutoring, Gateway Courses, Education Analysis

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Presenters:	Lily Lyons	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Co-Authors: Alejandro Vargas

Title: Optimizing Lipid Bilayer Formation to Study Protein Interactions with Model Cell Membranes

Abstract: Cells are surrounded by a plasma membrane that filters cellular imports/exports and protects their contents. It is made of a phospholipid bilayer, which is organized into regions of condensed lipids (ordered domains) and fluid lipids (disordered domains). These domains are contingent on lipid properties such as melting temperature, tail length, and headgroup charge, and they are important in protein interactions at the cell surface. Supported lipid bilayers (SLB's) are phospholipid bilayers made from unilamellar vesicles and allow scientists to study protein interactions with a phospholipid bilayer mimicking different cell types. SLB formation is also

contingent on lipid properties. This project focuses on optimizing supported lipid bilayer formation for confocal microscopy. SLB's composed of 35% cholesterol, 25% 1,2-dioleoyl-sn-glycero-3-phosphocholine (DOPC), 20% 1-palmitoyl-2-oleoyl-sn-glycero-3-phosphocholine (POPC), and 20% sphingomyelin (SM) were visually evaluated with different lipid concentrations and temperatures. This lipid composition was chosen to mimic the outer layer of the phospholipid bilayer. Several fluorescently labeled lipid dyes were used to image the SLBs to assess the membrane quality as conditions were varied. Findings show that 30µL of 3mM lipid solution added to 70µL of a 10X concentrated saline solution, and an SLB incubation temperature of 55°C minimized unfused vesicles in images. With newly optimized SLB parameters, this project sets the foundation for studying surface protein interactions in a model membrane under different cell conditions.

Keywords: Microscopy, confocal, fluorescence, protein interactions, lipid dynamics,

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Presenters: Alexander Ruiz | Graduate Student | College of Letters, Arts and Sciences | Department of Chemistry & Biochemistry

Author: Alexander Ruiz

Title: Syntheses focused on 1,4-disubstituted bis-1H-1,2,3-triazolophanes formed by ring-closing metathesis (RCM) via Grubbs catalysis by a build/couple/pair model

Abstract: The development of symmetrical 1,4-disubstituted bis-1H-1,2,3-triazolophanes was investigated using the build/couple/pair approach. Terminal alkene functionality was coupled onto symmetrical 1,4-disubstituted bis-1H-1,2,3-triazole derivatives to utilize olefin metathesis ring closure with the Grubbs II catalyst. Two novel triazole derivatives with allyl functionality were produced using SN2 methodology.

Keywords: Grubbs Catalysis, Triazole, Sn2, Novel

Presenters: Joseph Hamilton | Graduate Student | College of Letters, Arts and Sciences | Department of Chemistry & Biochemistry

Authors: Luis E. Lowe, Andrea Tully

Title: Brain Teasers! Analysis of Psychedelics in Postmortem Biological Samples Using LC-MS/MS

Abstract: With an increasing number of states in the US adding propositions to decriminalize psychotropic substances, it has become an objective for crime labs to develop ways to monitor their presence in postmortem toxicology samples and for lawmakers to receive these data. Some of the challenges with detecting compounds within biological matrices (blood, brain, urine, liver, and muscle tissue) include dealing with matrix effects, drug-drug interactions, and drug stability. The Standard Practices for Method Validation in Forensic Toxicology provides guidelines for developing new methods for sample preparation and drug extraction. Techniques such as solid phase extraction (SPE) and liquid-liquid extraction (LLE) are used to remove select drugs (basic indole alkaloids) from these complex biological samples taken at autopsy by manipulating their charge state. To quantitate the amount of drug present, liquid chromatography with a tandem mass spectrometry detector (LC-MS/MS) is a technique that is both sensitive and selective. Thus far, compounds in acetonitrile were stable for 14+ days stored in the freezer (-20 C) with limits of detection reaching as low as 1 ng/mL and recoveries of drug after spiking in synthetic urine as high as 99 percent. By verifying the stability of psychedelic drugs in biological matrices, developing an extraction protocol with high recovery, and using the validated method on samples collected by the El Paso County Coroner's Office, the results of this study will

demonstrate a verified method for detection and quantitation of these select compounds which will affect 20 counties across the state of Colorado.

Keywords: Psychedelics, Postmortem Forensic Toxicology, SPE, LLE, LC-MS/MS

Presenters: Alejandro Vargas | Undergraduate Student | College of Letters, Arts and Sciences | Department of Chemistry & Biochemistry

Author: Alejandro Vargas

Title: Impact of Galectin-3 Protein on Membrane Organization Using Fluorescence Microscopy

Abstract: The organization of membrane components is critical for cell-cell adhesion and signaling, with consequences in immune response, cancer metastasis, and neurodegeneration. Galectin-3, a human chimeric lectin protein, interacts with GM1 gangliosides in lipid rafts (rigid, liquid-ordered microdomains that host diverse signaling proteins); an interaction that is mediated by Gal-3 binding to the carbohydrate moiety of GM1 via its carbohydrate recognition domain (CRD). This project examined whether Gal-3 binding induces domain rearrangement in supported lipid bilayers (SLBs) of physiologically relevant composition. SLBs were prepared and imaged by confocal fluorescence microscopy over four hours. Membranes were labeled with TexasRed-DHPE, which partitions into liquid-disordered regions, enabling visualization of phase-separated features. Three membrane conditions were evaluated, which include bilayers containing 5% GM1 (no added protein), 0% GM1 + Gal-3, and 5% GM1 + Gal-3. Upon Gal-3 injection, we observed the emergence of dark patches consistent with condensed, liquid-ordered domains strictly in the 5% GM1 SLBs. These features were absent in the other compositions and in the absence of protein, which indicate that Gal-3/GM1 interactions promote reorganization of membrane structure. These observations support the hypothesis in which Gal-3 driven GM1 clustering alters membrane domain organization, providing future direction to test membranes under varying concentrations of both Gal-3 and GM1. Using fluorescently labeled galectin may aid in identifying the potential mechanism by which it could regulate signaling events in cells.

Keywords: microscopy, membrane reorganization, cell-signaling, galectin-3, GM1

Presenters: Kevin Schroeder and Anthony Economou | Undergraduate Student | College of Letters, Arts and Sciences | Department of Chemistry & Biochemistry

Co-Authors: Kevin Schroeder and Anthony Economou

Title: Use of Small Peptide Inhibitors in Complement Immune System and Epstein-Barr Virus

Abstract: The Epstein-Barr virus (EBV) infects more than 90% of the world's population, largely mediated by the EBV viral glycoprotein 350 (gp350), which binds to human complement receptor type 2 (CR2/CD21) on B-cells. Primary infection occurs early in childhood, but is usually asymptomatic; however, delayed infection in adolescence or later results in the development of infectious mononucleosis. EBV infection can result in long-term carriage, which can result in nasopharyngeal carcinoma, non-Hodgkin lymphoma, and autoimmune conditions like lupus erythematosus and rheumatoid arthritis. Currently, there are no vaccines or therapeutics against EBV. In this study, we investigated the use of small peptide sequences to inhibit the binding of gp350 to the CR2 receptor protein through using Bio-Layer Interferometry (BLItz) assays. Validation of our BLItz assay was shown as the interactions between gp350 and CR2, and C3d and CR2 matched literature values. Our results show that there are no inhibition characteristics

of PEP3 and PEP1 with CR2–IFNα interactions. Future focus for this study will be on the inhibition characteristics of PEP3 and PEP1 on gp350 – CR2 interactions.

Keywords: Epstein-Barr Virus, CR2, gp350, Complement Immune System, Inhibition,

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Presenters: Kristina Hrbac | Undergraduate Student | College of Letters, Arts and Sciences | Department of Chemistry & Biochemistry

Authors: Kristina Hrbac

Title: ThioflavinT Fluorescence Assays to Observe Aβ Fibril Growth in the Presence of EGCG

Abstract: Alzheimer's Disease is a neurodegenerative disease that afflicts millions of people. It is theorized that amyloid β (Aβ) aggregates on the outside of neurons, acting as a predecessor to this disease. In Alzheimer's disease, amyloid beta begins as a monomer and eventually aggregates into amyloid fibrils over time, causing neuronal toxicity. This process occurs even faster in the presence of cell membranes. EGCG, a molecule found in green tea, has been viewed as a potential compound to reduce Aβ fibrillation. Fibril formation of Aβ can be measured by the fluorescence of thioflavin T (ThT), but adding polyphenols like EGCG might cause interference in absorbance measurements. Aβ monomers were added to a solution containing model cell membranes (liposomes), ThT, and EGCG. After over 300 hours, it was observed that the fluorescence values increased in a stepwise manner as EGCG concentrations increased, indicating that EGCG alone causes background fluorescence that overlaps with detection in the region of interest. However, based on the ratios of EGCG:Aβ used, the change in fluorescence over time was varied, suggesting the EGCG is having a measurable impact on fibril formation. Overall, these results suggest that although ThT fluorescence assays are not the best tool to measure fibril formation in the presence of EGCG, the molecule is likely either preventing aggregation or changing the pathway the Aβ monomers take to make off-target aggregates. Future experiments will use a physiologically relevant lipid composition to give a clearer image on how EGCG interacts with Aβ in the human body.

Keywords: Fluorescence Assay, Alzheimer's Disease, Amyloid beta, ThT

Presenters: Katie Ly | Undergraduate Student | College of Letters, Arts and Sciences | Department of Chemistry & Biochemistry

Co-Authors: Hunter Redmon

Title: Applying Critical Point Positions for Enzyme Design: Kemp Eliminase Directed Evolution

Abstract: Designed enzymes greatly broaden the horizon of catalyzed reactions, but their catalytic efficiencies currently lag behind those of natural enzymes. One well-studied designed enzyme is kemp eliminase, which catalyzes isoxazole ring opening. Computationally designed kemp eliminases have been successfully subjected to lab directed evolution, significantly improving catalytic efficiency at the cost of being highly resource intensive. The goal of this work is to understand the potential optimization of electrostatic effects through vibrational motions occurring during directed evolution and incorporate this into computational enzyme design.

Although electrostatic preorganization has previously been found to be an important contributor to enzymatic activity, designing enzymes with this concept in mind is challenging, especially as the exact effects of electric fields on electron charge density are not well delineated. Through a QTAIM (quantum theory of atoms in molecules) lens, convergence of bond and ring critical points leads to bond breaking and therefore ring opening such as that seen in the kemp

elimination reaction. This work investigates the relationship between ring and bond critical point (CP) positions calculated with DFT (density functional theory) alongside activation energies. A uniform electric field of varying strengths is applied to a highly abbreviated kemp eliminase system (catalytic base and substrate only) in order to investigate changes in critical points. Changes in ring and bond critical point distance and directional alignment may lead to better informed information about the contributions of vibrational motions to catalysis.

Keywords: enzyme, kemp eliminase, computational chemistry, critical point, QTAIM, directed evolution

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Presenters: Daniel March | Undergraduate Student | College of Letters, Arts and Sciences | Department of Chemistry & Biochemistry

Author: Daniel March

Title: Determining Interactions Between Membrane-Bound Mucins and Galectin 3

Abstract: Mucins and galectin-3 are a class of proteins that, in normal, healthy cells, perform cell signaling, specifically for cell growth and division; however, they show differential expression in cancerous cells. In many cancer cells, mucins also contain the Thomsen-Friedenreich (TF) antigen, which is recognized by the galectin-3 protein. The goal of this research is to investigate the interactions between these two membrane-bound proteins using X-ray reflectivity and a Langmuir trough. The mucins in cells are large proteins with highly glycosylated polypeptide chains that extend from the membrane. To facilitate our experiments, we designed a model system where the mucin has been significantly shortened in length, with only one glycosylation site. When proteins interact with the membrane, they cause changes to the electron density, surface pressure, and the amount of X-ray radiation reflected to the detector. We observed that the membrane surface pressure increases gradually when mucin inserts into the membrane, and increases quickly when the galectin-3 attaches to the carbohydrate of the mucin. The increase in surface pressure suggests that the proteins bind to the membrane when added sequentially. Preliminary X-ray reflectivity measurements suggest that galectin-3 specifically binds to the TF antigen on the model mucin. The long-term impact of this work is to understand how the TF antigen facilitates binding between the mucin and signaling proteins, such as galectin-3, thereby contributing to cell signaling events that promote cancerous activity.

Keywords: X-ray reflectivity, proteins, mucins, galectin-3, cancer

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Presenters: Stephen Marshall | Undergraduate Student | College of Letters, Arts and Sciences | Department of Chemistry & Biochemistry

Co-Authors: Janel Owens

Title: Elucidating the Mechanism and Kinetic Parameters of SNaP: Silver Nanoparticle Antioxidant Assay

Abstract: Antioxidants are influential drivers of the billion-dollar anti-ageing industry, which includes the sales of personal care products and functional foods. Research in our group has focused on validating a silver nanoparticle (SNaP) assay to determine antioxidant potential of small molecules in foods, including known antioxidants like vitamin C. Here, we aim to elucidate the mechanism of this assay to understand how antioxidants react with ionic silver and/or silver nanoparticles (AgNPs) to cause a signal increase at 405 nm. Additionally, we aim to understand the kinetic parameters of the assay. To study the mechanism and kinetic parameters, AgNPs were synthesized using a laboratory-grade microwave from silver nitrate in the presence of soluble starch and arabinose. concentrations of pre-seeded AgNPs, silver ion (Ag+), and

antioxidant concentration (here, we used the antioxidant standard gallic acid) were varied in a simple array via a 96-well reaction plate while monitoring nanoparticle absorbance at 405, 430, and 450 nm while observing changes to gallic acid concentrations at 247 nm using a Biotek plate reader. Our initial results suggest that the inclusion of antioxidants causes the pre-seeded AgNPs to grow in size, resulting in a red shift and increasing absorbance at 430 and 450 nm, and that the assay is first-order with respect to antioxidant concentration.

Keywords: Kinetics Mechanism Silver Nanoparticles Antioxidant Assay

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Presenters:	Nathan Maruska	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Hunter Redmon, Amanda Morgenstern

Title: Controlling Unoccupied Molecular Orbital Stability Using External Electric Fields

Abstract: Chemical synthesis touches everyone's lives in one way or another, whether its with pharmaceuticals, fuels, or material science. One way to reduce synthesis duration is through enzymes, which greatly increase the rate of reactions. Enzymes such as kemp eliminase have the special ability to orient different amino acid residues such as glutamic acid and histidine to achieve a very specific electric field in the active site. These electric fields assist enzymatic reactions by destabilizing the reactant state and stabilizing the transition state. Given the existence of natural and engineered electric fields, it would be beneficial to obtain an improved fundamental understanding of the effect electric fields have on molecular orbitals (MOs) as they play a role in chemical reactions. Using density functional theory, homogeneous external electric fields were applied to a variety of cyclic organic compounds, with emphasis on the kemp eliminase substrate, benzisoxazole. This yielded a substantial energy decrease in unoccupied MOs. Antibonding б unoccupied MOs tended to delocalize from the whole molecule with the electric field and became more stable than antibonding π unoccupied MOs at high electric field strengths. However, effects on other unoccupied orbitals seem to vary between molecules. Electric fields along the isoxazole C-->H bond has been shown to catalyze the kemp elimination reaction. This work illustrates the increased interaction between the highest occupied MO of the nucleophile and lowest unoccupied MO of the substrate largely due to the rapid decrease in their energy gap after the application of an electric field.

Keywords: Computational Chemistry, density functional theory, kemp eliminase, catalysis, electric field, molecular orbitals, benzisoxazole

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Presenters:	Casper Reese	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Co-Authors: Luna Park

Title: Expression and Purification of a Galectin Protein

Abstract: Galectins are a family of proteins that bind to sugar-decorated molecules such as glycolipids and glycoproteins that are displayed on cell surfaces. Galectins bind to sugars using their carbohydrate recognition domains (CRDs). Galectin-3 (Gal-3) contains one CRD and a disordered N-terminal domain. Overexpression of Gal-3 has been linked to cancer metastasis and abnormal immune responses. A plasmid containing the Gal-3 coding sequence was transformed into BL21 E. coli, and protein expression was induced in the bacteria. Then, the bacteria were lysed using lysozyme and sonication, and the larger cell debris was removed through centrifugation. The supernatant was passed through a lactose affinity chromatography column to isolate and purify

the Gal-3. Functioning Gal-3 binds to the lactose in the column while the other contents of the cell are washed off, leaving the purified Gal-3 behind. Gal-3 was successfully purified through these methods, but a significant amount of protein was lost during the cell lysis process. Optimization of cell lysis will improve the protein yield, making the purification process more efficient. Gal-3 also binds the sugars on endotoxin, so the endotoxin needs to be removed from the sample before the protein can be used for experimentation. The purified Gal-3 will be used in future experiments that investigate the role of Gal-3 in cell membrane binding and organization..

Keywords: Galectin-3, Protein Expression, Protein Purification, Recombinant DNA, Affinity Chromatography

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Presenters:	Alexander Ruiz	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Alexander Ruiz

Title: Sonication for Rate Enhancement of a Copper(I) Azide-Alkyne Cycloaddition (CuAAC) Reaction

Abstract: Bis-triazoles have been prepared efficiently in our laboratory using an NHC catalyst in aqueous solution at 80°C. The reactions were carried out in aqueous solvent, affording very good to excellent yields. The reactions also proceeded in good yield in water at room temperature for about a day. Bis-triazolecarboxylic acid derivatives gave poor microwave yields due possibly to heat-driven decarboxylation, affording an opportunity for development of a more efficient procedure. Results on efforts to increase the reaction rates using sonication methodology, as compared with other methods, are presented here.

Keywords: Sonochemistry, Triazole, catalyst

Presenters:	Jose Andres Sandino	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Jose Andres Sandino

Title: Amyloid Beta and Epigallocatechin Gallate Interactions With Anionic and Complex Lipid Membranes

Abstract: Amyloid beta (Aβ) is a protein implicated in the development of Alzheimer's disease through its ability to bind to neuronal membranes and aggregate into fibrils that form amyloid plaques. These interactions can cause pore formation, membrane thinning, and increased fluidity, ultimately disrupting neuronal function. However, the precise mechanism by which Aβ binds to different types of membranes and the structural consequences of these interactions remain unclear. This study investigated how Aβ interacts with an anionic lipid membrane (DMPG) and a physiologically relevant six-component complex membrane, and whether epigallocatechin gallate (EGCG), a polyphenol found in green tea, can affect these interactions. X-ray reflectivity was used to measure the lipid monolayers before and after exposure to Aβ and EGCG. Reflectivity profiles were fitted to extract membrane-binding information and structural parameters such as membrane thickness, electron density, and interfacial roughness. Results showed that Aβ binds more strongly to the anionic DMPG membrane compared to the complex membrane, where Aβ primarily embedded within the monolayer rather than binding to its surface. Previous research has shown that Aβ will bind strongly to complex membranes given sufficient incubation time; for this study, neither the instrumentation nor the time were available to observe this. When EGCG was added, Aβ embedding decreased in both membrane

systems, suggesting that EGCG interferes with Aβ-lipid interactions either by altering Aβ conformation or by occupying membrane regions that block insertion. Overall, these findings demonstrate that membrane composition strongly influences Aβ behavior and that EGCG effectively limits Aβ insertion into membranes.

Keywords: Amyloid Beta, Epigallocatechin Gallate, X-Ray, electron density, anionic membrane, complex membrane, reflectivity

Communications Presentations

Presenters:	Sofia Shappell	Graduate Student	College of Engineering	Computer Science

Authors: Sofia Shappell

Title: Why Women Play

Abstract: By the age of fourteen, young girls drop out of sports at two-times the rate of young boys due to fewer opportunities to play, issues like safety and transportation, and social stigma around them playing (Women's Sports Foundation, 2025). This research study examines what motivates women to participate in sports as adults to help find solutions to girls dropping out of spots. The study focuses on what draws women to playing sports, potential barriers to participating, and individual athletes' stories.

Data was collected from a 29-question survey sent to adult female athletes. Questions included "How supported/encouraged do you feel to participate in sports?", "What are the biggest benefits to you participating in sports?", and "What are the biggest barriers to you participating in sports?".

The goal is to discover athletes' "why" and use their stories to help inspire other women to stay in sports, come back to sports they loved, or try a sport for the first time. The data in this study will inform a documentary for social media dedicated to telling female athletes' stories.

Keywords: women's sports, sports participation, amateur sports, sports, documentary, social media, sports media

Computer Science Presentations

Presenters:	Laura Baird	Undergraduate Student	College of Engineering	Computer Science
Author	Laura Baird			

Title: OrQstrator: An AI-Powered Framework for Advanced Quantum Circuit Optimization

Abstract: We propose a novel approach, OrQstrator, which is a modular framework for conducting quantum circuit optimization in the Noisy Intermediate-Scale Quantum (NISQ) era. Our framework is powered by Deep Reinforcement Learning (DRL). Our orchestration engine intelligently selects among three complementary circuit optimizers: A DRL-based circuit rewriter trained to reduce depth and gate count via learned rewrite sequences; a domain-specific optimizer that performs efficient local gate resynthesis and numeric optimization; a parameterized circuit instantiator that improves compilation by optimizing template circuits during gate set translation. These modules are coordinated by a central orchestration engine that learns coordination policies based on circuit structure, hardware constraints, and backend-aware performance features such as gate count, depth, and expected fidelity. The system outputs an optimized circuit for hardware-aware transpilation and execution, leveraging techniques from an existing state-of-the-art approach, called the NISQ Analyzer, to adapt to backend constraints.

Keywords: deep learning, reinforcement learning, nisq, quantum circuit optimization

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Presenters:	Michael Conner	Undergraduate Student	College of Engineering	Computer Science
Co-Author:	Terrance Boult			

Title: Large Language Models for Software Security Weakness and Vulnerability Mitigation

Abstract: Modern computing has advanced to perform in a wide array of different applications, from personal entertainment to advanced medical analysis. Contemporary software solutions that drive these fields of computing may be powered by potentially billions of lines of code being difficult to patch identified bugs or vulnerabilities. As such, automated vulnerability mitigation methods are a highly desired system for developers and maintainers of such large codebases. In turn, these solutions may potentially have significant impact on the effectiveness and efficiency of the work of software developers and software security experts tasked with these roles. However, current solutions are typically designed for a single language and seldom produce code that ”best fits” within a developer’s project. In addition, existing methods suffer from a typical over-fitment problem that potentially reduces their expansion potential and accuracy. In turn, current solutions often fail to identify and correct potential vulnerabilities when exposed to new and unseen code. Existing methods also lack a significant ability to provide new information and context to improve the success rate of generated patches. Using recent advancements in code analysis and Large Language Models (LLMs), we are proposing LPatcher as a new approach for Automated Vulnerability Repair (AVR). By leveraging the analytical power and wide knowledgebases of contemporary LLMs, LPatcher aims to also offer possible vulnerability patches and suggestions based on in/depth code analysis and generation rather than simple code matching.

Keywords: large language models, automated vulnerability repair, software security, vulnerability mitigation, code repair, ai4se

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Presenters:	Thomas Gherna	Undergraduate Student	College of Engineering	Computer Science

Authors: Thomas Gherna

Title: Efficient Heuristic Defense Policies for Dynamic Cyber Threats

Abstract: Effective cybersecurity often entails making decisions quickly with limited resources. Although there are mathematical frameworks that can compute the “best possible” defense strategy, these approaches become far too slow to use on real-world networks. This project explores whether simple, fast heuristic cleaning strategies against a spreading virus can still provide strong protection while remaining practical for large systems. To investigate this, we built a simulation framework that implements several heuristic strategies that prioritize cleaning computers based on their importance or position within the network. These strategies were compared to an optimal policy computed through an exact algorithm that is only feasible on small networks. Our results show that several of the network-based heuristic strategies perform close to the optimal solution on small networks, and we compare among the heuristic strategies on larger-scale networks. We observe that performance varies depending on network structure, suggesting that topology plays a key role. Overall, these findings indicate that lightweight, topology-guided approaches may provide a practical and scalable foundation for cyber-defense systems.

Keywords: Cybersecurity, Malware propagation, Dynamic decision-making, Markov decision processes (MDP), Heuristic defense strategies, Graph theory, Network topology, Simulation modeling

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Presenters:	Nazanin Siavash	Graduate Student	College of Engineering	Computer Science

Authors: Nazanin Siavash

Title: LLM-Powered Quantum Code Transpilation

Abstract: A wide range of Software Development Kits (SDKs) has been created to support different quantum computing platforms. Collectively referred to as Quantum SDKs (QSDKs), popular examples include Qiskit by IBM, Bracket by Amazon, and Cirq by Google. While this diversity enables developers/researchers to choose tools suited to their needs, it also introduces substantial difficulties for interoperability and cross-platform development of hybrid quantum–classical applications. Conventional approaches to transpiling code between QSDKs rely on manually designed, rule-based transpilers that demand significant effort, deep domain expertise, and constant maintenance to remain accurate. In this work, we investigate the potential of Large Language Models (LLMs) as a more adaptive and automated alternative. By harnessing their pre-trained knowledge, we treat LLMs as a language-agnostic code transpiler engine that can convert quantum programs between different QSDKs. This eliminates the burden of creating and maintaining handcrafted transformation rules and provides a more scalable, flexible approach to ensuring quantum software portability.

Keywords: large language models, transpilation, qiskit, cirq

Counseling and Human Services Presentations

Presenters:	Kazzandra Medellin	Graduate Student	College of Engineering	Computer Science

Co-Authors: Jose Tapia-Fuselier, Brynn Adamson

Title: Ableism in Therapeutic Settings: Addressing Health Disparities in Mental Health Services for the Disability Community

Abstract: There is a notable absence of disability-focused curriculum in mental health clinician training, leaving clinicians insufficiently prepared to provide affirming, competent care to disabled clients. This study seeks to address this gap by exploring the lived experiences of disabled clients who have engaged in mental health counseling. We employed a qualitative research study to gain insight on mental health experiences, disability competency of clinicians, accessibility of mental health organizations, relationship of disability to mental health, and recommendations for clinicians who work with disabled clients. Our inclusion criteria were aged 18+, self-identification as disabled, and previous experience in mental health counseling. We sent recruitment materials to 65 disability-related organizations for distribution and were contacted by 124 interested participants. We conducted eligibility screening among 68 participants (the remaining were added to a waitlist), and 56 enrolled and consented to participate in the study. Fifty participants completed a brief demographic survey, and a semi-structured interview. Interviews were analyzed using inductive thematic analysis. Participants described disability-related barriers in accessing care and undergoing assessments, the need for clinicians to initiate explicit conversations about disability, and the frustration of having to educate their clinicians about disability. Participants frequently engaged in self-advocacy within therapy, and desired disability to be acknowledged as a salient aspect of identity. Despite challenges, participants highlighted positive therapeutic experiences via supportive relationships, treatment autonomy, and meaningful accommodations. These findings underscore the critical need for disability competency training within counselor education and inform future training efforts.

Keywords: Disability Experience, Counseling, Mental Health

Cybersecurity Management Presentations

Presenters:	Adrian Dy	Graduate Student	College of Engineering	Computer Science
Co-Author:	Lamar Richardson, Michael Prindiville			

Title: A Green Data Privacy Program: Integrating Environmental, Economic, and Social Dimensions of Digital Sustainability at UCCS

Abstract: This study addresses the emerging research problem of aligning data privacy management with environmental sustainability and ethical digital practices within higher education settings. Grounded in the three pillars of sustainability: environmental, economic, and social, the initiative explores how digital privacy measures can be implemented in ways that minimize ecological impact, enhance cost efficiency, and promote user awareness.

Methodologically, the project adopts a participatory and experiential learning approach, engaging students in research, design, and prototype development. The environmental dimension focuses on minimizing digital waste and reducing energy consumption through practices such as cookie reduction and data minimization in compliance with data protection laws and regulations. The economic dimension emphasizes the development of scalable, cost-effective privacy solutions suitable for institutional implementation. The social dimension seeks to foster student awareness and behavioral change around sustainable and ethical data use.

Preliminary results indicate strong student engagement and growing awareness of the environmental implications of data practices. The next phase involves developing a proof-of-concept tool to visualize the real-time carbon impact of cookie tracking, with plans for presentation at the UCCS Mountain Lion Research Day.

Keywords: behavior data privacy, compliance, sustainability, social, environmental, economic

Electrical and Computer Engineering Presentations

Presenters:	Sina Sabotakin	Graduate Student	College of Engineering	Electrical and Computer Engineering
Authors:	Sina Sabotakin			

Title: Toward Efficient Wind Power Modeling: A Novel Data Driven Logistic-Based Model for Capacity Factor Estimation

Abstract: Wind energy generation depends on variable wind speeds, meaning turbines cannot consistently operate at their full nameplate capacity. The capacity factor provides a useful measure of how closely a wind turbine performs relative to its ideal output; therefore, accurate estimation of this factor is essential for reliable performance assessment and system planning. The capacity factor (CF), defined as the ratio of a wind turbine's average power to its rated power, exhibits a non-linear S-shaped relationship with wind speed. Existing estimation methods often rely on simple linear models, which are inaccurate, or piecewise regressions, which require many parameters and lack continuity. This letter proposes two new approaches: Extended Rating-Based Logistic (ERBL) method with an inflection-point slope method to estimate growth parameters, and a Simplified Rating-Based Logistic (SRBL) model designed to improve linear accuracy while remaining easy to apply. Validation across multiple turbine sizes and site wind conditions show that ERBL achieves the highest accuracy, reducing mean absolute error to 0.74 compared to 0.90 for the benchmark piecewise model, while using fewer inputs, and SRBL offers improved performance over traditional linear methods. The two proposed novel models advance wind energy modeling, enhancing accuracy while maintaining simplicity.

Obtained results have shown that ERBL achieves the highest overall accuracy, surpassing even the piecewise benchmark while the simpler SRBL also markedly improves upon the traditional linear model. These results indicate that the logistic approaches provide more reliable CF predictions across diverse sites and turbine sizes, offering a practical and accurate alternative to conventional methods while requiring far fewer input parameters.

Keywords: Capacity factor, wind turbine power curve, logistic function, data-driven model, renewable energy.

Presenters:	Laura Homet Garcia	Graduate Student	College of Engineering	Electrical and Computer Engineering
Co-Authors:	Arkan Alkamil, Mokhles Mohsin, Johannes MenzelDarshika G. Perera			

Title: FPGA-Based Hardware Architecture for Sequence Alignment by Genetic Algorithm

Abstract: With the advent of next-gen DNA sequencing technologies, there has been a massive growth in sequencing data and demand for analysis. The sequence of macromolecules such as DNA, RNA, and proteins are fundamental to the study of biology and medicine. Among many multiple sequence alignment techniques, Sequence Alignment by Genetic Algorithm (SAGA) generates high-quality alignments, but is computationally intensive, leading to low performance. In this paper, we propose an FPGA-based hardware architecture for SAGA to address the complexity and performance issues of SAGA.

Keywords: Sequency alignment; FPGAs; embedded hardware; Genetic algorithm; SAGA

Presenters: Mokhles Mohsin | Graduate Student | College of Engineering | Electrical and Computer Engineering

Co-Authors: S. Navid Shahrouzi, Darshika G. Perera

Title: Composing Efficient Computational Models for Real-Time Processing on Next-Generation Edge-Computing Platforms

Abstract: In the era of IoT and smart systems, an enormous amount of data will be generated from various IoT/smart devices in smart homes, smart cars, etc. Typically, this big data is collected and sent directly to the cloud infrastructure for processing, analyzing, and storing. However, traditional cloud infrastructure faces serious challenges when handling this massive amount of data, including insufficient bandwidth, high latency, unsatisfactory real-time response, high power consumption, and privacy protection issues. The edge-centric computing is emerging as a complementary solution to address the aforementioned issues of the cloud infrastructure. Furthermore, for many real-world IoT and smart systems, such as smart cars, real-time, in situ, and online data analysis and processing are crucial. With edge computing, data processing and analysis can be done closer to the source of the data (i.e., at the edge of the networks), which in turn enables real-time and in-situ data analytics and processing. We introduce novel and efficient computation models that are suitable for real-time processing and analysis on next-generation edge-computing platforms. Since most common edge-computing tasks are data analytics/mining, we focus on widely used data analytics techniques, including dimensionality reduction and classification techniques, specifically, principal component analysis (PCA) and support vectors machine (SVM), respectively. We introduce three different PCA+SVM models for real-time processing and analysis on edge computing platforms. Our experimental results and analysis demonstrate that Model 3 utilizes dramatically lower number of iterations to produce the results, compared to that of other two models, while achieving acceptable performance results.

Keywords: Edge computing, computational models, real-time processing, PCA+SVM, acceleration.

Presenters: Shivani Sharma | Graduate Student | College of Engineering | Electrical and Computer Engineering

Co-Authors: Darshika G. Perera

Title: Analysis of Generalized Hebbian Learning Algorithm for Neuromorphic Hardware Using Spinnaker

Abstract: Neuromorphic computing, inspired by biological neural networks, has emerged as a promising approach for solving complex machine learning tasks with greater efficiency and lower power consumption. The integration of biologically plausible learning algorithms, such as the Generalized Hebbian Algorithm (GHA), is key to enhancing the performance of neuromorphic systems. In this paper, we explore the application of GHA in largescale neuromorphic platforms, specifically SpiNNaker, a hardware designed to simulate large neural networks. Our results demonstrate significant improvements in classification accuracy, showcasing the potential of biologically inspired learning algorithms in advancing the field of neuromorphic computing.

Keywords: Neuromorphic Computing; SpiNNaker, Generalized Hebbian Algorithm; Neuromorphic Hardware, Accuracy.

Presenters: Joshua Essler | Graduate Student | College of Engineering | Electrical and Computer Engineering

Co-Authors: Tarek Masaud

Title: Optimal Planning of Vanadium Redox Flow Battery in Microgrids Considering Flow Rate–Efficiency Tradeoffs

Abstract: With the growing integration of renewable energy, energy storage systems have become essential for addressing the intermittency of renewable energy resources. Flow batteries are an attractive option for large-scale applications due to their long cycle life, and design flexibility. Unlike conventional batteries, where power and energy capacity are linked, flow batteries allow independent sizing of the power stack and electrolyte tanks, improving design flexibility. Two major drawbacks continue to limit their adoption in large-scale grid applications: relatively low round-trip efficiency and high capital cost.

Higher battery power ratings require higher flow rates to increase power density and enable greater energy delivery. Increasing flow rate also increases pumping losses, which reduces efficiency. Therefore, power capacity, energy capacity, and flow rate must be balanced to minimize losses and achieve cost-effective integration of flow batteries in microgrid applications. This need serves as the main motivation for this work.

This work proposes a novel optimization model that optimally sizes flow batteries for microgrid applications while simultaneously optimizing flow rate and efficiency. This model aims to minimize the battery's annual investment costs while accounting for flow rate–efficiency tradeoff. The effectiveness of the proposed model is demonstrated through simulations and validated via a comparative case study. The results indicate that incorporating flow rate optimization into planning models is effective in balancing between enhancing efficiency and improving power capacity. This optimization is crucial for supporting the advancement of flow battery technology for large-scale energy storage.

Keywords: Battery Sizing, Flow Battery, Flow Rate, Microgrid, Optimization

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Presenters: Sabir Ali Kalhoro | Graduate Student | College of Engineering | Electrical and Computer Engineering

Author: Sabir Ali Kalhoro

Title: Optimal Energy Management for a Novel Zero-Emission Provisional Microgrid Using Hydrogen Production Flexibility

Abstract: A provisional microgrid (PMG) relies solely on renewable resources and limited storage, which restricts its ability to sustain islanded operation without support from a coupled microgrid (CMG). Regular CMGs typically include fossil-fueled units, preventing the combined PMG–CMG system from achieving fully renewable, zero-emission operation. This paper proposes an optimization-based scheduling framework for a zero-emission PMG configuration in which the PMG is coupled with a hydrogen-energy-system-based microgrid. Both microgrids employ renewable generation and fuel cells, ensuring zero emissions. By leveraging the unused capacity of the hydrogen-based CMG and removing islanding requirements, the proposed configuration enables reliable islanded operation, supports 100% renewable penetration, and improves hydrogen utilization. The scheduling problem is formulated as a Mixed-Integer Linear Programming (MILP) model and evaluated under islanded and grid-connected mode. Results demonstrate that the PMG achieves 100% renewable operation and maintains islanding capability through the flexibility of the hydrogen energy system. Furthermore, the results show that the proposed PMG reduces the daily operating cost to $2,093.4, compared with $2,772.2 for a regular PMG, due to its ability to trade both electrical power and hydrogen. This research supports the United States' goal of achieving zero-emission operation across distributed energy systems and contributes to achieving the net-zero emission 2050 target.

Keywords: Zero-emission provisional microgrid, United States 100% Renewable 2050 goal, Sustainable and resilient power

Geography and Environmental Studies Presentations

Presenters:	Al Berman-Lyons	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Author: Al Berman-Lyons

Title: Microfossils of The Glen Eyrie Member

Abstract: Eight 1.2oz sediment samples were examined for the presence of conodonts to help constrain the earliest geologic age of the Glen Eyrie Member. Collected from the Black Canyon site off of Rampart Range Rd, the samples consisted of shale deposits that preserve a diverse accumulation of marine micro and macrofossils. Overall the Glen Eyrie member displays a systematic upward shift in depositional environments, beginning with marine-influenced deposits containing abundant ostracods, bryozoans, brachiopods, and other marine microfossils. The lower Glen Eyrie member gives way to coastal marshes and lagoonal facies characterized by plant fossils such as lepidodendron, stigmaria, and calamites, ferns, as well as thin coal seams, before transitioning into fluvial sandstones and conglomerates in the upper Glen Eyrie member. This change highlights the regression of the Absaroka sea to the sediment influx from the uplift of the Ancestral Rocky Mountains. The combination of microfossil assemblages, lithologic characteristics, and stratigraphic relationships provides evidence for rapid environmental shifts driven by both sea-level change and tectonic uplift. These microfossils and plant fossils refine interpretations of the Glen Eyrie member as a key record of late Mississippian to early Pennsylvanian landscape evolution in the southern Front Range.

Keywords: Sediment, Glen Eyrie Member, microfossils.

Presenters:	Al Berman-Lyons	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Co-Authors: Jordan King, Campbell Curico, Chase Ingersoll

Title: Tree Mortality in Austin Bluffs

Abstract: Tree mortality is an accelerating global issue with climatic changes in the regions being a strong contributor. Ponderosa Pine forests in Southwest Colorado are seeing die-off due to driving forces such as extended droughts and insect outbreaks. Using dendrochronological methods we are striving to reveal the death date of dead standing Ponderosa Pines in Austin Bluffs and whether these death events were synchronous across the landscape. These death dates can then be compared against known regional and local drought intervals, insect infestations, and other disturbances. This analysis provides the connections between environmental stress and tree mortality, giving a clearer picture of forest vulnerability and adaptive capacity, while also acting as a tool for how this ecosystem may respond to future climatic extremes. Understanding the date and cause of tree mortality enhances our ability to assess the resilience of the ecosystem and allow for informed management prescriptions in an era of climatic change..

Keywords: Dendrochronology, death years, Ponderosa Pines

Presenters:	Katherine Lanerie	Former Graduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Authors: Katherine Lanerie

Title: Snowed Under: Analysis of Frost Rings in Rocky Mountain Bristlecone Pine (Pinus Aristata) on Pennsylvania Mountain, Colorado

Abstract: It is the nature of forests to change. In many places around the world, however, forests are rapidly changing in response to rising temperatures, reductions in soil moisture, pathologies, and other factors associated with climate change. Rocky Mountain bristlecone pine (Pinus aristata) trees are useful for analyzing changes in climate because their growth rings are a climate-sensitive proxy. This research uses dendrochronological methods to build a comprehensive frost ring record for Rocky Mountain bristlecone pines growing on Pennsylvania Mountain, Park County, Colorado. The chronology and frost ring record span from 1202 to 2020. The oldest frost ring occurred in 1225 and the most recent complete frost ring occurred in 2012. The background frequency of frost rings for Rocky Mountain bristlecone pines on Pennsylvania Mountain is 3.46%, which is much lower than similar upper-montane sites in Colorado, likely because many old trees are included in the study and older trees are generally less sensitive to frost damage. There are several instances of earlywood and latewood frost damage coinciding with years of major volcanic eruptions including Krakatoa (1680), Mt. Pelée (1902), and the cataclysmic eruptions of Mt. Pinatubo (1991 and 1992). Of years with more than four samples, 1928, 1965 and 1966 had the highest percentage of frost rings, with 40%, 38.46% and 30.76% of samples showing frost damage in each respective year.

Keywords: dendrochronology, Rocky Mountain bristlecone pine, frost rings, volcanos

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Presenters:	Faraday Abplanalp	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Co-Authors: Gillian Murphy, Isabella Polombo, Joslyn Bayley

Title: Bent Narratives: The Myth of "Ute Prayer Trees" in Colorado

Abstract: A regional narrative of culturally modified trees (CMTs) arose along the Rocky Mountain Front Range in the late 1990s claiming that the Ute (Nuuchiu) peoples shaped ponderosa pines into twists for religious and cultural purposes, before the U.S. Army forced their removal in the 1880s; currently, the “Ute Prayer Tree” explanation is primarily disseminated by Euro-American settlers despite the Ute Mountain Ute and Southern Ute Tribes finding no pan-tribal oral or written histories, nor ecological records to support the claim.

Statements from Mr. Terry Knight, Ute Elder and Historian, emphasize that Ute sacred knowledge is unlikely to be shared broadly, nor provided at a fee, which contemporary Bent-Tree proponents have been documented to do. Tree-ring analysis conducted on a purported bent tree marked the age between 60-70 years, past the timeline of forced expulsion. Settler-colonial societies speaking for colonized peoples is long documented in American mythmaking- The narrative continues to persist and has become integrated into the regional identity of local Euro-American settlements, despite Ute representatives and scientific data negating it.

This presentation argues that the bent-trees-narrative acts as a microcosm of contested Native identity and Euro-American settler identity-making and questions whose discourse around

whose cultural heritage produces truth; in this instance, through the lens of P. ponderosa morphology.

Keywords: Ute, culturally modified trees, cmt, Colorado, colonization, settler-colonial, Ponderosa pine, Ute prayer tree

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Presenters:	Maerron Lovern	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Authors: Maerron Lovern

Title: Effects of Canopy Coverage on Understory Vegetation Diversity

Abstract: Understory vegetation diversity is important in determining the health of an ecosystem. The less diverse an area is, the more unstable and susceptible to damage the ecosystem can be. The purpose of this experiment was to determine how understory vegetation diversity is affected by canopy coverage (measured in percentages). In order to answer this question, 10 plots, areas of 1 meter by 1 meter were surveyed throughout the trail network located behind the main campus of University of Colorado Colorado Springs. Canopy coverage was measured using a denisometer app, determining the amount of filled versus unfilled space in an image of the canopy above the plot. After this data was collected and converted into a CSV file, it was analyzed in R. This produced 5 graphics that confirmed that canopy coverage negatively affected species diversity and overall density of understory vegetation, as well as showing that slopes with northern aspects were likely to be more diverse than southern slopes. The reduction of basal area would assist in making the understory vegetation of the area more diverse and could lead to a healthier ecosystem overall.

Keywords: Vegetation, Slope Aspect, Diversity, Canopy Coverage, Ecosystem

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Presenters:	Brendan Malloy	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Authors: Brendan Malloy

Title: Examining Sociodemographic Associations with Infant Mortality Through Spatial Analysis in the Contiguous United States

Abstract: Infant mortality rates (IMR) in the United States have risen since 2020, underscoring the importance of addressing racial disparities among these rates. IMR, which is measured by deaths before the age of 1 year per 1,000 live births, is highest among children born to Black women at 10.90, more than double the rate of Hispanic (4.89), White (4.52), and Asian (3.51) women according to the most recent National Vital Statistics Report. This study seeks to confirm and enhance our understanding of how race, ethnicity, and socioeconomic factors relate to infant mortality rates across the contiguous United States. Various spatial statistical analysis techniques are employed to identify concentration patterns and local associations throughout the study area. Spatial clustering is used to pinpoint regional concentrations of IMR. Multivariate clustering and geographically weighted regression (GWR) are applied to examine the relationship between regional IMRs and various sociodemographic factors. Additionally, we conducted a more detailed investigation of IMR concentrations in the Southeast region. Results indicated that while factors such as poverty and education levels correlate to IMR, race remains

the strongest predictor both nationally and regionally. Targeting interventions in areas with the most pronounced disparities is crucial in advancing equity in infant healthcare outcomes.

Keywords: infant mortality rate, sociodemographic, spatial analysis, healthcare, equity

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Presenters: Ahlene Pebley | Undergraduate Student | College of Letters, Arts and Sciences | Geography and Environmental Studies

Authors: Ahlene Pebley

Title: Environmental Injustice: Spatial Analysis of Emissions Generating Facilities and Marginalized Communities in Colorado

Abstract: Environmental inequality refers to the unequal distribution of environmental benefits and burdens across social groups often based on socioeconomic status. Environmental injustice highlights how marginalized communities disproportionally experience pollution and environmental hazards while already burdened by environmental inequalities such as limited access to clean air and green spaces. To explore if environmental injustice exists within Colorado this study aims to identify any correlation that may exist between emissions generating facilities and marginalized communities. Utilizing ArcGIS Pro spatial analysis tools, the spatial relationship of emissions generating facilities from the Environmental Protection Agency's 2020 National Emissions Inventory and socioeconomic variables of marginalized communities at the census block group level from the 2020 U.S. Census were examined. Relationships were analyzed based on the density of emissions generating facilities and percentages of the population for given socioeconomic variables. The results of the analysis showed that some correlations exist within Colorado between marginalized communities and emissions generating facilities, correlations varied based on socioeconomic variables. The analysis highlights areas within Colorado where marginalized communities may be experiencing environmental injustice. These communities could be at risk for increased health complications due to pollution and environmental hazards. It is important that these highlighted areas be studied further to gain a better understanding of how emissions generating facilities affect marginalized communities on a localized scale. These results serve as a beginning for future analysis and can be used to question why these correlations exist. This analysis is just a starting point in the fight towards environmental justice.

Keywords: Spatial Analysis, Environmental Injustice, GIS

Presenters: Noemi Rives | Undergraduate Student | College of Letters, Arts and Sciences | Geography and Environmental Studies

Authors: Noemi Rives

Title: Socioeconomic Disparities and Crime: A Spatial Analysis of Denver Census Tracts

Abstract: According to the US Census bureau, 35.9 million people lived in poverty in 2024. Denver's poverty rate has increased over the last five years to 8.5%, according to the latest American Community Survey from the U.S. Census Bureau. Furthermore, research shows the crime and poverty are correlated, specifically violent and property crimes. Contrarily, education is a direct pathway out of poverty, and therefore a public service needed to reduce crime. This research project focuses on census tracts in Denver and compares poverty rates with violent and property crimes, as well as false imprisonment. The final analysis is focused on Head Start programs, focusing on a type of public service available in vulnerable tracts.

Keywords: Correlation. Crime. Poverty. Spatial Analysis

Presenters:	Jacob Abbott	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Authors: Katherine Lanerie

Title: Population Demographics and Health Outcomes: Exploring the Human Geography of Colorado Springs, CO

Abstract: In the United States, a growing concern is the link between wealth and health, where differences in socioeconomic status lead to varied health outcomes. Focus is on the disproportionate impact on minority and low-income populations, especially in urban areas. This poster uses maps and analyses, created with R, to explore how health disparities relate to socioeconomic status and demographics in Colorado Springs and where they occur. The website "City Health Dashboard" provided census tract data on five variables: income inequality, racial/ethnic diversity, physical inactivity, obesity, and life expectancy. The maps for each variable showed that spatial relationships between lower income, higher racial/ethnic diversity, and poor health outcomes most often appeared in southeastern census tracts and downtown Colorado Springs. Inversely, better health outcomes were more common in higher-income, less diverse northern census tracts in the city's newer suburbs. Colorado Springs' pattern of health disparities, which mirrors low-income and minority populations, reflects the broader trend that wealth influences health. The aim should be to maintain the health of the U.S. population by addressing social determinants of health inequalities regardless of income, race, or ethnicity.

Keywords: Health, wealth, income, race, ethnicity, inequality, social determinants of health, Colorado Springs

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Health Sciences Presentations

Presenters:	Corey Schneider	Undergraduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Corey Schneider

Title: Evaluating Caffeinated / Fungal Extract - Syrup Mixtures on Honeybee (Apis mellifera) for consumptive effects

Abstract: Since the phenomenon first drew attention in 2006–2007, Colony Collapse Disorder (CCD) and related large-scale honeybee losses have posed a major threat to managed Apis mellifera (honeybee) populations and agricultural pollination services. Methods to increase bee consumption of beneficial supplements in their food sources could potentially mitigate CCD. This study investigates the impacts of adding caffeine, a stimulatory reinforcement, to Apis mellifera syrup supplements containing fungal extract of Ganoderma Lucidum, which has been shown to improve immune function. Using apiaries located at the UCCS Farm, bees were fed sugar-water solutions in 1:1 and 2:1 ratios in two separate feed trials comparing caffeinate+fungal extract, non-caffeinate+fungal extract, and control (no caffeine or fungal extract) feeds.

Between the two trials, a feed type swap among the experimental hives was done. Pre and post consumption rates were calculated and compared across the three groups. Observed changes in both individual and colony behaviors like foraging, raiding, memory development in intra and inter-hive relationships were also documented. For both feeding trails, caffeinated treatment consistently produced the highest consumption rates, though larger sample sizes are required to confirm these findings. Preliminary results suggest a consistent trend toward increased syrup consumption when caffeine is present, supporting further trials to evaluate the observed nutraceutical or immune-modulating benefits in honeybees.

Keywords: Honeybees - Colony Collapse Disorder - Caffeine - Fungal Extract - nutraceutical supplementation - apiculture

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Presenters:	Amy Temte	Graduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Amy Temte

Title: Peer Health Coaching To Improve Perceived Wellness In Academic Populations

Abstract: Health coaching interventions are known to enhance self-efficacy, goal attainment, and overall well-being, yet their impact within academic settings remains underexplored. Purpose: This mixed-methods pilot study evaluated the effects of a 12-week individualized peer health coaching (PHC) intervention on perceived wellness among ten female university students, faculty, and staff. Methods: Participants completed twelve weekly 30-minute coaching sessions emphasizing goal setting, reflection, and health behavior change. Quantitative measures assessed perceived wellness across eight domains (emotional, environmental, financial, intellectual, occupational, physical, social, and spiritual) using paired-samples t-tests, while qualitative interviews were analyzed thematically through the lens of the Temporal Self-Regulation Theory (TST). Results: Significant quantitative improvements were observed in overall perceived health ($p < .001$), flourishing ($p = .037$), and specific domains including emotional ($p = .004$), physical ($p < .001$), and environmental ($p = .002$) wellness, with positive trends in perceived stress and sedentary behavior. Qualitative data corroborated these gains, revealing enhanced self-awareness, accountability, and intrinsic motivation as mechanisms driving behavior change. Conclusion: Triangulating quantitative and qualitative findings indicates that individualized health coaching not only produces measurable improvements across key wellness domains but also facilitates deeper internal wellness drivers for sustainability. Guided by TST, the integration of outcomes suggests that health coaching strengthens intention and self-regulation over time, supporting its potential as a scalable model for promoting holistic well-being in academic communities.

Keywords: Health Coaching, University Wellness, Self-Efficacy, Temporal Self-Regulation Theory, Behavior Change, Intrinsic Motivation

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Presenters: Anysia Hovel | Undergraduate Student | College of Nursing and Health Sciences | Health Sciences

Authors: Anysia Hovel

Title: The Rhythm Within: Exploring the Physiological Effects of Music on the Body

Abstract: The pursuit of alternative therapies has gained significant traction in recent years, as traditional medical approaches often present side effects and unintended consequences. Among these emerging therapies, the potential of music's influence on both mental and physiological health has gained growing interest. This project explores the relationship between music/sound frequencies and cellular processes and aims to uncover how sound frequencies may impact cellular functions and contribute to a broader understanding of human physiology. This project is a collection of research done by neuroscientists, acoustic physics researchers, and biologists with the common goal of discovering why and how music affects us not only emotionally but also physically. This project is intended to show not only how music can physically heal us but also how we can develop this knowledge into treatments for disease. Finally, further understanding these mechanisms could lead to noninvasive, low-risk therapeutic options for chronic conditions.

Keywords: Cymatics, music, Neurology, cancer treatment, Alzheimers study, Frequencies

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Presenters: Margaret Kasberger | Graduate Student | College of Nursing and Health Sciences | Health Sciences

Co-Authors: Alison Regal

Title: Regional Body Composition Changes Following Strength Training in Perimenopausal and Postmenopausal Women

Abstract: Background: The menopausal transition is associated with unfavorable body composition changes, including decreased lean mass and increased fat mass, which elevate cardiometabolic and functional health risks. Exercise interventions that integrate strength, power, and high-intensity interval training (HIIT) may counteract these changes, however, limited studies have evaluated outcomes using practical field measures such as multifrequency bioelectrical impedance analysis (BIA). Objective: To examine the effects of a 12-week strength, power, and HIIT based training program combined with educational sessions on hormonal health in midlife women using InBody BIA assessments.Methods: This retrospective pre–post study included 18 women (mean age, 49.7 ± 8.2 years) who completed InBody scans before and after a 12-week intervention. The program consisted of structured strength training 3 days per week, weekly HIIT sessions, aerobic conditioning, and three educational workshops focused on female physiology, hormonal fluctuations, and nutrition. Primary outcomes were lean body mass (LBM), skeletal muscle mass (SMM), body fat mass (BFM), percent body fat (PBF), total body water (TBW), and basal metabolic rate (BMR). Paired-samples t-tests evaluated pre–post differences ($\alpha = 0.05$). Results: Significant improvements occurred across multiple outcomes. LBM increased by 2.42 ± 2.36 lb ($p < 0.001$), SMM increased by 1.67 ± 1.43 lb ($p < 0.001$), and TBW increased by 1.84 ± 1.73 lb ($p < 0.001$). BFM decreased by 2.12 ± 2.52 lb ($p = 0.002$), and PBF decreased by 1.47 ± 1.42% ($p < 0.001$). BMR increased by 24.3 ± 23.1 kcal/day ($p < 0.001$). Body weight and BMI did not significantly change ($p > 0.05$). Conclusion: A 12-week combined training and education program produced significant favorable body composition changes in midlife women as measured by InBody BIA. These findings support the use of multifaceted exercise and education interventions to improve musculoskeletal health during the menopausal transition.

Keywords: Strength training, perimenopause, postmenopause, body composition, lean mass, menopause staging.

Presenters: Matthew Price | Graduate Student | College of Nursing and Health Sciences | Health Sciences

Co-Authors: Amanda Elder

Title: Analysis of 5-year Shoulder Epidemiology in Professional Rodeo

Abstract: Objective: The purpose of this study is to analyze shoulder injury frequency, density, location, type, mechanism of injury (MOI), activity phase of injury, and injury risk within the shoulder of professional rodeo athletes. Design: Retrospective Epidemiologic Review Setting: Professional Rodeo Cowboys Association (PRCA) sanctioned rodeos from 2015 to 2019. Participants: PRCA competitors in bull riding, bareback riding, saddle bronc riding, steer wrestling, hazer, tie-down roping, team roping, barrel racing, and steer roping. Main outcome measures: Injury reports were assessed from an electronic medical record system by Justin Sports Medicine Team at PRCA sanctioned events. Variables analyzed include injury frequency, density, location, type, MOI, and injury activity phase . Results: A total of n=678 shoulder injuries were reported over the 5-year period. Rough stock riders, including bulls, bareback, and saddle bronc, accounted for 86.9% of all shoulder injuries (49.1%, 20.8%, and 17.0%, respectively). Most injuries analyzed (483, 71.2%) were sprains, strains, contusions, dislocations, and a combination of sprains and strains. The shoulder girdle (435, 64.2%) had the highest incidence of injury. Collisions with the ground and the animal accounted for 53.7% (364) of injuries over the 5-year period. Most injuries occur during competition and immediately after the dismount (392, 57.8%). Conclusion: Rough stock events, including bull

riding, have the greatest risk of shoulder injury in professional rodeo. Of the timed events steer wrestling has the greatest risk. Medical professionals should utilize this information to implement individualized preventative measures for PRCA athletes.

Keywords: professional rodeo, shoulder epidemiology, injury frequency

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Presenters:	Donovan Osaer	Graduate Student	College of Nursing and Health Sciences	Health Sciences

Co-Authors: Joshua Mohler

Title: Characterization of CRISPR-Induced CEP57 Mutations in Chinese Hamster Ovary Cells

Abstract: This project aims to generate and characterize CRISPR induced mutations in the Cep57 gene of Chinese Hamster Ovary (CHO) cells. The CEP57 gene encodes a centrosomal protein involved in microtubule organization, and disrupting its function allows us to study the cellular consequences of centrosome-associated defects. The workflow begins with the design of a guide RNA targeting Cep57, followed by a PCR assembly of a T7 promoter/gRNA DNA template and in-vitro transcription to produce a functional RNA. After purification, the gRNA was complexed with Cas9 protein and delivered into CHO cells via lipofection. Following transfection, the cells were monitored by light microscopy to assess morphology and viability then the genomic DNA was extracted for PCR-based screening of possible indels at the target site. Fluorescence staining and imaging were used to visualize cellular structures and evaluate whether CRISPR editing affects cytoskeletal or organelle organization. Finally, mutant lines were cryopreserved to prevent loss of edited populations. The insights gained from characterizing CEP57-deficient cells will provide a useful model for future research on centrosome function, microtubule organization, and the broader mechanisms underlying genomic instability and cell division disorders..

Keywords: CRISPR/Cas9, CEP57, CHO cells, centrosome function, microtubule organization, genomic instability, indel screening, T7 endonuclease assay, fluorescence microscopy, lipofection, gene editing, and cytoskeletal defects

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Presenters:	Blanca Munoz-Luna	Undergraduate Student	College of Nursing and Health Sciences	Health

Co-Authors: Amerie Quindara

Title: Role of ArpC2 gene in morphology of CHO Cells

Abstract: This study examines the role of the ARPC2 gene in the morphology and function of a eukaryotic cell, specifically, in Chinese hamster ovary (CHO) cells. The ARPC2 gene encodes for one of the seven subunits of the ARPC2/3 complex, which regulates the formation of actin complexes within the cell. Moreover, actin complexes play crucial roles in cells, such as shape, DNA replication and repair, regulating the cell cycle, cell motility, and intracellular transport. ARPC2 has been linked to fundamental roles in the promotion of breast cancer proliferation and metastasis. Which is why it is important to see the effects of a possible deletion of this gene. For a broad overview of how the cell's morphology would change, we used CRISPR/Cas9 to attempt to delete a specific target sequence in the ARPC2 gene sequence. We transfected CHO cells with

an in-vitro transcribed gRNA and cas9 protein via lipofection. We then observed the phenotypic changes in comparison to a wild type CHO cell using live cell staining and fluorescence microscopy. The cells harboring the deletion appeared to have lost the ability to form a defined cortex, as they appeared spiky and branching out in different directions. The same cannot be said regarding the wild type CHO cells when examined by microscopy. There was a clear visualization of the round cortex in the cells, unlike the mutant ARPC2 CHO. Methods such as gel electrophoresis, nanodrop spectrophotometry, fluorescence microscopy and PCR were conducted to analyze wild type purified DNA and “mutated” DNA of the CHO cells.

Keywords: ArpC2, CHO cells, ArpC2/3 complex, CRISPR/Cas9, lipofection

History Presentations

Presenters:	Jaedyn Brown	Graduate Student	College of Education	History

Authors: Jaedyn Brown

Title: Propaganda: A Philosophical Inquiry about the Holocaust

Abstract: This research analyzes how the Jewish community was affected by negative stereotypes and discrimination that was exacerbated by the spread of propaganda. This research argues that the use of racial and ethnic disparities in propaganda is the result of stereotyping based on eugenists and biopolitical ideologies. Furthermore, propaganda is often the result of xenophobia and fear of difference during times of human conflict. When such conflict occurs, nation states sometimes impose a "state of exception" that warrants authorities to strip groups of individuals of their rights and freedoms. During the 1930s and 1940a Jews were subjected to oppression, where many Jewish individuals fell victim to the atrocities of the Holocaust. Furthermore, this research will also analyze the effects of generational trauma, especially for Jewish immigrants and refugees.

Throughout this research there will be a major content advisory warning: explicit, graphic, harmful, racist, etc. imagery will be shown.

Keywords: Propaganda, biopolitics, eugenics, "state of exception", generational trauma

Human Physiology and Nutrition Presentations

Presenters:	Raul Rizik Santiago	Undergraduate Student	College of Nursing and Health Sciences	Human Physiology and Nutrition

Authors: Raul Rizik Santiago

Title: Investigating a novel role of RNA in fertility

Abstract: Recent studies have revealed that male ejaculate contains not only sperm and proteins but also RNAs that may influence female reproductive physiology. Some of these RNAs are translated into proteins by female cells after mating, producing male-derived female-translated proteins (mdFTPs). ARI26005 is a mdFTP transferred exclusively as RNA, without a corresponding male protein, providing a unique opportunity to investigate the functional effects of male RNA alone on female fertility and fecundity. To examine the role of ARI26005, we generated CRISPR/Cas9 knockout lines in Drosophila arizonae. Two rounds of embryo injections were performed. The first round produced individuals with fragment analysis patterns suggestive of edits; however, line loss and screening challenges prevented establishment of carriers. The second round yielded adults that were screened via full-body squish and fragment analysis, resulting in the identification of candidate mutants. Sanger sequencing confirmed both frameshift and non-frameshift alleles. Three homozygous lines are currently being established. Once established, males from these lines will be mated to wild-type females. Fecundity will be assessed by quantifying the number of eggs laid per female over seven days, and fertility will be measured by determining the proportion of eggs successfully fertilized using fluorescent in situ hybridization. We hypothesize that loss of ARI26005 will reduce egg-laying and increase the proportion of unfertilized eggs compared to controls, providing insight into the functional role of this RNA-only mdFTP in female reproductive physiology.

Keywords: RNA, fertility, CRISPR, CAS9, Genetics

Presenters:	Andrea Rodriguez Soto	Undergraduate Student	College of Nursing and Health Sciences	Human Physiology and Nutrition

Co- Authors: Chelsea Howard, Amelia McManus

Title: Different Contraceptives, Different Cycles: How Hormonal Use Influences Menstrual Hormones and Symptoms

Abstract: Hormonal contraceptives are widely prescribed to manage menstrual-related symptoms, yet limited research has compared how different contraceptive types affect ovarian hormones and overall menstrual experiences. This study examines how hormonal contraceptive use influences urinary concentrations of estrone-3-glucuronide, pregnanediol glucuronide, and luteinizing hormone, along with the severity and type of menstrual symptoms, between women using combined or progestin-only hormonal contraceptives and those who naturally menstruate. Over the course of one menstrual cycle, participants complete an initial lab visit for dual-energy x-ray absorptiometry measures of body composition and at-home monitoring that includes daily symptom tracking and urinary hormone testing using the Mira® device. It is expected that hormonal contraceptive users will display more stable hormone levels and a reduced menstrual-related symptom burden compared to naturally menstruating women, with absolute average hormone values anticipated to be lower than those of non-users. Findings from this study may

help researchers better understand how different types of hormonal contraceptive use influences menstrual symptoms and ovarian hormones. Additionally, the results may contribute to future approaches for monitoring and managing menstrual health.

Keywords: Hormonal contraceptives; Menstrual cycle; Estrogen; Progesterone; Menstrual symptoms; Urinary hormone monitoring

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Presenters: Justin Chappell | Undergraduate Student | College of Nursing and Health Sciences | Human Physiology and Nutrition

Authors=: Justin Chappell

Title: The effectiveness of emergency room protocols for treating hyperthermia

Abstract: Purpose: To determine the average rate of cooling of Ice Pack Cooling (IPC), Body Bag Cooling (BBC), Ice Sheet Cooling (ISC), and Cold-Water Immersion (CWI), after exercise induced hyperthermia, compared to a Passive Cooling Control (PASS) trial.

Methods: On five separate occasions, 3 participants (3 male; 23 ± 4 y; 175 ± 5cm; 71.8 ± 10kg) completed a standardized exercise protocol in an environmental chamber (40°C [104°F]; 40% relative humidity). Following five minutes of seated rest, participants walked for five minutes at a 5% incline and a speed eliciting 30% of their maximal oxygen uptake (VO2max), then ran for 15 minutes at 70% of their VO2 max with no incline. This cycle was repeated until the participant reached a rectal temperature of 39℃ (102.2℉), at which point the assigned cooling protocol was initiated until they reached 38℃ (100.4℉). Data are presented as means with standard deviation and percent increase from control.

Results: Data collection is ongoing. Preliminary findings indicate. PASS resulted in an average cooling rate of 0.0452±0.025°C/min. IPC (0.0556±0.019°C/min; 23.15%) and ISC (0.0572±0.005°C/min; 26.69%) produced modest improvements relative to PASS. In contrast, BBC demonstrated a substantially faster cooling rate (0.0719±0.041°C/min; 59.14%). The most effective modality was CWI, yielding a cooling rate of 0.184±0.122°C/min, corresponding to a 308.62% improvement over passive cooling.

Conclusion: These preliminary findings suggest that cold water immersion and body bag cooling are effective cooling techniques, and should be considered when trying to rapidly treat hyperthermia in the emergency room.

Keywords: Hyperthermia, treatment, cooling rate, Emergency Room, rectal temperature

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Presenters: Rose Hehn | Undergraduate Student | College of Nursing and Health Sciences | Human Physiology and Nutrition

Co-Authors: Maya Garcia-Sojo, Gigi Douillard, Zachary Leach

Title: Investigating Plasmid Inheritance in E. Coli Under Varying Nutrient and Antibiotic Conditions

Abstract: Antibiotic resistance is a growing global issue in medicine as bacteria gain the ability to evade previously effective treatments. This resistance is due to the presence of resistance genes found on plasmids, small circular DNA that can spread between bacteria. We are interested in developing a teaching lab activity to help students learn about this process. For this work we are using colorful E. coli, a collection of six strains genetically engineered to express one of six different chromoproteins. The genes for color, and for resistance to the antibiotic kanamycin, are present on a plasmid. The bright cell coloration serves as visible indication of plasmid presence and antibiotic resistance. Our goals are to identify growth conditions that accelerate plasmid loss, and to determine the time frame for loss. E. coli strains were cultured either with or without antibiotics, and with standard or low nutrition, and colony color scored. Bacteria were streaked onto sequential plates so that each time point could be visualized. We found that bacteria grown with antibiotics retained their color across multiple plantings, on both high and low nutrient plates. Bacteria grown with full nutrition and no antibiotics also stayed colorful. By contrast, bacteria grown in the absence of antibiotics with low nutrition showed the presence of pale colonies, which indicates plasmid loss. These results illustrate that bacteria can lose or maintain genetic traits depending on environmental factors. Overall, colorful E. coli provide a visual tool for teaching students about antibiotic resistance, selective pressure, and trait favorability.

Keywords: Antibiotic resistance is a growing global issue in medicine, emphasizing the importance of bacterial genetics and gene transfer. Colorful E. coli is a type of E. coli strain that is genetically engineered to express different chromoproteins, serving as visible indicators of plasmid presence and antibiotic resistance.

Presenters: Emma Barich | Graduate Student | College of Letters, Arts and Sciences | Human Physiology and Nutrition

Co- Authors: Dr. Kathy Liu

Title: Predictive Risk Factors of Ankle Sprains: A Systematic Review

Abstract: Context: Ankle sprains are the most common injury in athletic populations that can lead to recurrent injuries and functional limitations. Understanding risk factors that may lead to an ankle sprain can help reduce the risk of these injuries. The purpose of this study was to examine the body of literature for prospective studies that examine ankle sprain risk factors.
Methods: A systematic review of existing literature was conducted, searching PubMed and Google Scholar using the terms “predictive risk factors AND prospective AND ankle sprains AND (risk OR prediction OR incidence OR prevention)”. Prospective cohort studies involving athletic populations were included if they assessed baseline injury predictors, reported ankle sprain incidence during follow-up, met OCEBM levels 1–3, and were published in English.
Results: After the studies were reviewed for inclusion and exclusion criteria, 22 studies met the criteria to be in the systematic review. From these studies, 47 statistically significant injury predictors were identified, including: prior ankle sprain, dorsiflexion mobility, balance performance, hip abductor strength, ankle strength asymmetry, and structural alignment variables.

Discussion: Evidence supports a multifactorial risk profile for ankle sprains, with several intrinsic factors contributing to injury susceptibility. Prior injury history was consistently the strongest predictor, with modifiable neuromuscular factors (limited dorsiflexion ROM, impaired balance, hip abductor weakness, and ankle strength imbalances) appearing repeatedly across studies. Structural characteristics such as tibial varum, calcaneal eversion, and talar tilt also influence

risk, suggesting that anatomical alignment should also be considered. These findings support the implementation of multicomponent injury prevention programs.

Keywords: predictive risk factors, prospective studies, ankle sprains, systematic review, athletics

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Presenters: Brennan Gonzales | Graduate Student | College of Letters, Arts and Sciences | Human Physiology and Nutrition

Author: Brennan Gonzales

Title: Comparison of Ankle Strength Between Involved and Uninvolved Limbs of Unilateral Ankle Sprains

Abstract: Context: Lateral ankle sprains are one of the most common injuries within the physically active community, often leading to residual strength deficits. Strength asymmetry between both the involved and uninvolved ankle may contribute to prolonged dysfunction and increased risk of re-injury. Therefore, the purpose of this study was to examine differences in concentric and eccentric ankle strength between the involved and uninvolved ankle in individuals with a history of unilateral ankle sprains.

Methods: 200 collegiate athletes with a history of unilateral ankle sprains were tested using an isokinetic dynamometer. Concentric and eccentric strength of plantar flexion, dorsiflexion, inversion and eversion were measured at velocities of 30°/s and 120°/s.

Results: The injured ankle resulted in significant strength deficits in plantarflexion, inversion and eversion compared with the uninjured side. Concentric plantarflexion was reduced at a higher velocity (120°/s), while eccentric plantarflexion was lower at both testing speeds (120°/s & 30°/s). Inversion and eversion showed consistent deficits across all contraction types and velocities, indicating continued weakness of the stabilizing muscles. Dorsiflexion strength remained comparable between limbs, showing no difference.

Conclusion: Individuals with a history of unilateral ankle sprains show strength asymmetries, specifically in plantar flexion, inversion and eversion. Clinicians should emphasize strengthening of these muscle groups in long-term rehabilitation even after these individuals have returned to sport.

Keywords: lateral ankle sprain, strength asymmetry, isokinetic strength

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Presenters: Kimber Scifres | Graduate Student | College of Letters, Arts and Sciences | Human Physiology and Nutrition

Co-Author: Dr. Amanda Elder

Title: Analysis of 5-year Facial Epidemiology in Collegiate Rodeo

Abstract: Objective: The purpose of the study was to analyse the frequency and prevalence of facial injuries among collegiate rodeo athletes and evaluate whether facial injury location is associated with injury type, event, rough stock or timed event, mechanism of injury (MOI), and protective equipment use. Design: Prospective Epidemiologic Review Setting: Professional Rodeo Cowboys Association (PRCA) sanctioned rodeos held between 2015 and 2019. Participants: Professional

Rodeo Cowboys Association competitors in bull riding, saddle bronc, bareback, steer wrestling, and tie-down roping events. Main outcome measures: Injury reports were extracted from the Justin Sports Medicine Team's electronic medical record system for all PRCA sanctioned events. The analysed variables include injury frequency, location, type, MOI, injury activity phase, rough stock or timed event, and protective gear usage.

Keywords: professional rodeo, facial injuries, protective equipment, prospective study

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Presenters: Matthew Price | Graduate Student | College of Letters, Arts and Sciences | Human Physiology and Nutrition

Author: Matthew Price

Title: Analysis of 5-year Shoulder Epidemiology in Professional Rodeo

Abstract: Objective: The purpose of this study is to analyze shoulder injury frequency, density, location, type, mechanism of injury (MOI), activity phase of injury, and injury risk within the shoulder of professional rodeo athletes. Design: Retrospective Epidemiologic Review Setting: Professional Rodeo Cowboys Association (PRCA) sanctioned rodeos from 2015 to 2019. Participants: PRCA competitors in bull riding, bareback riding, saddle bronc riding, steer wrestling, hazer, tie-down roping, team roping, barrel racing, and steer roping. Main outcome measures: Injury reports were assessed from an electronic medical record system by Justin Sports Medicine Team at PRCA sanctioned events. Variables analyzed include injury frequency, density, location, type, MOI, and injury activity phase .

Results: A total of n=678 shoulder injuries were reported over the 5-year period. Rough stock riders, including bulls, bareback, and saddle bronc, accounted for 86.9% of all shoulder injuries (49.1%, 20.8%, and 17.0%, respectively). Most injuries analyzed (483, 71.2%) were sprains, strains, contusions, dislocations, and a combination of sprains and strains. The shoulder girdle (435, 64.2%) had the highest incidence of injury. Collisions with the ground and the animal accounted for 53.7% (364) of injuries over the 5-year period. Most injuries occur during competition and immediately after the dismount (392, 57.8%).

Conclusion: Rough stock events, including bull riding, have the greatest risk of shoulder injury in professional rodeo. Of the timed events steer wrestling has the greatest risk. Medical professionals should utilize this information to implement individualized preventative measures for PRCA athletes.

Keywords: Professional rodeo, shoulder epidemiology, injury frequency

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Presenters: Mollie Kloster | Graduate Student | College of Letters, Arts and Sciences | Human Physiology and Nutrition

Co-Author: Kathy Liu

Title: Lower Extremity Muscle Strains and Reinjury Rates Across Collegiate Sports

Abstract: Context: Lower extremity muscle strains are a common injury in sport reinjury rates. These injuries often come with significant time loss from competition. Limited research has compared muscle-specific strain and reinjury patterns across collegiate sports. Therefore, the purpose of this study was to examine the distribution of single and recurrent muscle strains and rate of reinjury within thigh muscle groups.

Methods: Deidentified injury records of muscle strains were categorized by sport, muscle group, side, and reinjury status. Muscle groups were categorized by: hamstring, quadriceps, groin, and hip flexors. Chi-square tests were used to evaluate differences in muscle involvement, reinjury frequency, and sport-by-muscle distributions.

Results: Hamstrings were the most frequently single strained (n=107) followed by quadriceps (n=41), groin (n=39), and hip flexors (n=30). Hamstrings accounted for the highest reinjury rate (n=34) with quadriceps (n=45), groin (n=43), and hip flexors (n=30) having lower recurrence rates. Injury totals varied by sport, including football, men and women's soccer and lacrosse, but hamstrings remained the most strained and most likely to be reinjured across the dataset.

Conclusion: This study identified distinct patterns of lower extremity muscle strains in collegiate athletes. Hamstring strains were the most injured and reinjured when compared against quadriceps, groin, and hip flexors. Categorizing injuries by sport, muscle group, and reinjury status, demonstrates that hamstrings are consistently the greatest portion of the overall injury count. Understanding which muscle groups carry the greatest reinjury risk can guide rehabilitation planning, return to play criteria, and future research aimed at reducing recurrent soft tissue injures.

Keywords: strains, reinjury, thigh muscles, collegiate level

Leadership, Research, & Foundations Presentations

Presenters:	S. Nikki Myers	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: S. Nikki Myers

Title: An International Study of Child-Centered Practices Identified by Gifted Education Leaders

Abstract: This research focuses on the identified practices of school leaders across multiple countries and how cultural differences create support and challenges for child-centered practices in gifted education. Eisner's Educational Connoisseurship and Critique methodology along with the School Ecology framework provides the basis for identification and co-construction of themes towards a child-centered versus achievement-centered approach within international settings. The data for this qualitative study were collected through an online survey and focus group, and results include the selection of validated scales that will form the basis of a follow-up quantitative survey of K12 principals in the United States. Results also suggest implications for further research on practices to mitigate gifted student burnout and underachievement cycles that could be the result of high stakes testing cultures.

Keywords: gifted education, child-centered, burnout, high stakes testing

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Presenters:	Amy Akerman	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Amy Akerman

Title: Motivations and Interventions to Increase the Number of Physician Assistants Working in Rural Colorado

Abstract: A mixed-methods approach, integrated with a self-determination theory framework, was used to analyze the motivations that drive physician assistants (PAs) to practice primary care in rural communities. The Colorado Rural Healthcare Workforce Initiative (CRHWI), was enacted in 2022 to increase the number of healthcare providers working in rural counties. The legislation allocates funds to establish specialized educational 'tracks' in fifteen Colorado health professions programs, which provide specialized courses, rural training, and student scholarships to increase the number of graduates who work in rural areas. The aim of this analysis was to investigate whether these government-funded programs will increase the number of PAs working in rural Colorado and offer recommendations for improving recruitment and retention efforts. Graduates from one Colorado PA program were invited to complete an online survey that collected information on background, participation in the rural track, work experiences, and motivations for working in a rural setting. PAs who graduated from this program between 2012 and 2022 were tracked for their practice location and medical specialty. Participants could opt in to schedule a brief online interview with the researcher. A phenomenological approach was used to collect data from participants' lived experiences, identify themes, and explore relationships with quantitative variables. Interview participants emphasized that clinical mentorship and professional and social supports are essential to improve the recruitment and retention of PAs working in rural areas. Understanding the factors that influence PAs to practice in rural locations is vital for informing strategies to increase the number of rural providers.

Keywords: Physician Assistant, rural healthcare, self-determination theory, phenomenology

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Presenters:	Deanna Johnson	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Deanna Johnson

Title: Understanding Factors Affecting First-Generation Students from Appalachia in Their Decisions to Attend Graduate School: A Mixed Methods Study

Abstract: First-generation undergraduate college students from Appalachia may face many barriers when enrolling in higher education and their attrition to completing their undergraduate degree. These factors also may have an impact on their ability to attend graduate school. However, current literature presents a gap in research regarding how current and recent first-generation graduate students from Appalachia perceive their path and motivations to attend graduate school, and how factors such as poverty, county of origin, or undergraduate institution may be affecting decisions to attend and complete graduate school. This study will seek to fill the gap in the literature regarding this underrepresented population of students. This mixed methods study will focus on current and recent, first-generation graduate students from Appalachia and their experiences of enrolling in graduate school through the lens of self-determination theory. Through qualitative, semi-structured interviews, participants will be asked to speak about their experiences with enrolling in graduate school and factors relating to motivation, including autonomy, relatedness, and competence. Utilizing data provided by the Kentucky Council of Postsecondary Education, historical data will be quantitatively analyzed to explore different factors affecting the likelihood of Kentucky undergraduate students matriculating into graduate school when controlling for different variables such as being first-generation, low-income, or undergraduate institution. Data collected from this study will seek to provide higher education administrators in Appalachia ways to address student success and other barriers relating to graduate school matriculation for first-generation students from Appalachia.

Keywords: First-Generation Students; Higher Education; Appalachia; Graduate School

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Presenters:	Michelle Kephart	Graduate Student	College of Letters, Arts, and Sciences	Education

Authors: Michelle Kephart

Title: Policy Analysis of Using Simulation for Clinical Hours: A Case Study of One Prelicensure Nursing Program in Colorado

Abstract: According to political systems theory, policies should evolve as the policy context evolves. The purpose of this qualitative policy analysis was to investigate if it is still warranted to limit the number of simulation hours that can replace clinical hours in prelicensure nursing education programs. Advances in technology and changes in the clinical setting have led to a different policy context than what existed when the policy was created. An interpretivist case study methodology was used to learn the perspectives of simulation faculty on the quality of education provided when simulation replaced 100% of the clinical hours. The results provided insights into the current and future potential of simulation given the advances in technology, and ways to think about didactic, simulation, and clinical learning. Rather than thinking of simulation as a replacement for clinical learning, policymakers should consider simulation as a separate modality that can address learning needs not satisfied fully by didactic or clinical teaching modalities.

Keywords: simulation, policy, prelicensure nursing

Mechanical and Aerospace Engineering Presentations

Presenters:	Katie Girardeau	Undergraduate Student	College of Engineering	Department of Mechanical and Aerospace Engineering

Authors: Safwan Aljbaae

Title: Equilibrium Points Around the Asteroid Apophis: Dynamical Analysis and Implications for Mission Design and Internal Structure Inference

Abstract: The modeling of the gravity field of an irregular body can be costly computationally; the mascon gravity approach accurately models the gravity field of Apophis (99942) while reducing computational cost as compared to other methods. Using a polyhedral source, the asteroid is modeled as a set of tetrahedrons with a triangle on the surface as its base. The tetrahedrons are then divided into layers. The center of gravity of each layer is treated as a mass point, so the body is modeled as a cloud of mass points. A Mascon-1 and Mascon-30 approach are used to verify the increased accuracy of modeling with more layers; however, the 1 layer model is sufficient for equilibrium point analysis for Apophis. The computations of gravity potential and pseudo-potential with the Mascon-30 approach results in an error of nearly zero compared to computations with the polyhedral method. The Mascon approach reduces computational time of the gravity potential, gravity gradient, and pseudo-potential while maintaining accuracy comparable to previous methods. From the pseudo-potential, the locations of the four equilibrium points and their respective Jacobi constant and stability are determined. Apophis is found to have four unstable equilibrium points that lie in the same plane. These equilibrium points will impact the orbit of the spacecraft set to travel to Apophis during its close approach in April 2029.

Keywords: mascon gravity approach, astrodynamics, Apophis

Philosophy Presentations

Presenters:	Lucian Anthony Ensell	Undergraduate Student	College of Letters, Arts, and Sciences	Department of Philosophy
Authors:	Lucien Anthony Ensell and Lorraine Marie Arangno			

Title: Ἔστι δίκη (There is Justice)

Abstract: Against a backdrop of deepening distrust in American institutions, further deepened by the Trump administration's erosion of legal norms and moral accountability, this paper advances a basic claim: that the law has and must continue to make a claim to moral legitimacy. Against cynics who would reduce the law to coercion, political will, or procedural formality, I argue that, through millennia of moral and political philosophy, in forms rooted in divine justice, civic virtue, natural right, and categorical obligation, a common affirmation runs: law is an instrument of justice. This paper builds a cross-traditional case for the moral legitimacy of American law, whose living vessel is found in the U.S. Constitution. Though the origin stories may vary, the implication runs steady: law must be more than enforceable; it must be ethical. From Aristotle's teleological ethics to Locke's conception of political consent, from Kantian conceptions of duty to contemporary liberal theories of justice, I trace a lineage of philosophical thinking that invests moral meaning in legal institutions. By recovering the soul of American law not as a cold apparatus of order but as a moral project, a promise collectively undertaken to do justice, I offer a framework for understanding legal authority, not as power over persons but as structured moral responsibility. The law's legitimacy, I argue, lies not in its age or enforcement but in its orientation toward the good.

Keywords: Jurisprudence, Legal Ethics, Moral Theory.

Presenters:	Taiya Werling	Undergraduate Student	College of Letters, Arts, and Sciences	Department of Philosphy
Authors:	Taiya Werling			

Title: The Philosophy of Trumpism and the Erosion of Democratic Reason

Abstract: This thesis investigates the philosophical dimensions of democratic backsliding and ideological affect vis-à-vis Trumpism and the social and political repercussions of such, arguing that the normalization of authoritarian rhetoric and motivated ignorance represents a crisis of collective moral cognition. Drawing from political philosophy, affect theory, and social epistemology, I examine how populist movements manipulate emotions-- particularly anger, fear, and nostalgia-- to reify hierarchies of race, gender, sexuality, and religion under the guise of nationalism and freedom. From a philosophical standpoint, Trump's appeal reflects a distinctly Machiavellian fusion of spectacle, fear, and manipulation- utilized as an exercise of power through affect rather than principle. This mode of rule reconfigures idealized politics, where persuasion supersedes truth while demagoguery supplants deliberation. Furthermore, I extend my interpretation of the erosion of democratic norms from a Lockean perspective as an affective process rooted in status threat and motivated ignorance, where citizens willingly exchange truth and equality for emotional belonging and perceived order. Ultimately, I contend that Trumpism operates as both a social movement and a philosophical problem: a modern caudillo experiment that fuses political affect, populist spectacle, and the willful suspension of ethical reasoning. By situating this phenomenon within broader theories of ideology, knowledge, and emotion, the

paper illuminates the perilous convergence of epistemic irrationality and authoritarian desire that now defines the American political imagination-- demanding a renewed examination of how affect, ideology, and moral cognition shape the boundaries of political truth.

Keywords: democratic backsliding, political affect, motivated ignorance, status threat, populism, ideology; nationalism, epistemic irrationality, Trumpism, moral cognition.

Physics Presentations

Presenters:	Will Thompson	Graduate Student	College of Letters, Arts, & Sciences	Department of Physics and Energy Science
Co-Authors:	Aliakbar Ashkarran			

Title: Tuning Electron Transport in Peptides through Sequence Modifications

Abstract: Electron transport across biological molecules (e.g., proteins) is a fundamental phenomenon that happens in most living organisms. Peptides provide powerful molecular junctions to investigate the physics of charge transport affected by molecular architecture, orientation, and molecule−metal linkages. Research on cell-penetrating peptides (CPPS) has grown recently to better understand their ability to deliver drugs beyond the cellular walls. There is not much investigation done on how CPPs electron tunneling properties change with phosphorylation and sequence modification. We designed an experiment using self-assembled monolayers (SAMs) of various peptides bonded to gold substrate. A soft eutectic gallium-indium (EGaIn) served as the top electrode of the system, pressed against the surface in random spots to measure electron transport across a voltage range. We measured the current density of four different R9 (Arg9) backbone CPP's including native R9, aromatic enhanced R9, phosphorylated R9, and a control Ala-Gly peptide. We found that aromatic enhancement significantly improved the charge transport properties while phosphorylation has minor improvements. We then investigated site-specific phosphorylation more closely. Our initial sample had the phosphate group at the second position of the peptide, so we prepared four additional variants with phosphorylation at even-numbered sites (4, 6, 8, and 10). Site-specific phosphorylation altered the overall dipole moment showing a steadily increasing trend as the phosphate group moved farther from the base of the peptide. These results demonstrate that charge transport is highly sensitive to both sequence and modification site, highlighting the significant potential of CPPs as tunable building blocks for future bioelectronic applications.

Keywords: charge transport, cell-penetrating peptides, self-assembled monolayers, bioelectronic

Psychology Presentations

Presenters:	Samantha Torres	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Samantha Torres

Title: Moral Foundations-Based Dialogue and Political Tolerance in Undergraduate Students

Abstract: Political polarization is widely acknowledged as a pressing social issue, yet little empirical work examines how structured dialogue practices might reduce polarization among young adults. This mixed-methods pilot study investigates how undergraduate students understand and navigate political disagreement, and whether the use of Moral Foundations Theory-based dialogue techniques – specifically, utilizing the Crossing Party Lines "curious conversations" methodology – can cultivate greater interpersonal political tolerance. Two waves of survey data are being collected from students enrolled in a senior-level social psychology seminar (Wave 1 N ≈ 30; Wave 2 forthcoming). Measures include political interest, internal and external political efficacy, interpersonal political tolerance, political motivations, and open-ended reflections. Preliminary results from Wave 1 indicate moderate to high political interest, strong internal political efficacy, and relatively high tolerance for cross-ideological friendships but lower tolerance for politically mixed romantic relationships. Qualitative observations suggest that students draw on different moral foundations when interpreting the same political issues and that structured dialogue encourages greater empathy, perspective-taking, and reduced defensiveness. The final analysis will assess whether participation in moral foundations–based dialogue predicts increases in political tolerance between survey waves. This pilot study contributes to ongoing efforts to understand how educational settings can foster healthier political engagement among emerging adults.

Keywords: polarization; political tolerance; social psychology;

Presenters:	Harinishree Obla	Graduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Harinishree Obla

Title: On the Nature of Attention-Deficit/Hyperactivity Disorder in Children and Adults

Abstract: This study examined the symptoms associated with attention-deficit/hyperactivity disorder (ADHD) in a sample of 780 community-dwelling children and adolescents and 513 community-dwelling adults. Samples were gathered by approval of the Institutional Review Board of UCCS. The parents of the child-adolescent sample completed the 200-item Coolidge Personality and Neuropsychological Inventory, which measures 18 ADHD criteria in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR). The adult sample completed the self-report, 260-item Coolidge Axis II Inventory, which also measures the 18 DSM-5-TR ADHD criteria. Previous literature suggests that the hyperactivity/impulsivity symptoms of ADHD diminish with age. First, we found that the correlation of the 9 inattention criteria between the two samples was r = .38,

which indicates that the rankings of the inattention criteria were similar between the samples, with independent samples t-tests indicating that children were higher on three of the criteria, adults were higher on two of the criteria, and four of the criteria had nonsignificant differences between the means. We also found that the correlation of the 9 hyperactivity/impulsivity criteria between the two samples was r = .34, which also indicates that the rankings of the hyperactivity/impulsivity criteria were similar. However, we found that all 9 hyperactive/impulsive means for the adults were significantly greater than for the children, with six of the criteria having medium to strong effect sizes (Cohen's d). In summary, preliminarily, our findings do not support the hypothesis that hyperactivity and impulsivity diminish in adults with ADHD symptomatology, but they appear to increase with age.

Drawing on a sample of 175 racial/ethnic minority children (50% female) from a longitudinal study of child development, the current study utilized parent reports of environmental adversity exposure from birth to age 6 and children's self-reports of their ERI at age 8, and their self-esteem at age 10. We hypothesize that early childhood exposure to environmental adversity will negatively impact self-esteem with this negative correlation being more pronounced among children from minority ethnic-racial groups who have lower scores of ERI. Findings from this study will have implications for understanding how cultural factors can shape the psychological well-being of children growing up in adversity, providing insight for intervention and support strategies for minority families experiencing more environmental hardship.

Keywords: Attention-deficit/hyperactivity disorder, ADHD, children, adolescents, adults, DSM-5-TR

Presenters: Gabriela Elder | Undergraduate Student | College of Letters, Arts and Sciences | Psychology

Co-Authors: Kevin Summers

Title: The Relationship between Changes in Coping Self-Efficacy and Mental and Physical Health Outcomes

Abstract: In 1996, residents of Buffalo Creek, Colorado, faced a forest fire and flood that devastated their homes. Researchers conducted three studies with these residents, one of which investigated how coping self-efficacy predicted long-term distress. The current work examines the association between coping self-efficacy (CSE) and residents' (N = 50) self-reported general health outcomes. We hypothesized that increases in coping self-efficacy would be associated with better physical and mental health outcomes. To test this hypothesis, we conducted linear regressions to examine whether changes in CSE from baseline to one-year post-disaster were related to 8 subsections of the Health-Status Profile (i.e., physical functioning, role limitations due to physical health, bodily pain, general health, vitality, social functioning, role limitations due to emotional problems, and mental health; Hays et al., 1995), while controlling for residents' baseline CSE, age, gender, and socio-economic status (SES). We found increases in CSE were related to lower role limitations due to physical health (b = -1.66, p = .032), lower role limitations due to emotional problems (b = -2.61, p = .002), lower bodily pain (b = -1.14, p = .029), and lower energy (b = -0.45, p = .002). Increases in CSE were associated with higher self-perceptions of overall health (b = 0.63, p = .043). We did not find that changes in CSE were associated with mental health or social and physical functioning. Findings demonstrate the impact of CSE on general health and the importance of examining changes in CSE on long-term physical health outcomes.

Keywords: coping-self efficacy, physical health, mental health, natural disasters

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Presenters:	Andrew He	Staff	College of Letters, Arts and Sciences	Psychology

Co-Authors: Logan Clark, Holli Fullbright, Gemma Brom

Title: Avoiding Distress, Experiencing Decline: Substance Use Coping Motives and Consumption as Predictors of Posttraumatic Depreciation

Abstract: After campus gun violence occurs, some community members experience heightened distress and negative changes in their sense of self, relationships, and beliefs, which is referred to as posttraumatic-depreciation (PTD). In the aftermath of violence, some individuals engage in substance use, though two distinct use-related factors may differentially contribute to PTD: one's motivation to use substances to cope with distress, and the amount one uses. Coping-motivation for use might reflect one's perception that they lack effective coping alternatives, whereas, some use of "recreational" substances, such as alcohol and marijuana can serve relatively benign enhancement and social motives. Thus, the degree that use is driven by coping motives may more strongly predict PTD than amount of general use. The proposed study will examine whether the these two categories of factors explain unique variability in PTD among university community members three-to-four months following a fatal campus shooting. University community members (N = 229) have completed an online survey including measures assessing coping-motivated use (Drinking Motives Questionnaire; Marijuana Motives Questionnaire) use amount (Alcohol Use Disorders Identification Test; Cannabis Use Disorders Identification Test) and PTD. A hierarchical linear regression model will be conducted with race and gender as demographic control variables in block 1, substance use coping motives in block 2, and substance use amount in block 3. It is hypothesized that coping use motivation will account for more variance in PTD than use amount. Findings may inform interventions targeting coping-motivated alcohol and cannabis use in college populations following experiences with campus gun violence.

Keywords: Posttraumatic depreciation, substance use, alcohol use, marijuana use, substance use coping motives

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Presenters:	Anna Holloway	Graduate Student	College of Letters, Arts and Sciences	Psychology

Co-Authors: Michael A. Kisley

Title: Effect of Non-Human Animal Emotion Perception and Beliefs on Companion-Animal Intervention Technique

Abstract: Previous investigations have shown that behavioral problems, specifically aggression, are the most frequently cited reasons for animal relinquishment (Kisley et al., 2024). The present study was designed to investigate how the perceived emotion of a pet (fear vs. anger), species (cats vs. dogs), and the intensity of aggressive act (high vs. low) influence the intervention techniques humans utilize, including relinquishment. The research question was examined with a mixed factorial design where participants (N = 194) recruited via Prolific were randomly assigned into either the high or low intensity condition for the aggressive acts, including both a cat and a dog vignette. In addition to the two vignettes, participants were given two short Likert-Type scales measuring the perceived animal emotion and the likelihood of utilizing each of six intervention strategies for each animal type. Participants then completed the Beliefs about Animal Emotions Scale and a version of the Implicit Theory of Emotions Scale adapted to measure beliefs about animal's emotional capacities. Results suggest not only that there are systematic differences in what intervention techniques are utilized between cats and dogs, but also that similar perceived emotions and beliefs about animal emotions predict distinct intervention techniques for both

cats and dogs. These findings highlight the importance of human beliefs and perceptions of animal emotions in shaping the interactions with our companion animals, specifically in response to aggressive behaviors.

Keywords: animal emotion, beliefs about animal emotion, perception, intervention, relinquishment, social, companion animal, fear, anger, treatment,

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Presenters: Knox Huang | Staff | College of Letters, Arts and Sciences | Psychology

Co-Authors: Michael A. Kisley

Title: Racial Differences in the Perception of Pets as Close Friends and as Family Members

Abstract: Companion animals (i.e., pets) have become increasingly important in recent decades, as evidenced by ethnographical accounts and popular media in different societies. In parallel, research on human-animal interaction has proliferated in the past 25 years. Most of this research, however, has been conducted with populations of Western European descent. This exploratory study examined whether people's perceptions of pets as close friends and as family members vary by race. It also examined whether people's beliefs about animal emotions and their identification with certain Asian values serve as covariates. U.S pet owners who are White, Asian, or Biracial of the two (N = 169) were recruited via Prolific. Results showed that Asian participants were less likely than White participants to perceive their pets as close friends or as family members, with Biracial participants scoring between the two races. Believing that human emotions should be prioritized over animal emotions negatively predicted the likelihood of such perception but did not vary across racial groups. Thematic analysis of the open-ended question responses revealed companionship, emotional resonance, perspective taking, emotional support, and obligations to be the core themes underlying perception of pets as close friends and as family members. Findings indicate variations in how people of different cultural heritage perceive the role of companion animals in their relationship networks and demonstrate the reasons behind such perception, contributing to the existing literature on human-pet interaction.

Keywords: Human-Pet Interaction, Emotion Belief, Cultural Diversity

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Presenters: Modica Jimenez | Graduate Student | College of Letters, Arts and Sciences | Psychology

Co-Authors: Kristen Rudd

Title: Pregnancy Stressful Life Events and the Parent-Child Relationship: Examining the Moderating Effects of Social Support

Abstract: Although the development of the parent-child relationship is multifaceted, for each additional stressor experienced during pregnancy, women's distorted representation of their child increased by 390% for each additional stressor experienced during pregnancy (Bailes et al., 2024. Social support serves as a buffer against pregnancy stressors on parent-child closeness (Becker et al., 2023). The proposed study explores the effects of pregnancy stressors on parent-child relationship, and whether social support moderates these associations, offering resilience against negative life events during pregnancy. We hypothesized that pregnancy stressors will have a negative impact on the maternal perceptions of their relationship with their child, such that more stressors during pregnancy predicts a lower parent-child relationship score. Additionally, we hypothesized that, the effect of pregnancy stressors on the parent-child

relationship would be moderated by maternal social support, such that maternal social support would attenuate the negative effect of pregnancy stressors on the parent–child relationship. No significant main effects for both pregnancy stressors and social support on parent-child relationships, but a significant interaction ($b = -0.09$, $p < .05$) emerged. Women with high levels of social support had the highest parent-child relationship perceptions in contexts of low pregnancy stress but lower perceptions in contexts of high pregnancy stressors ($b = -0.05$, $p < .05$). The findings suggest that social support may only have a positive impact on the parent-child relationship when there is low pregnancy stress, rather than function as a protective factor against high pregnancy stress.

Keywords: Pregnancy stressors, social support, child-parent relationship, development

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Presenters:	Minoti Karnik	Graduate Student	College of Letters, Arts and Sciences	Psychology

Co-Authors: Modica Jimenez, Clay Pollock

Title: The Development of Metamemory Ratings and Justifications during Middle Childhood

Abstract: Metamemory refers to the ability to self-reflect about one's own memories. Metamemory, especially in adults, is typically measured through a numeric confidence rating scale (e.g., how sure are you on a scale of 0 to 100 that you are correct). Importantly, recent research in adults suggests that verbal justifications predict memory performance above and beyond confidence ratings, suggesting self-reflections through verbal responses contribute unique information to successful memory recall. Critically, little is known about whether verbal justifications or confidence reports are more accurate predictors of memory performance in children and whether this pattern changes across development. Considering that confidence ratings may involve a complex process of choosing one number to represent higher order thought processes, verbal justifications may be more developmentally appropriate to measure children's metamemory. The current study aims to collect a sample of 100 children between ages 8 through 13 while completing a face recognition task. Importantly, metamemory will be measured through both confidence ratings (on a scale of 1 "not so sure" – 5 "really sure") and verbal justifications (i.e., children explain in their own words why they selected a particular face). We hypothesize that both confidence ratings and verbal justifications will uniquely predict memory performance across all age groups. However, we predict that verbal justifications will be a much better predictor of memory than confidence ratings in younger compared to older children. These findings are expected to have important implications for memory research with children particularly in eyewitness testimony settings.

Keywords: development, metamemory, verbal justifications, confidence ratings

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Presenters:	Lisa Kujawa-Levine	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Author: Lisa Kujawa-Levine

Title: Sleep Quality, Cognitive Function, and Sex Differences in Midlife and Older Adults

Abstract: Sleep disturbances are highly prevalent in midlife, especially among women navigating the menopausal transition, and have been linked to difficulties with attention, processing speed, and executive functioning. Yet, relatively few studies have examined these relationships in racially and ethnically diverse community samples. The present study draws from the Aging, Resilience,

and Cognition (ARC) study to examine whether self-reported sleep quality is associated with cognitive performance among midlife and older adults.
Sleep quality will be assessed using the Pittsburgh Sleep Quality Index (PSQI), and cognition with be measure online with TestMyBrain (TMB) tasks emphasizing executive function, processing speed, and attention in White, Latinx, and African American adults in midlife and older adulthood. Guided by prior work showing poorer sleep among midlife women than midlife men, it is hypothesized that:

- H1: Midlife women will report poorer sleep quality than midlife men.
- H2: Midlife women will perform lower on executive function and processing speed tasks than midlife men.
- H3 (Exploratory): Older postmenopausal women will demonstrate relatively higher cognitive performance compared to perimenopausal/menopausal women, reflecting potential stabilization of sleep patterns in later adulthood.

Planned analyses include independent-samples t-tests, hierarchical multiple regression, and two-way ANOVA to test sex and age group differences and the predictive role of sleep quality on cognition. Findings may help identify sleep as a modifiable target for supporting cognitive aging and resilience in underrepresented populations.

Keywords: Sleep quality; Cognitive function; Sex differences; Midlife and older adults; Cognitive aging; Racial and ethnic diversity

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Presenters: Megan Linn | Graduate Student | College of Letters, Arts and Sciences | Psychology

Author: Megan Linn

Title: Student Aggression Toward Educators: Trauma Responses and Mental Health

Abstract: Student aggression toward educators is increasing. When student aggression rises to the level of trauma, it is associated with teachers leaving the profession. This study assessed relationships between student aggression toward educators and staff mental health outcomes from 89 public school, k-12 staff in an urban Colorado Springs, Colorado school district. Significant instances of verbal, physical, and indirect aggression were reported on the Aggression Toward Teachers (ATT) questionnaire. Higher student aggression was correlated to higher trauma responses on the Trauma Screening Questionnaire (TSQ) and post-traumatic stress disorder (PTSD) subscale of the Coolidge Axis Two Inventory (CATI). Over 10% of the respondents had enough symptoms on the TSQ to warrant a full evaluation considering a trauma disorder diagnosis. Hierarchical regression showed significant predictors for staff mental health concerns of executive dysfunction, anxiety, and depression on subscales of the CATI. Staff demographic information, type of educational setting, level of student aggression, and higher trauma responses all predicted staff mental health outcomes. Further investigation into staff mental health outcomes related to student aggression is warranted to determine if these predictors are consistent across school settings, which could lead to more effective staff supports. The present study utilized a sample of 87 parent-infant dyads when infants were 6 months old. Dyads completed a modified Still-Face Paradigm (SFP), which included an additional still-face reunion sequence. Parent regulation of distress was coded based on attempts to soothe infant distress during the play and reunion phases. Salivary cortisol levels were collected pre-and-post-SFP using salimetrics swabs, with cortisol reactivity defined as the difference between the pre-and post-SFP swabs. Linear regression analyses revealed a significant main effect of maternal regulation of distress on cortisol reactivity, while neither the infant sex nor the interaction between infant sex and

maternal behaviors were significant predictors. Our findings suggest that maternal regulation behaviors influence infant cortisol reactivity, irrespective of infant sex, highlighting the importance of effective parental regulation strategies in supporting optimal stress regulation during early development.

Keywords: Student Aggression, Trauma, Educator Trauma, Executive Dysfunction, Anxiety, Depression

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Presenters: Conner M. Pardo | Undergraduate Student | College of Letters, Arts and Sciences | Psychology

Authors: Conner M. Pardo

Title: On the Relationship Between Troubled Sleep and Its Sequelae in Children and Adolescents

Abstract: The present study examined sleep-related problems and their comorbid psychopathological sequelae in an archival sample of 780 purportedly typically developing children and adolescents. This study was approved by the UCCS Institutional Review Board. The sample ranged in ages from 5-17 years old, with 30 boys and 30 girls at each age level. Parents completed the 200-item Coolidge Personality and Neurological Inventory (CPNI; Coolidge, 2022), which measures clinical and neurocognitive symptoms and syndromes according to the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2022). Six CPNI items were sleep related: Item 59: This child has terrible nightmares; Item 111: This child sleeps too much; Item 115: This child is afraid to go to sleep without an adult nearby; Item 126: This child has terrible nightmares about being separated from me; Item 134: This child has trouble staying asleep; Item 191: This child has trouble falling asleep. Cronbach's internal reliability of this 6-item sleep scale was α = .65, which is deemed acceptable. A principal components analysis revealed two components: (1) three items that measured nightmares and fears about sleeping; and (2) sleeping too much, trouble staying asleep, and trouble falling asleep. The two components accounted for 38% and 19% of the total variance, respectively. We found that the sleep scale was significantly and positively correlated with childhood anxiety (r = .56), childhood depression (r = .64), and ADHD (r = .36). Although correlation does not imply causation, the association of sleep-related problems in children and adolescents is certainly worthy of further investigation.

Keywords: Sleep-related problems, psychopathological sequelae, children and adolescents, depression, anxiety, ADHD

Presenters: Colin Schmitt | Graduate Student | College of Letters, Arts and Sciences | Psychology

Co-Authors: Colleen E. Mock, Daniel L. Segal

Title: Insomnia and its Relations to Psychopathology: A Psychometric Evaluation of the Insomnia Severity Index Among Older Adults

Abstract: The Insomnia Severity Index (ISI) is a seven-item self-report screening tool designed to assess the presence and severity of insomnia symptoms. Although the ISI has been widely validated, its psychometric properties remain understudied in older adults, a population at highest risk for insomnia symptoms due to age-related changes in sleep quality. The present study assessed the reliability and convergent validity of the ISI in an older adult sample. Older adult participants were recruited via the online research platform Prolific. A final sample of 248 participants (M age = 69.81 years, SD = 4.13, range 65–85 years) completed the ISI and four self-report measures of comorbid symptoms: Brief Geriatric Suicide Ideation Scale (BGSIS), Michigan Alcohol

Screening Test-Geriatric Version (MAST-G), Geriatric Depression Scale-15 (GDS-15), and Geriatric Anxiety Scale (GAS). Results indicated high internal consistency of the ISI (Cronbach's α = .89). Item-total correlations ranged from .56 to .80, indicating no poor items. Bivariate correlational analyses revealed positive correlations with the other measures, all in expected directions, ranging from weak (MAST-G, r = .28), to medium (BGISIS, r = .42; and GDS-15, r = .49), to large effect sizes (GAS, r = .68). Regarding GAS subscales, all correlations were large, with the somatic subscale showing the highest correlation (r = .75). These findings provide evidence in support of the reliability and convergent validity of the ISI among older adults. Findings also indicate that that insomnia symptoms are highly comorbid with anxiety, depression, suicide ideation, and alcohol use symptoms in this population.

Keywords: Insomnia, Older Adults, Insomnia Severity Index, Sleep, Psychopathology

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Presenters: Abigail Sisneros | Graduate Student | College of Letters, Arts and Sciences | Psychology

Co-Authors: Cherry Ann Bice, Diana Selmeczy

Title: The Development of Metacognition and Learning Strategies in Children With and Without ADHD

Abstract: Metacognition is a higher order cognitive process involving thinking about and regulating one's own learning processes and has been shown to play an essential role in effective learning and academic performance. Although executive function has been thought to play a role in metacognition, relatively little research has examined how specific metacognitive processes differ in children who experience executive functioning and learning difficulties, such as children with Attention-Deficit/Hyperactivity Disorder (ADHD). The current ongoing study examines how children (ages 6 to 10) with (N = 16) and without (N = 42) ADHD engage in metacognitive processes during a memory task. Using a Japanese Kanji paired associates learning task, we specifically assess metacognitive monitoring (i.e., self-reflections on accuracy of memory prior to and following a memory test) and metacognitive control (i.e., self-regulated decision-making regarding allocation of study time and volunteering responses for a reward). We predict that children with ADHD will exhibit less calibration than children without ADHD in their metacognitive control behaviors, such that they will show less accuracy in decisions about which answers to volunteer toward a reward, and less accuracy in allocating study time towards items they feel uncertain about remembering. Given that executive function has more frequently been associated with metacognitive control, we predict that metacognitive monitoring (i.e., ratings of confidence in their performance prior to and following the test) will be similar for children with and without ADHD.

Keywords: Metamemory, ADHD, Memory, Metacognition, Learning Strategies

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Presenters: Annalee Smith | Graduate Student | College of Letters, Arts and Sciences | Psychology

Co-Authors: Leilani Feliciano

Title: An Examination of Preferences and Effectiveness of Memory Wallets

Abstract: The aging of the cohort known as the "Baby Boomers" has led to a steep growth in our older adult population. Along with this growth in numbers comes a potential rise in cases of cognitive impairment. Individuals with cognitive impairment must find compensatory strategies, such as

external memory aids (EMAs), to aid in everyday activities and conversations due to the impact of cognitive impairment on communication skills. Memory wallets have been examined in previous literature as an EMA. Both visual and written cues, such as photographs accompanied by written captions, provide individuals with cognitive impairment with an accessible way of enhancing their personal knowledge or fostering prosocial behavior and positive interactions with formal and informal caregivers in their lives. Memory wallets may contain anecdotes about an individual's personal life or reminders and steps on how to complete activities of daily living. Since the development of memory wallets, technology has advanced to support EMAs and engagement with digital stimuli. Virtual reality (VR) has emerged as an additional tool to aid interventions for individuals living with cognitive impairment. Due to the increase in digital technology, virtual versions of memory wallets could be a more accessible way of displaying the information presented within them, but the preferences of older adults for modalities may differ. Using VR, memory wallets will be presented to participants virtually in addition to a physical copy. This proposed study will examine preferences for physical or virtual versions, and the effectiveness of the conditions in promoting engagement and prosocial behaviors.

Keywords: Cognitive impairment, external memory aids, memory wallets, virtual reality, prosocial behaviors

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Presenters: Brittany Moncalieri | Graduate Student | College of Letters, Arts and Sciences | Psychology

Co-Authors: Todd Collinsworth, Diana Selmeczy

Title: The Reactivity Effect of Metacognitive Judgments in Childhood

Abstract: Metacognitive monitoring is the ability to self-reflect and assess our cognitive processes. This is crucial for decision-making and learning effectively. For example, when feeling unsure about our knowledge we should seek help or restudy information. While metacognitive monitoring is thought to guide decision-making, research in adults shows that simply reflecting on our knowledge can increase memory. However, little research has been done to better understand how these metacognitive abilities benefit children's memory. The current study will look at how metacognitive judgments affect overall memory performance in children ages 5- to 8- years-old, a period of development with substantial metacognitive improvements. Specifically, we will examine how judging how well you've learned information (i.e., Judgements of Learning (JOLs)) impacts recognition memory and memory for details. Children will rate themselves using a confidence rating scale (1 "not so sure" to 3 "really sure") while studying new items for a future memory test. We hypothesize that children will experience a positive reactivity effect such that children who make JOLs during learning will experience higher recognition accuracy at test compared to children who do not. We also predict in the JOL group that older children will have higher memory accuracy compared to younger children. Furthermore, we will explore whether these effects improve with development and extend to memory for details.

Keywords: metacognition, judgements of learning, reactivity effect

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Presenters: Kathryn Zieba | Undergraduate Student | College of Letters, Arts and Sciences | Psychology

Author: Kathryn Zieba

Title: Understanding Depression Stigma in the Workplace: The Role of Causal Attributions.

Abstract: Goffman (1963) described stigma as a “deeply discrediting” attribute that reduces individuals to a spoiled social identity. Weiner et al. (1988) further showed that mental-behavioral stigmas are often viewed as more causally controllable than physical stigmas, leading to greater anger, blame, and punitive responses. Because reactions to stigma can shift based on perceived cause, further research is needed to understand how causal attributions shape responses to mental illnesses such as depression. Although the Depression Stigma Scale (DSS; Griffiths et al., 2008) has been used to examine relations among stigma, symptoms, and treatment-seeking, little is known about how depression stigma interacts with specific causal attributions in interdependent contexts like the workplace.

This study examines whether responses to a depressed coworker are predicted by an interaction between participants’ depression stigma levels and the perceived cause of the coworker’s symptoms. Three hundred participants from Prolific Academic will complete the DSS and read one of two vignettes describing a coworker whose depression resulted from either initiating a romantic breakup (controllable) or being broken up with (uncontrollable). Participants will then report their support for group realignment strategies and select recommendations for the coworker. Two 2 (high vs. low stigma) × 2 (controllable vs. uncontrollable cause) ANOVAs will analyze these outcomes. We hypothesize that higher stigma will predict more internal-locus recommendations, greater endorsement of avoidance, and stronger support for punishment, particularly in the controllable condition, whereas lower stigma will relate to more external-locus recommendations and greater support for resocialization, particularly in the uncontrollable condition.

Keywords: depression, stigma, group socialization, workplace, attribution, locus of control

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Presenters: Lauren Suiter | Undergraduate Student | College of Letters, Arts and Sciences | Psychology

Author: Lauren Suiter

Title: Evaluating the Associations between Risk Taking Behaviors and Physiological Regulation in Adolescents

Abstract: Research shows an association between parasympathetic nervous system (PNS; measured by respiratory sinus arrhythmia, RSA; Beauchaine, 2015) regulation and risk-taking behavior in adolescents. However, findings appear to be mixed as to whether low or high RSA is associated with more risk-taking behaviors (Loheide-Niesmann et al., 2021; Zhou et al., 2022). One reason for such differences may be biological sex (Barry et al., 2015). Therefore, to clarify these associations, this study examined whether PNS regulation during a risk-taking task predicted risk-taking behaviors and whether child biological sex modified these associations using a sample of 129 adolescents. Risk-taking was assessed using the Brief Sensation Seeking Scale, and PNS regulation was measured during the Balloon Analogue Risk Test (BART). Covariates include socioeconomic status. We hypothesized that adolescents who evidenced low RSA reactivity during the BART would show more risk-taking behaviors, whereas adolescents who demonstrate higher RSA reactivity would have fewer risk-taking behaviors, and that this association would be stronger for boys. Linear regression revealed a significant main effect of sex, (β = -.322, p = .158) such that boys indicated more risk-taking behaviors than girls. There was no significant main effect of physiological regulation or interaction between physiological regulation and child sex (p >.05). While this study shows that boys tend to display more risk-taking behaviors, physiological regulation may not play a direct role in risk-taking behavior. Future research should examine other factors such as family dynamics and instances of peer pressure that may be important for understanding risk-taking propensity.

Keywords: risk-taking behavior, adolescents, respiratory sinus arrhythmia, parasympathetic nervous system

Social Work Presentations

Presenters:	Kelsie Fucci	Graduate Student	College of Public Service	Social Work

Author: Paul Stubbs,

Title: Rolling with the Punches: A Phenomenological Study of Boxing and Mindfulness Therapy (BAM-T)

Abstract: Boxing and Mindfulness Therapy (BAM-T) is a unique therapeutic modality that integrates bilateral stimulation, mindfulness, and somatic processing through the use of structured boxing sequences. BAM-T allows clients to engage physically with traumatic experiences, while supported by the therapist, who regulates session intensity by wearing protective gear and becoming the target of the clients' punches. This qualitative phenomenological study explores the lived experiences of both past and current BAM-T clients to better understand the therapeutic process and its perceived outcomes. Data collection involves a brief survey (anticipated n=10) assessing mental health symptomatology and prior treatment experiences, followed by semi-structured interviews focused on physical and psychological experiences during BAM-T sessions. Using an Interpretative Phenomenological Analysis (IPA) framework, preliminary findings indicate themes of empowerment, mind-body integration, unique trauma-reprocessing experiences, and strengthened therapeutic alliance following traumatic experiences. Participants report both positive transformation and meaningful emotional shifts, while engaging in BAM-T. This study findings will inform practice guidance for clinicians interested in incorporating BAM-T elements, highlight potential risks or contraindications, and identify recommendations for program improvement and future controlled studies.

Keywords: Social Work, Therapy, Boxing, Mindfulness, Bilateral Stimulation, Somatic processing, Trauma, Reprocessing, Mental health

Sociology Presentations

Presenters:	Tyler Driscoll	Undergraduate Student	College of Letters, Arts and Sciences	Sociology

Author: Tyler Driscoll

Title: Peaking Profits: Urban Renewal, Public Value Capture, and Gentrification in Colorado Springs

Abstract: Peaking Profits examines how urban renewal functions as a state-led tool of capitalist accumulation in Colorado Springs. Informed by a Marxist political-economic perspective, it argues that renewal is not a simple policy position of physical development or neighborhood revitalization, but an economic and spatial strategy that captures public resources for private profit. The project employs an in-depth case study of the Colorado Springs Urban Renewal Authority utilizing quantitative coding to identify recurring themes related to the material and ideological dimensions of renewal.

The findings show that CSURA's use of tax-increment financing (TIF) and blight designation, redirect surplus value into the built environment under the guise of public improvement. Urban renewal in Colorado Springs reflects a neoliberal mode of municipal governance characterized by fiscal dependency, a reliance on public-private partnerships, and aesthetic narratives of improvement that mask a process of public wealth capture. Renewal projects may succeed in attracting investment, but they also deepen inequalities and can displace working-class populations.

By situating these dynamics within critical Marxist theories of urban space and the 'right to the city', this project concludes that renewal serves as a local expression of wider capitalist urbanization patterns. Ongoing community advocacy shows potential in reclaiming urban common space. .

Keywords: neoliberal urbanism, urban renewal, gentrification, municipal governance, accumulation by dispossession, spatial inequity, capitalism

Teaching and Learning Presentations

Presenters:	Lesley Noel	Faculty	College of Education	Teaching and Learning
Co-Author:	Joseph Qualls			

Title: Representation in Classroom Books: A Critical Content Analysis for Teacher Education

Abstract: This study conducts a critical content analysis of one fourth-grade teacher's classroom library using Bishop's (1990) Windows and Mirrors framework to evaluate representation across race, ethnicity, culture, religion, and (dis)ability. The analysis investigates the extent to which historically underrepresented characters appear across the collection and examines how textual and visual narratives challenge or reinforce stereotypes. It further explores whether the books offer readers both "windows" into diverse experiences and "mirrors" that reflect their own identities. The purpose of this inquiry is to identify patterns of inclusion and omission, with particular attention to the underrepresentation of marginalized groups, and to propose strategies for building more equitable and inclusive classroom libraries. Although the study centers on a single classroom, it is positioned as a microcosm of broader systemic inequities in access to and representation within children's literature, offering insights relevant to teacher preparation and literacy equity.

Keywords: Critical Literacy, Children's Literature, Representation

The History of Mountain Lion Research Day

The History of Mountain Lion Research Day began in 2009. It was the brainchild Dr. Michael Larson, who at the time was the Associate Vice Chancellor for Research and Innovation. At its inception, there were two major objectives for Mountain Lion Research Day:

1. To allow UCCS faculty and students to become better acquainted with the research being conducted by faculty and students at the University with the hope of stimulating cross-campus collaborations.
2. To introduce potential partners in the Pikes Peak region to the research happening at UCCS. As a "regional" university, it was beneficial for UCCS researchers to engage with entities in Colorado Springs.

For that first Mountain Lion Research Day, 80 faculty and students across the university submitted abstracts and then prepared poster presentations to document the research work being done. The event was held in The Lodge during the Spring Semester and was co-sponsored by EPIIC (El Pomar Institute for Innovation and Commercialization) and the Office of Research. Mountain Lion Research Day quickly outgrew the Lodge and then moved to Berger Hall and now Gallogly Hall. We also moved the event to the Fall Semester to not compete with the Colorado Springs Undergraduate Research Forum (CSURF) held each spring. In the Fall of 2020, we took our showcase virtual and held the first ever Mountain Lion Research Week. This format allowed presenters to create video recordings of their research for the campus community to view from remote locations. In 2021, we were thrilled to be back in person with our fantastic research community. The Office of Research now sponsors and organizes this event but always with the help of many partners on campus.

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