Office Of Research

16th Annual Mountain Lion Research Day

December 6, 2024
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 16th 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 everyday 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 @OOR_UCCS 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.

List of Presenters

Last Name	First name	Department	Faculty Advisor	Poster #
Ahumada Villanueva	Karen	Psychology	Kelli Klebe	75
Ahumada Villanueva	Karen	Psychology	Kristen Rudd	76
Akerman	Amy	Leadership, Research, and Foundations	Patty Witkowsky	63
Akerman	Amy	Leadership, Research, and Foundations	Patty Witkowsky	64
Baca	Makenzie	Psychology	Colin Mahoney	87
Baca	Makenzie	Psychology	Kelli Klebe	88
Baird	Maggie	Health Sciences	Kathy Liu	55
Barovic	Ana	Chemistry & Biochemistry	Janel Owens	33
Barrientos	Sean	Psychology	Rachel Thayer	77
Bazan	Daniel	Chemistry & Biochemistry	Crystal Vander Zanden	20
Beitle	Nicole	Chemistry & Biochemistry	Allen Schoffstall	34
Beltran Guzman	Yvette	Health Sciences	Kathy Liu	56
Benavidez*	Marissa	Biology	Jeremy Bono	2
Black	Kailene	Geography and Environmental Studies	Emily Skop	53
Blickhan	Adrianna	Biology	Jeremy Bono	3
Bond	Kathryn	Human Physiology and Nutrition	Keston Lindsay	60
Bondarchuk~	Natalie	Biology	Amy Klocko	4
Brown	Lillian	Social Work	Stephanie Gangemi	92
Burrows	Jen	Chemistry & Biochemistry	Amanda Morgenstern	21
Byrd*	Austin	Computer Science	Keith Paarporn	40
Carruthers*	Jared	Computer Science	Dana Wortman	41
Collinsworth~^	Todd	Psychology	Kristen Rudd	78
Cook	Jacob	Chemistry & Biochemistry	Amanda Morgenstern	35
Craven~	Kriselda	Leadership and Research Foundations	Robert Mitchell	62
Crossett	Dylan	Chemistry & Biochemistry	Dylan Crossett	22
Curcio~	Campbell	Geography and Environmental Studies	Eric Billmeyer	54

Dean	Sean	Leadership, Research, and Foundations		65
DeLeonardis	Lauren	Geography and Environmental Studies	Eric Billmeyer	
Faggionato	Gabrielle	Psychology	Michael Kisley	79
Faggionato	Gabrielle	Psychology	Kelli Klebe	80
Forst*	Azahra	Biology	Jeremy Bono	5
Fullbright	Holli	Psychology	Steve Bistricky	81
Fullbright	Holli	Psychology	Steve Bistricky	82
Gavin	Ciara	Biology	Carol McClelland	6
Hanna	Michael	Computer Science	Sang-Yoon Chang	42
Harvey	Emma	Chemistry & Biochemistry	Janel Owens	23
Heflen	Ethan	Biology	Douglas Risser	7
Hermina*~	Christine	Teaching and Learning	Pat McGuire	94
Hileman	Wesley	Electrical and Computer Engineering	Gregory Plett	50
Hrbac	Kristina	Chemistry & Biochemistry	Crystal Vander Zanden	
Hunsicker	Samuel	Biology	Xiying Fan	8
Hurtado~	Angelo	Mechanical & Aerospace Engineering	Michael Calvisi	69
Kaddar	Farh	Chemistry & Biochemistry	Andrew Klocko	36
Kalhoro	Sabir Ali	Electrical & Computer Engineering	Tarek Masaud	52
Lawrence	Heather	Computer Science	Yanyan Zhuang	43
Leach*	Zachary	Biology	Amy Klocko	9
Lee	Morgan	Chemistry & Biochemistry	Ronald Ruminski	24
Lenz	Heron	Biology	Emily Mooney	10
Levis	Summer	Biofrontiers	Guy Hagen	1
Lindsey*	Dawson	Chemistry & Biochemistry	Nathan Morris	25
Lundberg	Tiffany	Chemistry & Biochemistry	Andrew Klocko	26
Ly	Katie	Chemistry and Chemistry & Biochemistry	Amanda Morgenstern	37
Lyons~	Lily	Chemistry & Biochemistry and Biochemistry	Crystal Vander Zanden	38
Macdonald	Blake	Biology	Dr. Amy Klocko	
Maldonado	Mark	Computer Science	Shouhuai Xu	44

Martin~	Evan	Mechanical & Aerospace Engineering	Lynnane George	67
Maruska	Nathan	Chemistry & Biochemistry	Allen Schoffstall	27
Metzger~	Madeline	Health Sciences	Jennifer Zohn	59
Mewada	Hetal	Chemistry	Allen Schoffstall	96
Miles	Kyra	Health Sciences	Kathy Liu	58
Miller*~	Teresa	Sociology	Haruki Eda	93
Milliron~^	Kyrie	Chemistry & Biochemistry	James Kovacs	39
Montgomery	Ryan	Computer Science	Sang-Yoon Chang	45
Morrissey~	Rosemary	Health Sciences	Kathy Liu	57
Nguyen	Alicia	Biology	Douglas Risser	11
Nguyen	Khoa	Biology	Doug Risser	12
Nightshade~	Mallory	Biology	Amy Klocko	13
Olmstead	Paul	Biology/UCCS Teach	Lisa Hollis-Brown	18
Patton	Alexis	Psychology	Colin T. Mahoney	83
Pearson*	Kinzy	Mechanical & Aerospace Engineering	Lynnane George	68
Pierce~	Jessica	Biology/UCCS Teach	Lisa Hollis-Brown	19
Powell*	Laurel	Physics & Energy Science	Robert Camley	72
Powell *~	Laurel	Physics & Energy Science	Robert Camley	73
Ramirez	Benjamin	Biology	Lisa Hollis-Brown	14
Rittler*	Sloane	Biology	Emily Mooney	15
Robb	Elise	Psychology	Kristen Rudd	84
Rodriguez*~	Naomi	Computer Science	Phillip Brown	46
Roth-Broske	Faith	Human Physiology and Nutrition	Keston Lindsay	61
Rothwell*	Josiah	Mechanical & Aerospace Engineering	Lynnane George	70
Rothwell*	Josiah	Mechanical & Aerospace Engineering	Lynnane George	71
Ruiz	Alexander	Chemistry & Biochemistry	Allen Schoffstall	28
Saboktakin~	Sina	Electrical and Computer Engineering	Tarek Masaud	51
Salazar	Christopher	Chemistry & Biochemistry	Kevin Tvrdy	29
Sanchez	Alan	Computer Science	Sang-Yoon Chang	49
Schilling*	Evan	Computer Science	Dana Wortman	47
Sharma	Reeti	Leadership, Research, and Foundations	Patty Witkowsky	66
Siefken	Jacquelynn	Biology	Lisa Hollis-Brown	16

Streicher	Klaus	Computer Science	Shouhuai Xu	48
Suiter	Lauren	Psychology	Thomas Francis	89
Suiter	Lauren	Psychology	Kelli Klebe	90
Sundby~	Jonathan	Psychology	Leilani Feliciano	85
Unger	Alexa	Chemistry & Biochemistry	Crystal Vander Zanden	30
Vanga*	Varun	Physics & Energy Science	Ezio Iacocca	74
Velazquez	Sam	Biology	Carol McClelland	17
Voris	Jacob	Chemistry & Biochemistry	Andrew Klocko	31
Weiss	David	Chemistry & Biochemistry		32
Wilke	Michelle	Psychology	Frederick Coolidge	86
Wilkerson	Renee	Public Administration/Criminal Justice	Robin Kempf	91

* Undergraduate Research Academy Member 2024

~ Top Scholar Finalist

^ Top Scholar Winner

Abstracts in alphabetical order by department

Biofrontiers Presentations

Presenters: Summer Levis, Undergraduate Student College of Letters, Arts & Sciences Biofrontiers

Authors: Joey Hamilton & Guy Hagen

Title: Correlative Microscopy: Imaging Rat Testis with SIM and SEM

Abstract: Correlative microscopy techniques are used for many different applications in molecular and biological sciences, since the comparison of different imaging methods allows researchers to gain more insight and data from samples. Biological samples have been more recently used in correlative light and electron microscopy (CLEM) as new methods have developed to preserve them to withstand the harsh environments that come with imaging cells and tissues using electron microscopy. After being imaged using traditional widefield (WF) and super resolution maximum a posteriori structured illumination microscopy (MAP-SIM), a NanoSuit chemical treatment was applied to a rat testis sample before imaging with scanning electron microscopy (SEM). This was done to compare the image quality and the resolution of each technique. SEM yields the best resolution for imaging biological samples and provides a more detailed structural analysis for future applications in biological sample analysis.

Keywords: Structured illumination microscopy, SIM; scanning electron microscopy, SEM; correlative light and electron microscopy, CLEM

Biology Presentations

Presenters:	Marissa Benavidez	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Toan Hoang & Jeremy Bono

Title: Investigation of the role of the ARI26162 gene in Drosophila arizonae fertility.

Abstract: The biomolecular mechanisms involved in successful reproduction are poorly understood in most organisms since research has mainly focused on the interactions between male sperm and a female egg. Recent research in our lab has shown that Drosophila arizonae males indeed transfer RNA through seminal fluid which the female then translates into functional proteins that affect her reproduction. This research sparks the exploration of the functional significance of these male-derived, female-translated proteins (mdFTPs) in fertility. Mating experiments will be conducted with a knockout ARI26162 gene on a line of Drosophila arizonae. Fertility assays will then be investigated to observe the difference in egg-laying, fertilization efficiency, and IR size between control and mutant lines.

Keywords: Drosophila, Fertility

Presenters:	Adrianna Blickhan	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Toan Hoang, Clinton Green, Marissa Benavidez, & Jeremy Bono

Title: Investigating the influence of ARI20219 on fertility in Drosophila arizonae

Abstract: Speciation and the formation of reproductive isolating barriers between species are important evolutionary processes that may be driven by sexual selection and conflict. Drosophila mojavensis and D. arizonae, two closely related species with overlapping ranges in arid parts of the southwestern United States and northwestern Mexico, exhibit strong post mating-prezygotic isolation. Both species have promiscuous mating systems, which increases sexual selection, which may lead to rapid evolutionary divergence of reproductive features. Previous research on the gene ARI20219 suggests that it is evolving rapidly and is therefore a candidate for involvement in post mating-prezygotic isolation. To test whether ARI20219 is involved in fertility, we are comparing fertilization efficiency of wild-type D. arizonae females mated to either wild-type males or knockout (KO) males with a disabled version of the gene. If ARI20219 is involved in fertility, we expect females mated to KO males to produce fewer fertilized eggs than those mated to wild-type males.

Keywords: drosophila fertility

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

Authors:

Title: Variation in floral form of CRISPR-Cas9 edited domestic apple trees

Abstract: CRISPR-Cas9 gene editing has amazing potential to specifically target genes in a wide variety of organisms, including model species, domestic plants and animals, and even humans. In the last year CRISPR editing has been approved for use on humans to treat sickle cell disease. This therapy works by deactivating a gene to allow for restored production of hemoglobin normally expressed in early childhood. While the gene target site is very specific, the repair of DNA after the cutting leads to a variety of potential outcomes, most of which are predicted to deactivate the target gene. We are interested in understanding the types of changes that can be obtained, and their impacts on the phenotype of the organism. Our study organism is domestic apple. A commercial crop, genetically modified apples could lead to improved varieties, disease resistance, and other practical horticultural improvements. The goal was using CRISPR to target two AGAMOUS (AG) genes in domestic apples, while the purpose was to determine how efficient the editing is and discover the amount of shared function within these genes. Currently, our trees are reaching maturity, and we can now analyze the phenotypes of the flowers. We are interested in our trees with complete editing of target genes, as we predict these trees to show dramatic changes to flower structure. We are now comparing their exact genotypes and phenotypes to provide an overview of the multifaced outcomes of this editing tool. This experiment shows that CRISPR-Cas9 is an efficient mechanism that provides countless applications.

Keywords: CRISPR-Cas9 apple floral development phenotypes

Presenters:	Azahra Forst	Graduate Student	College of Letters, Arts and Sciences	Biology

Authors:

Title: Investigation of the functional significance of ARI00758 on reproductive outcomes in Drosophila arizonae

Abstract: Previously our lab has shown that males transfer RNA transcripts to females during mating in Drosophila arizonae. Since it is seen in many other species, we know that RNA is a common feature of male ejaculates. Recently, we have shown that RNA transcripts transferred through ejaculate are then translated into a protein by the female following copulation. Our current focus is to investigate the functional significance of these male-derived, female-translated proteins (mdFTPs). My research focuses on the mdFTP, ARI00758, which is a serine protease. To investigate the functional significance of this gene, I am generating a knockout mutation using CRISPR gene editing. Mutant male virgins will be mated with wild type virgin females and compared to the mating of wild type virgin males and wild type virgin females. Following the experiment, we will compare egg hatching, egg laying, and insemination reaction size to evaluate any phenotypic changes. The insemination reaction is a mass that forms in the female's reproductive tract after copulation. Because serine proteases have known roles in coagulation, we predict that ARI00758 may play a role in the formation or degradation of the mass. If we observe changes in egg hatching, egg laying, or reaction mass size in females mated to mutant males, this will provide direct evidence of the involvement of this mdFTP in reproductive outcomes.

Keywords: Reproductive efficiency, Insemination reaction, fertility, fecundity

Presenters:	Ciara Gavin	Undergraduate Student	College of Letters, Arts and Sciences	Biology
Authors:				

Title: Evaluating the Role of Enolase as a Virulence Factor in Cryptococcus neoformans

Abstract: Cryptococcus neoformans, a globally distributed heterothallic basidiomycetous fungus, is the leading pathogen on the WHO's Critical Fungal Pathogen Priority List. It kills over 180,000 people annually, primarily due to cryptococcal meningitis in immunocompromised individuals. Virulence factors include the presence of a polysaccharide capsule, melanin production, growth at body temperature, and enzyme secretion. Sex locus genes have also been identified as virulence factors. Phosphopyruvate hydratase, commonly known as enolase, catalyzes the conversion of 2-phosphoglycerate to phosphoenolpyruvate as the penultimate step of glycolysis, and has been shown to function as a moonlighting protein important for virulence in other pathogenic fungi. We are attempting to overexpress enolase by cloning an extra copy into a genomic "safe haven" region to determine if enolase plays a similar role in C. neoformans pathogenesis in the more virulent α mating type of the serotype D congenic strain. Several factors complicate this process, including the recalcitrance of C. neoformans to homologous transformation. To overcome this obstacle, Agrobacterium tumefaciens mediated transformation (ATMT) was used in the presence of non-homologous end joining inhibitors to increase the efficiency of homologous recombination. To test this insertion strategy, the nourseothricin resistance gene was cloned from a plasmid and will be ligated into the safe haven regions first.

Keywords: pathogenic fungi, enolase, molecular cloning, Cryptococcus neoformans

---

Presenters:	Ethan Heflen	Undergraduate Student	College of Letters, Arts and Sciences	Biology
Authors:				

Title: Investigating the Function of Npun_F 3829 in Nostoc punctiforme Hormogonia and Motility

Abstract: Cyanobacteria play a key role in global carbon and nitrogen cycles, and their metabolic versatility, along with their ease of genetic manipulation, make them promising candidates for applications in biomaterial and biofertilizer production. Nostoc punctiforme is a filamentous cyanobacterium capable of both oxygen photosynthesis and nitrogen fixation. N. punctiforme generates three distinct cell types: akinetes, heterocysts, and hormogonia. Hormogonia are motile filaments that allow the cyanobacteria to move along surfaces to seek light sources for photosynthesis or to find symbiotic plant partners for nitrogen fixation. Several factors are required for efficient motility in Hormogonia including cell morphology changes, production of hormogonium poly saccharide (HPS), and functioning Type IV pili. By transposon mutagenesis, NpF 3829 was identified to be essential for motility in N. punctiforme. A protein BLAST search of NpF 3829 identified a response regulator domain (REC domain). The role of the remaining region of the protein was unknown. We present an in-frame deletion of the gene NpF 3829 to investigate its role in the motility of N. punctiforme. The deletion mutant, Δ3829, was non-motile, exhibited reduced HPS production, retained cell morphology of wild-type (WT) hormogonia, and lacked functional Type IV pili. These findings suggest that NpF 3829 either interacts directly with the Type IV pilus system or affects the expression of the genes responsible for it.

Keywords: Nostoc punctiforme, cyanobacteria, hormogonia, motility, Type IV pilus system, Sigma Factor Cascade

---

Presenters:	Samuel Hunsicker	Graduate Student	College of Letters, Arts and Sciences	Biology
Authors:	Xiying Fan			

Title: Meta-Analysis of Gene Expression in Cutaneous Squamous Cell Carcinoma

Abstract: There are an estimated 1.8 million new diagnosed cases of cutaneous squamous cell carcinoma (cSCC) every year. Because of this high incidence rate, there are increasing amounts of cSCC tissue samples available for RNA-sequencing (RNA-seq). However, the heterogeneous nature of cSCC causes demographic differences in each study and can cause discrepancy in the RNA-seq results. The aim is to look past the discrepant genes and find the common differentially expressed genes (DEGs). True DEGs can lead to further research of the mechanics behind cSCC. A meta-analysis of 5 different datasets in the Gene Expression Omnibus (GEO) was performed. Using the analysis, a significant gene list was created from the overlapping top 100 upregulated differentially expressed genes in the datasets. Many genes on the list were already well studied in cSCC, so after mechanistic research of the unstudied genes, TDO2 was selected for further analysis. A cell line composed of cSCC mouse tumor cells derived from KrasG12D and P53 -/- mutations was drugged with 680C91 (a selective TDO2 inhibitor). Additionally, human cSCC samples were immunohistochemistry stained. Results conclude TDO2 knockdown significantly decreases cell proliferation with apparent morphological changes. The IHC stains concluded TDO2 was only present in cSCC tissue, not normal skin. Research of the morphology changes may provide more insight to TDO2's mechanisms for tumorigenesis.

Keywords: squamous cell, cutaneous, cancer, TDO2, RNA-seq, IHC, tumor

---

Presenters:	Zachary Leach	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Mallory Nightshade

Title: Applications of Colorful E. coli

Abstract: Escherichia coli, also known as E. coli, are a normal part of a human gut microbiome. In this location, E. coli is a normal part of the human microbiome and aids in vitamin production. E. coli is also a popular model organism and teaching tool with many applications. It is cheap to acquire and easy to keep alive. For this project, I have been exploring the possible methods (while learning much more about bacteria myself). E. coli usually has an off-white color, but it can be engineered to express different chromoprotein colors, creating Colorful E. coli. This is done when the chromoprotein gene is inserted into an expression vector, which allows the organism to express the novel protein. I obtained six different varieties of Colorful E. coli, some of which appear white in room lighting but fluorescence under blacklight or UV, the rest show their vivid coloration in standard light. Colorful E. coli can be used to teach many different levels of biology and even microbiology. Colorful E. coli can benefit the public by educating how bacterial transfer works from surfaces for public health. Another application for Colorful E. coli is that it can teach students how selective pressure works. These bacteria can even be used to create Petri dish artwork. Studies in education show that students benefit more in an active learning environment with hands-on activities so these cells can be used to create novel beneficial lesson ideas.

Keywords: Chromoprotein, expression vector, selective pressure, bacterial transfer, teaching tool

---

Presenters:	Heron Lenz	Graduate Student	College of Letters, Arts & Sciences	Biology

Authors: Sloane Rittler, Spencer Wright

Title: Ant-Aphid Mutualisms Respond Differently to Increased Temperatures Due to Ant Species Identity

Abstract: Ant-aphid mutualisms are keystone insect interactions in which ants harvest honeydew produced by aphids and in return protect the aphids from predators. As most research on aphids is conducted in agricultural systems, knowledge gaps exist surrounding the ecology of these interactions in natural settings. Specifically, little is known regarding how the traits of different ant species impact how the mutualism responds to increasing temperatures due to climate change. In this experiment, we established aphid colonies on the flowering stalks of Ligusticum porteri plants. Open top warming chambers were used to experimentally increase the temperature of some colonies, and ant species identity was manipulated by selecting study sites where different species were present. We found that temperature impacted both aphid colony growth and ant abundance on the colonies. However, the three ant species responded differently to temperature, and in turn had different impacts on aphid colony growth. These findings suggest that as climate change progresses, ant-aphid mutualisms may change uniquely based on the species of ant involved.

Keywords: insect ecology, ant-aphid mutualisms, climate change

---

Presenters:	Alicia Nguyen	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Grant Capen

Title: A Wzx/Wzy polysaccharide export system is essential for motility in Nostoc punctiforme

Abstract: Nostoc punctiforme is a type of 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 involving nitrogen-fixation. Motility in N. punctiforme requires the secretion of a polysaccharide, called hormogonia polysaccharide (HPS) and the type IV pilus system. In N. punctiforme, a glycosyltransferase will add sugars to a conjugate which is then transported into the periplasm where additional genes will synthesize HPS. HPS is then transported from the periplasm to the outside of the cell. In a previous study, F0458, F0459, and R4342 were implicated to be involved in HPS production. R4342 was suspected to facilitate the incorporation of fucose into HPS. F0459 was suspected to be responsible for regulating the length of the HPS chain, and F0458 may be involved in the export of HPS from the periplasm to the cell's environment. To confirm these genes' roles in N. punctiforme, deletion strains of F0458, F0459, and F4342 were created. Each strain produced non-motile hormogonium and showed little to no signs of HPS secretion while still retaining T4P activity. These results support the previous implications of their roles in HPS production in N. punctiforme.

Keywords: Nostoc punctiforme, motility, Wzx/Wzy system, polysaccharide

---

Presenters:	Khoa Nguyen	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Paul Dang

Title: Fucose sugar epimerase is vital for motility in Nostoc punctiforme

Abstract: Nostoc punctiforme is a species of cyanobacteria that is most known for its ability to fix nitrogen. N. punctiforme differentiates into three distinct cell types: hormogonia, akinetes, and heterocysts. The differentiation from vegetative cells to hormogonia cells allows motility and enables movement across cell surfaces. The regulation of hormogonium development and motility is important for the establishment of nitrogen-fixing symbioses with plants. Hormogonia employ type IV pilus (T4P) motors to power motility, and secrete hormogonium polysaccharide (HPS), which is essential for movement. Using a transposon mutagenic screen, Npun_F3486 was identified as essential for motility. Npun_F3486 encodes a putative sugar epimerase that synthesizes fucose. To determine its role in N. punctiforme, a Npun_F3486 deletion strain was created. The mutant strain was non-motile and failed to produce HPS or accumulate PilA, the major pilin of the T4P systems. HPS is known to contain fucose, and accumulation of PilA is influenced by the glycosyl transferase OgtA. These results suggest that fucose is produced by Npun_F3486, and that this fucose is subsequently used to synthesize HPS and as a substrate for OgtA, leading to accumulation of PilA.

Keywords: nostoc punciforme, motility, fucose, Type IV pilus, Hormogonia polysaccharide, PilA

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

Authors:

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

Abstract: Modern genetic engineering methods can create new and improved varieties of trees and other plants with useful novel traits such as insect resistance, herbicide tolerance, disease resistance, and more. However, the addition of novel traits via new genes is considered genetic modification (or transgenic) and the use of such organisms is highly regulated and controversial. A main concern is the risk of genes moving. In the case of poplar trees, our species of interest, they have an extensive pollen range and could inadvertently release genetically modified material into the environment via breeding with wild trees. However, it is possible to prevent this gene flow by what is generally termed genetic containment approaches. Developing efficient and reliable genetic containment strategies is crucial for safely using transgenic trees for commercial use. Our goal is to utilize CRISPR-Cas9 technology as a possible approach to mitigate this gene flow.

CRISPR-Cas9 gene editing can be used to make changes to genes of interest. Our research here focuses on changing two key floral development regulators, AGAMOUS (AG) and LEAFY (LFY), as targets for genetic containment in poplar. Changes to these genes typically result in complete or nearly complete bisexual sterility, making them suitable targets. The research aims to assess the stability and efficacy of these mutations over multiple flowering seasons.

The experimental plan involves a comprehensive analysis of CRISPR-modified poplar trees planted in the field. We have 360 total trees, with both male and female varieties. We are focusing on characterizing the genetic changes to the targeted genes, analyzing floral form and floral fertility, and assessing overall tree performance and health. Trees were planted in 2017 and 2019, providing us with several years of tree growth data and trees are just now reaching maturity and forming flowers. By addressing important ecological and regulatory concerns, this research aims to comprehensively understand CRISPR-Cas technology's application in tree genetics.

Keywords: CRISPR; AGAMOUS; LEAFY; Poplar trees; floral development; genetic containment

---

Presenters:	Paul Olmstead	Undergraduate Student	College of Letters, Arts, & Sciences	Biology/UCCS Teach

Authors: Paul Olmstead & Grayson Sharp

Title: Gauging Crumple Zone Effectiveness using the Kinetic Disassembly of LEGO's

Abstract: In the automotive industry, much research has been dedicated to the topic of safety in driving. This was driven by profit (safer cars are more likely to sell) but in the end helped the overall safety of operating a vehicle. Much of this research into safety was dedicated to the idea of crumple zones, the "crumpling" of metal beams and structures within the frame of a car, so as to disperse energy away from the passengers within the car, thus decreasing the rate and severity of injury for said passengers in crashes. Our goal for this experiment is to find a better way to design the crumple zones so as to do the job of redirecting energy away from passengers with greater potential and compare those designs with each other to determine which design is the most effective at dispersing energy. We believe that there must be a better design of crumple zone, thus we've decided to simulate the design of a new crumple zone out of LEGO. To test this, we replicated the design of 4 different crumple zones (friction hinge, friction slide, pop-out, and popup) using everyone's favorite choking hazard and Swedish caltrop, LEGOs! Our results

indicate that the Pop up crumple zone design had the “softest crash”, smallest change in acceleration, and greatest reduction force for a driver in a crash.

Keywords: Legos, Collisions, Design, Crumple Zones, Acceleration

---

Presenters: Jessica Pierce | Undergraduate Student | College of Letters, Arts, & Sciences | Biology

Authors: Jessica Pierce and Kate Cronin

Title: Investigating the Dangers of Non-stick Cookware on Plants (Brassica oleracea)

Abstract: Per- and poly-fluoroalkyl substances, known as PFA, are man-made chemicals manufactured in common items like plastics and cookware. PFA is an umbrella term for a family of chemicals characterized by their strong carbon-fluoride bond, attributing it non-stick properties. Previous research on analytes of PFAs like PFOs, PFOAs, and PFBs have been linked to fertility issues, increased cancer risk, and contamination of soil and water (Leubker et al., 2005). Due to its widespread use, PFAs pose a potentially huge risk to the environment and public. PFA can exist as either long or short chain (length determined by the amount of carbon bonds in the chemical ‘chain’) and have either a sulfonic acid or carboxyl group that determines its hydrophobicity (Scher et al., 2018). Length and functional group are both important for determining what medium (soil or water) it is more likely to disperse in and where the chemical will accumulate in an organism's body (Scher et al., 2018). The confirmation of the health hazards posed by the aforementioned PFA analytes led to the development of “novel” PFAs in industry, but there is controversy about their safety (Tiburtini et al., 2024). In this study, we aim to test the effects of these novel PFAs on kale seeds after exposure. We expect slower or inhibited growth in the seeds exposed to higher concentrations. Exploring this could give new insight into the effect of these novel PFAs and confirm if budget cookware manufacturers are adhering to EPA guidelines.

Keywords: Health, environment, environmental pollution, Teflon, Non-stick cookware, chemical

---

Presenters: Benjamin Ramirez | Undergraduate Student | College of Letters, Arts and Sciences | Biology

Authors:

Title: Changes in Vanessa cardui Larval Growth Induced by Artificial Sweeteners

Abstract: Artificial sweeteners, also known as non-nutritive sweeteners (NNS), have become popular alternatives in sugary drinks, recipes, and daily diets for many Americans. NNS are significantly sweeter than sucrose, often by a factor of up to 250 times. These sweeteners include lab-manufactured options like aspartame and naturally occurring alternatives like monk fruit. To investigate their effects on organismal development, Vanessa cardui larvae were raised on a diet containing aspartame, monk fruit, sucrose, or a control (no added sweeteners). After two weeks, the mass of each larva was recorded. Caterpillars fed the aspartame mixture exhibited significantly lower mass than all other groups, as determined by a Kruskal-Wallis Test followed by Dunn’s post-hoc test (P < 0.0083, Bonferroni corrected). These findings indicate that aspartame may negatively impact larval growth rates with broader ecological implications as artificial sweeteners become more prevalent. Aspartame’s low solubility in water may have influenced the observed results. Further research should incorporate sucralose, another lab-manufactured sweetener that is highly soluble in water.

Keywords: Insect nutrition, artificial sweeteners, non-nutritive sweeteners, insect physiology, entomology, painted-lady butterfly, Vanessa cardui, monk fruit, aspartame

---

Presenters:	Sloane Rittler	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors:

Title: Associations Between Deer Browse and Aphid Colonization in a Long-Term Monitoring Study of Liguisticum porteri

Abstract: Deer are charismatic and prolific herbivores, but these cute plant eaters are capable of decimating populations of plants and even other herbivores if their populations rise dramatically. Due to the rapidly increasing abundance of deer, this risk is getting ever closer to becoming a reality. This phenomenon is a concern for a large number of herbivores that share plant resources with deer species, as well as the plants that deer rely on for food themselves. Many of the herbivores at risk of this competition are insects. Insect populations are already decreasing, but with the recent increase in deer abundance and, thus, increased competition around the corner it is of upmost importance to understand how these organisms interact. This study explores the ecological and trophic relationships between mule deer (Odocoileus hemionus) and aphid colonies (Aphis asclepiadis) on the plant Osha (Ligusticum porteri) and the possibility that deer are seeking out aphid colonized plants as a food source.

Keywords: Ecology, insect ecology, large herbivores, trophic interactions

---

Presenters:	Jacquelynn Siefken	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Madison Pugh

Title: Impact of Wi-Fi Radiation on the Height and Germination Rate of Basil Plants Over a Two-Week Period

Abstract: Can the invisible forces of Wi-Fi signals affect plant growth? This project explores the potential impact of 2.4 GHz Wi-Fi radiation on basil plants, with implications for food production in technology-rich environments. We hypothesized that Wi-Fi exposure would stunt growth and reduce germination rates, while shielding plants with Faraday fabric would promote greater growth and higher germination success. Using a Google Home device to simulate radiation exposure, we compared results between exposed and unexposed plants. While statistical tests, including T-tests and Chi-square, found no significant differences in growth or germination rates, visual observations told a different story. The radiation-exposed plants appeared less green and displayed irregularly shaped leaves, while the control group was greener and had more uniform leaf shapes. These intriguing visual patterns suggest that Wi-Fi radiation may subtly affect plant physiology, even if measurable growth metrics remain unchanged. This opens the door for further exploration into how technological environments influence plant development.

Keywords: radiation, basil, wi-fi, germination, plant growth

Presenters: Sam Velazquez | Undergraduate Student | College of Letters, Arts and Sciences | Biology

Authors: Carol MClellan

Title: Phenotypic Changes Associated with CRISPR/Cas9 Gene Knockout of Myosin-16 in Chinese Hamster Ovary Cells (CHO)

Abstract: Myosin 16 is a member of the myosin superfamily (actin-associated motor proteins) that is predominantly expressed in neuronal tissues. Recent findings suggest that Myo-16 plays a role as a signal transduction protein utilizing cell signaling pathways to facilitate actin cytoskeleton reorganization. It is hypothesized that myo-16 genetic alteration may contribute to a variety of human neurologic disorders including schizophrenia, major depressive disorder, and bipolar disorder. CRISPR/Cas9 is a dual system derived from bacteria that can be utilized to make precise edits to living organisms' genomes. The goal of this project was to knock out (KO) the Myo-16 gene in CHO cells using the CRISPR/Cas9 system and evaluate the phenotypic changes associated with absence of this gene to better understand its structural function within individual cells. The Cas9 protein and in vitro transcribed RNA were prepared separately then combined with the CRISPR reagent prior to transfection via lipofection. Following a 72 hour incubation cells were passaged prior to harvesting for evaluation to allow ample cellular reproduction. Successful genetic mutation of the mutant strain was confirmed via gel electrophoresis. Phenotypic characterization was performed using light and fluorescence microscopy, wild type CHO cells were prepared in the same manner to serve as a control. The Myo-16 KO mutant strain and wild type was prepared for fluorescence microscopy utilizing actin, nuclear, and mitochondrial stains to highlight key cellular structures. It was found that the Myo-16 KO strain exhibited altered cytoskeletons and larger cell size.

Keywords: Cell Culture, CHO, CRISPR/Cas9, Cytoskeleton, Gene Editing, Myosin-16

Presenters:	Blake Macdonald	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Blake Macdonald

Title: Testing a dominant negative gene fusion to study the role of LEAFY in vegetative and floral development in hybrid poplar

Abstract: Forest ecosystems are some of the largest carbon capture zones and an important element in preventing the continuation of global heating. These ecosystems, like the Congo and Amazon rainforests, are entering an endangered state as delicate processes are thrown off by human activity. Most of the global wood supply is harvested in plantation style orchards where humans have control over the location and density of tree growth. Despite these domesticated tree farms reducing the practice of deforestation, the growth of these plantations can introduce invasive tree species that outcompete the native plants within critical areas. One of our research goals is to modify forestry species to reduce their invasive potential, with one of our approaches targeting genes essential for reproduction. For this study, we are attempting to alter the function of LEAFY, an ancient gene that is key for inducing a transition from vegetative to reproductive growth. As LEAFY is highly conserved, our approach should be applicable across a variety of species. LEAFY is a transcription factor, a protein which binds DNA and induces expression of genes. We created dominant negative gene fusion of LEAFY through the joining of another transcription factor, the EAR motif, to create an LFY:EAR fusion protein. This LFY:EAR fusion protein is predicted to bind DNA but fails to induce gene expression, thus blocking normal LEAFY function. We transformed hybrid poplar trees with the LFY:EAR fusion gene and performed both greenhouse and field tests. The greenhouse study, with genetically accelerated flowering, showed a very unusual floral form with the flowers being very leaf-like in overall appearance. These samples differ from trees that have reached maturity in field conditions, as they demonstrate flowers with a normal appearance. We are in the process of testing genetic material extracted from trees grown in the field to check the presence of the normal LEAFY and our added LFY:EAR fusion. This will allow researchers to determine whether the tree expresses a dominant or loss of the LEAFY gene, evidence that is subsequential in determining their phenotype. Dominant expression can lead to tall narrow plants while a loss could result in shorter plant life. Field samples have already been observed to have flowering uncharacteristic of normal samples, with the flowers being made of leaves instead of petals. Being able to alter the expressive traits of LEAFY with the LFY:EAR motif could create beneficial outcomes for accelerating domestic tree evolution, preventing wild type competition through sterilization, and cementing genetic engineering as a fundamental aspect of future crop growth.

Chemistry and Biochemistry Presentations

Presenters:	Ana Barovic	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Ana Barovic

Title: The Human Exposome: Consumer Product Chemicals in Indoor Dust

Abstract: According to the World Health Organization, air pollution ranks among the top five risk factors for chronic disease. Given that Americans spend approximately 90% of their time indoors —70% of which is at home—indoor air presents a substantial exposure pathway. Analyzing indoor dust collected on HVAC filters offers a comprehensive view of indoor air quality, as dust acts as a sink for many volatile and semi-volatile organic compounds. Of particular concern are endocrine-disrupting compounds (EDCs) sourced from sunscreen and antimicrobial agents commonly used in consumer products. Here, we present the application of a robust extraction protocol, QuEChERS (Quick, Easy, Cheap, Effective, Rugged, and Safe), for EDCs from HVAC dust. Target analytes include six UV filters (benzophenone, homosalate, octinoxate, octocrylene, oxybenzone, and avobenzone) and three antimicrobial agents (triclocarban, triclosan, and chloroxylenol). The method has been validated on the LC/MS/MS and GC/MS, achieving percent recoveries of 70% or greater for all analytes across the entire working range (0.25 – 1.5 ng/ µL). Most EDCs were detected with concentrations in the order of 1000-10,000 ng/g. Among them, UV filters, homosalate and octocrylene, were detected at the highest concentrations (>23,000 ng/g and >79,000 ng/g respectively). These data highlight the need for consumer and regulatory awareness about the accumulation of EDCs in indoor dust, emphasizing the importance of mitigating these risks in indoor environments.

Keywords: Analytical Chemistry, Method Development, Method Validation, Mass Spectrometry, Indoor Dust, QuEChERS Extraction, Exposome, UV-Filters, Endocrine-Disrupting Compounds, HVAC Filters

---

Presenters:	Daniel Bazan	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Kyle Talley, Leah Tamarez, Herbert Kaltner

Title: Galectin-4 and -8 Binding to Membranes Containing Sulfated Ligands

Abstract: Galectins are β-galactoside-binding proteins that play important roles in cell signaling, typically through binding to glycoconjugates such as glycosylated proteins and the sulfated galactocerebroside lipid SM4, among others. Tandem repeat galectins (galectins-4, -8, -9, and -12) contain two carbohydrate recognition domains (CRDs) connected by a peptide linker, suggesting a role in connecting various glycosylated molecules at the cell membrane surface. Galectin-4 (Gal-4) and galectin-8 (Gal-8), can both induce T-cell apoptosis, modulate inflammation, and are highly expressed in tumor tissue, suggesting a role in cell carcinogenesis or metastasis. Both the N-terminal and C-terminal Gal-4 CRDs bind to glycosphingolipids, but the C-terminal domain has a higher binding affinity for sulfated glycosphingolipids, including SM4. Gal-8 differs where only the N-terminal domain has affinity for glycosphingolipids. The purpose of this work is to investigate the structure of Gal-4 and Gal-8 bound to a model membrane containing sulfated ligands. In this study, we used liquid surface X-ray reflectivity (XR) to measure the electron density profile of Gal-4 and Gal-8 bound to a lipid monolayer in a Langmuir

trough. Specifically, we investigated the structures of Gal-4 and Gal-8 bound to a membrane containing 20% SM4, and Gal-4 bound to a membrane containing 20% cholesterol 3-sulfate. Primarily results have shown that Gal-4 bound to both types of membranes and formed an electron-dense protein layer extending ~40 Å beneath the membrane, which is approximately the length of one CRD. Gal-8 bound to the 20% SM4 membrane and formed a longer protein layer beneath the membrane. These preliminary results indicate that both CRDs of Gal-4 bound the sulfated ligand, but suggests that only one Gal-8 CRD binds, while the other CRD may extend further away from the membrane. Overall, this work provides some early structural information on the binding of Gal-4 and Gal-8 to membranes containing sulfated ligands.

Keywords: Glycoproteins, Galectins, X-Ray Reflectivity, Cell Membranes

---

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

Authors: Allen Schoffstall

Title: Synthesis of 3,5-disubstituted isoxazoles and subsequent transfer hydrogenation

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: One-pot procedure, 3,5-disubstituted isoxazoles, Cycloaddition, Hydroximinoyl chlorides, Acetylenes, Isoxazoles, Transfer hydrogenation, Hydrazobenzene, Copper on iron catalyst, Reductive ring opening, Enaminones

---

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

Authors: Kristina Hrbac, Crystal Vander Zanden

Title: Amyloid β and EGCG Interacting with a Model Cell Membrane

Abstract: Alzheimer's Disease is a neurodegenerative disease that affects millions worldwide. It is thought to have a connection to the aggregation of amyloid β (Aβ) on the outside of neurons. A compound found in green tea, EGCG, may help prevent the aggregation of Aβ. Langmuir trough experiments were conducted using DMPG to create a model cell membrane. The water subphase had 1 µM Aβ as a control, then an addition of 50 µM EGCG, then an addition of 250 µM EGCG. The addition of EGCG resulted in lowered surface pressures as well as faster binding. This may be indicative of Aβ monomers binding to EGCG on the membrane, rather than preventing binding altogether. Future work would benefit from using a more physiologically relevant lipid composition and THT assays to observe how EGCG impacts fibril formation of Aβ.

Presenters:	Hetal Mewada	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Hetal Mewada, Allen Schoffstall

Title: Synthesis of Biobased and Partially Biobased Polyesters and Copolyesters from Furan-Based Diol and Dichloride

Abstract: Petrochemical-based polyesters contribute to microplastic pollution. A potential solution lies in biodegradable polyester. This study explores the synthesis of biobased polyesters using 2,5-furandicarboxylic dichloride and 2,5-furandimethanol, reacted with an unsaturated compound in the presence of DABCO (1,4-diazabicyclo[2.2.2]octane) and toluene at low temperatures. The products were analyzed with Infrared (IR), and NMR spectroscopy.

Presenters:	Jen Burrows	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Jen Burrows

Title: Using QTAIM to determine binding between TbGSK3 and Inhibitors

Abstract: A neglected tropical disease called Human African Trypanosomiasis (HAT), previously known as African Sleeping sickness, affects sub-Saharan Africa's rural populations and is carried by the Trypanosoma brucei (Tb) parasite. HAT progression starts with increasingly severe physiological and neurological symptoms and results in death if left untreated. A promising target for eliminating HAT is Tb's glycogen synthase kinase-3 (GSK3) enzyme, which is essential for cell growth. This project uses computational methods to understand how known ligands bind with the TbGSK3 active site in order to create an appropriate-sized model to test novel inhibitors. A more reliable or cheaper method could be developed to analyze model systems using QTAIM, compared to calculating ligand binding energies, and would improve the drug design process for HAT. Indirubin derivatives with experimentally determined IC50 values were docked into TbGSK3 using HADDOCK. UCSF ChimeraX was used to analyze the docked systems to determine which residues were important in ligand binding and create smaller receptor-ligand complexes. The complex systems were imported into Amsterdam Modeling Suite (AMS) to calculate system energetics using density functional theory (DFT) and identify binding interactions within each system using QTAIM. The data will determine the appropriate size of a TbGSK3-specific model active system to compare energetics and binding events with experimental IC50 values.

Keywords: Quantum mechanics, QM, cluster, QTAIM, drug design, computation, binding interactions, DFT

Presenters:	Jacob Cook	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Amanda Morgenstern & Jonathan Gertner

Title: Computational Analysis of ESI Induced Methylene Bridge Loss in Tetramine Analogues

Abstract: Tetramine (TETS), a formerly common and currently banned rodenticide, was found in previous works to undergo a condensation reaction to form a dimer hexamethylenetrisulfohexamine (HEXS). In addition, it was found to experience methylene bridge loss fragmentation in electrospray ionization (ESI). This loss of a methylene group is extremely unusual for a cage structure molecule, due to their generally high stability. Previous computational work elucidated possible mechanisms with activation barriers for TETS, HEXS, and a simplified analogue hexamethylenetetramine (HMT), used as a control. The present study analyzed reactant and intermediate states in the gas phase to rationalize the differences in activation barriers between the three analogues using DFT calculations. Results of these calculations were analyzed using the quantum theory of atoms in molecules (QTAIM) atomic charges, bond critical points, and fragment interaction energies. Each individual step of the most energetically favorable fragmentation pathway for each tetramine analogue (TETS, HEXS, and HMT) was modeled using AMS software and analyzed using only techniques relevant to each specific step. It was found that HMT is the most stable of the analogues across the board and has the highest activation barrier in every step, which supports experimental observations. HEXS and TETS generally showed similar energies in each calculation. These results, coupled with experimental observations, suggest that the presence of sulfonyl groups is necessary for the loss of the methylene bridge.

Keywords: DFT, ADF, AMS, computational chemistry, QTAIM, potential energy surfaces, bond critical points, electron density, fragment interaction energy

---

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

Authors: Janel Owens & Luis Lowe

Title: Analysis and Stability of Beer Flavor Profile

Abstract: This project involved the stability testing of 6 certain beers obtained from a local brewery. The testing was conducted to determine whether the flavor or taste profiles of the beer changed after being left out and aged. The experiment was conducted over a nine week period, where samples were taken at week 0, week 1, week 3, week 6, and week 9. The last measurement was supposed to be done in week 8 but a cancellation due to the snow prevented that measurement from being taken. Measurements were done using Gas Chromatography. Samples were aged over the 9 week period by being placed in an oven that was set at 37°C. On the day of recording measurements, a vial of each beer was retrieved from the oven, and taken back to the lab. Then 2.5 mL of each beer were pipetted into a corresponding labeled vial. 2.5 mL of a 25.0 gram/125 mL Sodium Chloride/Water solution was also added to each vial. Finally, an internal standard was added to each vial. The internal standard used was 50 µL of Butanol, 100 µL of Octanol, and then filled to the mark of a 125 mL volumetric flask with Ethanol. Along with the 6 vials for the beers, a seventh “junk” vial was put in first to verify that the solution was prepared properly. After the junk vial was measured and the chromatogram looked good, the other 6 vials were then measured. The peak number, retention time, and peak area were input to an excel spreadsheet, and graphs were constructed to show the relationship of each chemical responsible for the flavor of the beer over the amount of weeks they were tested.

Keywords: Analysis, Stability, Flavor Profile

Presenters:	Emma Harvey	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Luis Lowe

Title: Detection of flame retardants in dryer lint from Colorado Residential Homes

Abstract: Organophosphate esters (OPEs) are toxic synthetic chemicals used as flame retardants and plasticizers in a variety of consumer products, such as textiles, paints, and electronics. The production and routine use of these products release OPEs into the environment; the hazardous compounds have been found in water, soil, air, and indoor dust in significant concentrations. Clothing is a matrix that has not been extensively studied and could be a direct exposure pathway to OPEs. This study determined levels of three OPEs—TCPP, TDCPP, and TPHP—in dryer lint from residential homes in Colorado using GC/MS. To extract the target OPEs from a lint sample, a simple solvent mixture of hexanes:acetone was used. A spike and recovery method was used to validate the extraction method for all analytes across the entire working range, achieving percent recoveries of 80-140%. OPE concentrations for 14 lint samples ranged from trace amounts up to 3,276 ng/g. These data motivate consumer awareness about the accumulation of toxic OPEs in what we wear.

Keywords: OPEs, Dryer lint, GC/MS

Presenters:	Farh Kaddar	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Luis Lowe

Title: Heterochromatic histone deacetylase loss alters genome organization, histone acetylation, and facultative heterochromatin in Neurospora

Abstract: Chromosomes must correctly fold in eukaryotic nuclei for proper genome function. Eukaryotic organisms hierarchically organize their genomes, including in the fungus Neurospora crassa, where chromatin fiber loops compact into Topologically Associated Domain (TAD)-like structures formed by heterochromatic region aggregation. However, insufficient data exists on how histone modifying complexes, including histone deacetylases, affect genome organization and heterochromatin composition. In Neurospora, the HCHC complex (comprised of the proteins HDA-1, CDP-2, HP1, and CHAP) deacetylates heterochromatic nucleosomes, as loss of individual HCHC members increases centromeric acetylation and alters the methylation of cytosines in DNA. Here, we assess if the HCHC complex affects genome organization and the deposition of histone post-translational modifications by performing chromosome conformation capture with high-throughput sequencing (Hi-C) and Chromatin Immunoprecipitation-sequencing (ChIP-seq) in a strain deleted of the cdp-2 gene. We found that CDP-2 loss increases intra- and inter-chromosomal heterochromatic region interactions and causes gains in heterochromatic H4K16 acetylation while smaller heterochromatic regions lose H3K9 trimethylation and gain inter-heterochromatic region interactions. In addition, we performed ChIP-seq of H3K27 di- or trimethylation, which marks facultative heterochromatin, to address whether another repressive histone mark could be altered in strains lacking heterochromatic histone deacetylation. Here, we present our current results for how the loss of HCHC HDAC activity affects the acetylation and methylation of heterochromatic nucleosomes and the organization of the Neurospora genome.

Keywords: Genome organization, histone acetylation, post-translational modifications, facultative heterochromatin

---

Presenters:	Morgan Lee	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Ronald Ruminski

Title: Synthesis and Characterization of proximal and distal [Os(dpop')(dpt)(Cl)]+

Abstract: The proximal and distal isomers of [Os(dpop')(dpt)(Cl)]+ were synthesized, characterized, and analyzed for future use in anticancer phototherapy applications. The novel complex [Os(dpop')(dpt)(Cl)]+ was synthesized by mixing Osdpop'Cl3 and dpt (bis(2-pyridyl)tetrazine) in ethylene glycol. The mixture was heated at 105°C for about three hours. After synthesis, the product was precipitated by the addition of NH4PF6 (aq). Crude product was then dissolved in acetonitrile and separated into proximal and distal isomers through column chromatography on an Al2O3 column. 1H and COSY Nuclear Magnetic Resonance was performed to confirm the identity of both isomers, which are distinguishable by a characteristic signal near 10 ppm for the distal isomer. Furthermore, quantitative UV/Vis spectroscopy was utilized to characterize each isomer. High Resonance Mass Spectrometry quantification is in progress and electrochemical analyses will be performed in the future. Future work with these complexes also includes possible platinum (II) binding to create cis-platin analogues that may have applications in anticancer photodynamic therapy.

Keywords: Inorganic, Phototherapy, Metal-Ligand Complexes

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

Authors:

Title: The Effect of Topically Applying Five Thermoreceptor-Stimulating Chemicals on Local Thermal Sensation and Pain Thresholds

Abstract: **PURPOSE:** To determine the effect of menthol (MEN), capsaicin (CAP), camphor (CAM) eugenol (EUG), and cinnamaldehyde (CIN) on local thermal sensation and pain thresholds of the forearm, compared to a control (Vaseline; CON) trial.
METHODS: On six separate occasions, 8 participants (4 male, 4 female; 27±5 y; 171±9cm; 74.5±10.3 kg) sat passively in a thermoneutral environment (21.5±0.5°C and 50±3% relative humidity), while temperature stimuli were applied to the ventral surface of the forearm using a peltier device coated in one of the six aforementioned chemicals, while thermal sensation was recorded on a 200 mm visual analog scale (0 mm = extremely cold, 200 mm = extremely hot). The temperature stimuli ranged from 10 to 46°C in two-degree increments (19 stimuli total), delivered in a randomized order, and were batched as COLD (10-16°C), COOL (18-24°C). NEUTRAL (26-32°C), WARM (34-40°C) and HOT (42-46°C) for analysis. Subsequently, the detection thresholds for warm and cool sensation and pain thresholds for hot and cold sensations were determined by temperature-ramp protocols.
RESULTS: All five chemicals were compared to the CON trial (COLD: 55±19mm; COOL: 78±9mm; NEUTRAL: 100±4mm; WARM: 122±11mm; HOT: 148±7mm). MEN caused cooler sensations in the COLD (36±20mm, P=0.02) and COOL (55±19mm, P=0.01) temperature ranges. CIN caused warmer sensations in the COOL (87±8mm, P=0.05) and HOT (163±13mm, P=0.02) temperature ranges. CAP caused warmer sensations in the WARM (147±24mm, P=0.05) and HOT (174±18mm, P=0.01) temperature ranges. No differences were observed with EUG and CAM at any temperature range (P>0.24). In the CON trial, detection of cool sensation occurred at 24.2±1.2°C, cold pain at 2.2±2.9°C, warm sensation at 39.2±2.3°C, and hot pain at 48.2±1.9°C. With CAP, detection of warm sensation (36.0±2.8°C, P=0.002) and hot pain at (44.5±5.0°C, P=0.005) occurred at lower temperatures. With CIN, detection of hot pain (47.6±2.3°C, P=0.05) occurred at a lower temperature. No difference to CON were observed in the EUG and CAM trials (P>0.19).

CONCLUSION: Menthol lowered thermal sensation in the cooler temperature ranges and capsaicin increased thermal sensation in the warmer temperature ranges, demonstrating chemically mediated thermal perception is range dependent and does not occur across all temperatures.

Keywords: Physiology, Menthol, Capsaicin, Cinnamaldehyde, Eugenol, Camphor, Thermoregulation, Thermal sensation, Thermoreceptors, TRPV, Topical, Human.

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

Authors: Nickolas Lande, Sara Hanson, & Andrew Klocko

Title: Characterizing the histone post-translational modification enrichment and genome organization in species of the Ogataea clade

Abstract: The DNA of eukaryotic genomes is packaged in the nucleus as chromatin – an association of DNA and proteins that is necessary for the regulation of the genome, including for the control of gene transcription. Chromatin can either be active and open (euchromatin) or silenced and compact (heterochromatin), the latter typically characterized by a lack of histone acetylation in budding yeasts. Recent advances have shown that chromatin composition is a determining factor controlling genomic DNA organization, including how the aggregation of the heterochromatic regions at the nuclear periphery, which segregates euchromatin to the center of the nucleus, is critical for the compaction of fungal genomes into the nucleus. Specifically, the centromeres aggregate independently of the telomere clusters to form a Rabl conformation. However, it is unknown if chromatin composition and genome organization differ or is conserved in closely related species, including in fungi. To this end, we examined differences in histone post-translational modification deposition by Chromatin Immunoprecipitation-sequencing (ChIP-seq) and genome organization, assessed by chromosome conformation capture coupled with high-throughput sequencing (Hi-C) in two species of yeast in the Ogataea clade. We are focusing on Ogataea polymorpha, which is typically used for industrial protein production, and the closely related Ogataea haglerorum; the O. haglerorum isolate used in this study has a translocation between chromosomes one and six, relative to O. polymorpha. Here, we will present our preliminary analysis of the species-specific differences between O. polymorpha and O. haglerorum. Using two activating marks, trimethylation of lysine 4 histone H3 (H3K4me3) and the acetylation of lysine 16 on histone H4 (H4K16ac), we will assess differences in euchromatin and heterochromatin formation. Further, we will explore the genome organization changes between these two Ogataea species by Hi-C. Preliminarily, O. polymorpha and O. haglerorum show chromosome-wide euchromatin compaction and the clustering of centromeres that is independent from telomere bundles, suggesting the genomes of both species form a Rabl chromosome conformation. Together, our work should help elucidate differences in chromatin composition and genome organization between Ogataea species.

Keywords: Genome organization, fungal genetics, chromatin composition, Ogataea

---

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

Authors: Jen Burrows & Amanda Morgenstern

Title: Investigating Optimal Quantum Mechanical Cluster Size for Drug Design Targeting TbGSK3 Enzyme

Abstract: Current treatment options for Human African Trypanosomiasis, a neglected tropical disease caused by the Trypanosoma brucei parasite, are limited and can have significant side effects. T. brucei's glycogen synthase kinase 3 (TbGSK3) enzyme is important in metabolism, lending itself to be a strong candidate for inhibition and development of more targeted pharmaceuticals.

Computational chemistry has increasingly become a primary tool in screening pharmaceutical candidates and designing drugs. Quantum mechanical (QM) modeling of active site clusters, as opposed to molecular modeling (MM) or combined QM/MM systems of full enzymes, is a relatively new technique in exploring ligand-enzyme interactions with the potential to more accurately predict experimental binding energies. The tradeoff between computational cost of increasing cluster size and accuracy is an issue impeding efficiency. This work utilizes TbGSK3 to explore the effects of radial cluster size on calculated binding energy values, with the goal of correlating to experimental IC50 values of indirubin ligands. Density Functional Theory (DFT) calculations were performed on active site cluster models in one-Angstrom intervals from 3 Å to 6 Å. Binding energies converged around the 4 Å abbreviated amino acid size (276 and 220 atoms for the two ligands tested). Calculations were compared at varying levels of complexity. On average, optimizing geometry added 13 hours of computational time. Future work will examine additional ligands as well as compare calculated binding energies to experimental IC50 values.

Keywords: drug discovery, drug design, computational chemistry, ligand, enzyme, inhibitor, GSK3, Trypanosoma brucei

---

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

Authors: Crystal Vander Zanden

Title: Characterizing Cancerous and Non-Cancerous Phospholipid Membrane Compositions Using Confocal Microscopy

Abstract: This project focuses on exploring the differences in lipid organization and diffusion between cancerous and non-cancerous plasma membranes. Literature has found that due to a loss of polarity within cancer cells, the composition of lipids in the inner and outer leaflet of the plasma membrane changes when compared to a non-cancerous cell. This change can affect lateral diffusion through the plasma membrane, which can influence how proteins interact at the cell surface. This work sets the foundation for studying surface protein interactions in a model membrane mimicking different cell conditions. Two lipid compositions were studied, one reflecting the typical composition of the outer leaflet of the plasma membrane. The second composition was designed to mimic the outer membrane of cancer cells, containing higher amounts of phosphatidylserine and phosphatidylethanolamine lipids, which are typically only observed in the inner leaflet of the plasma membrane. Membranes were fluorescently labelled and visually characterized with confocal microscopy. Lipid lateral diffusion was also quantified using fluorescence recovery after photobleaching (FRAP). Results from confocal microscopy images indicated that the cancerous lipid membrane composition had larger domain formation when compared to the non-cancerous membrane. Analyzing FRAP data concluded that the cancerous membrane also had a diffusion coefficient of 0.59+/-0.04μm2/s compared to 0.42+/-0.03 μm2/s for the noncancerous membrane, indicating faster lipid diffusion in the cancerous model. Overall, this project found that the cancerous lipid model membrane was more laterally mobile than the non-cancerous, which could influence how transmembrane proteins are able to interact with cell-coordinating proteins at the cell surface.

Keywords: Cancer, Lipid Organization and Dynamics, Cell Surface Interactions

---

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

Title: Synthesis of isoxazoles and enaminals as precursors to novel heterocycles

Abstract: This project is directed towards the synthesis of heterocycles via novel enaminals derived from readily available salicylaldehyde derivatives. Reacting the derivatives with propargyl bromide in base and later with hydroxylamine yields a propargylated oxime. These propargylated oxime derivatives undergo intramolecular cycloaddition to form tricyclic isoxazoles which can be reduced to enaminals with Raney Nickel in pressurized hydrogen atmosphere. Select tricyclic isoxazole derivatives reduce fully and require no purification.

Keywords: Isoxazole, Enaminal

Presenters:	Kyrie Milliron	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry
Authors:				

Title: Understanding The Molecular Determinants Required For Epstein-Barr Virus Attachment and Inhibition

Abstract: Epstein-Barr virus (EBV) is one of the most common human viruses infecting 95% of the world's adult population. EBV establishes a lifelong latency where the virus can reactivate triggering severe cancers and autoimmune diseases. Currently, there are no therapeutics or vaccines against EBV. The crucial interaction between Complement Receptor 2 (CR2), on the surface of B-cells, and EBV's surface glycoprotein 350 (gp350) results in the viral infection. This study presents data from methods that have not been used on the gp350 – CR2 interaction. The interaction was studied via the biophysical method of bio-layer interferometry (BLItz) and the computational method of High Ambiguity Driven Biomolecular Docking (HADDOCK). The 293T cell line was used for protein production as the proteins have never been fully produced in a human cell line and used in binding assays. The BLItz method gave a calculated binding affinity of 0.9 ± 0.2 μM. The HADDOCK method allowed for detailed depictions of theoretical binding between the proteins and provided common residues to be further explored. The inhibition of the binding of gp350 to CR2 was explored via five different peptide sequences and the BLItz method. The results indicated binding inhibition of gp350 to CR2 for all peptides. This study's data allows for a better biophysical and computational understanding of how EBV interacts with the body while also providing new residues to be further explored for their importance to the interaction. The data also provides a peptide inhibition method as a first step towards a therapeutic against the virus.

Keywords: Virology, Immunology, Biochemistry, Virus, Epstein-Barr virus, Peptides, Biophysical Methods, Computational Methods, Human Cell line, E. coli Cell line

---

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: Christopher Salazar — Graduate Student — College of Letters, Arts and Sciences — Department of Chemistry & Biochemistry

Authors: Kevin Tvrdy

Title: Modeling of a Hydrogel Through Computational Means to Determine its Interaction Properties with Single Wall Carbon Nanotubes (SWCNTs)

Abstract: Purification of single-walled carbon nanotubes (SWCNTs) is necessary for the optimal utilization of their structure dependent properties. To date, the most scalable method to achieve such involves iterative hydrogel chromatography, which affords enriched samples of SWCNTs based on type (metal/semiconducting) and band structure (chirality). There are three possible interactions that may occur between a hydrogel and a SWCNT in such schemes: reversible binding, irreversible binding, or absence of binding. To better understand the mechanisms for these events and achieve molecular-scale correlation between experimental data and nanotube/gel interactions, a Monte Carlo method was developed to simulate the formation of hydrogels containing varying components. This method of building the system relies on equilibrium statistical mechanics rather than quantum mechanics or molecular dynamics. Sephacryl is the hydrogel of interest and is a cross-linked copolymer of allydextran (aDex) and N,N'-methylene bisacrylamide (MBA) that is radicalized by ammonium persulfate (APS) radicals. The shape of aDex was approximated to be spherical due to its Newtonian viscosity behavior at concentrations used during hydrogel synthesis, but because of varying techniques it is unknown what its exact volume is. On the other hand, the volume of an individual molecule of MBA and ASR can be determined and approximated by their respective molecular weights and density. To simplify and approximate computational methods the three subunits of Sephacryl were coded to be spheres and placed randomly in a simulation volume with periodic boundary conditions (PCBs), with adjustability to fine tune either aDex's unknown volume or the desired resolution of the entire simulation.

Keywords: single-walled carbon nanotubes, SWCNTs, iterative hydrogel chromatography, Monte Carlo method, Sephacryl, allydextran, and computational simulations

---

Presenters: Alexa Unger — Undergraduate Student — College of Letters, Arts and Sciences — Department of Chemistry & Biochemistry

Authors: Jamil Nemri, Nathaniel Gilbert

Title: Structure of Membrane Bound Human 15-Lipoxygenase-2

Abstract: In heart disease, atherosclerotic plaque formation is linked to oxidation of poly-unsaturated fatty acids, which is catalyzed by 15-lipoxygenase-2 (15-LOX-2) in macrophages. This contributes to development of foam cells in atherosclerotic plaques. 15-LOX-2 is hypothesized to undergo structural rearrangement as it binds membranes to perform oxidation. The structure of cytoplasmic 15-LOX-2 bound to a substrate mimic is known, and previous work suggests membrane binding is driven by calcium ions, a long hydrophobic loop, and structural rearrangement to expose an amphipathic helix. The purpose of this research is to determine the structure of active 15-LOX-2 when membrane bound, as this membrane-bound structure is likely a more relevant target for inhibitor design. Molecular dynamics (MD) simulations in combination with liquid surface X-ray reflectivity of 15-LOX-2 bound to a model lipid membrane were performed to determine electron density profiles for membrane-bound 15-LOX-2. Preliminary results suggest that the structure obtained from MD simulations accurately reproduces the electron density profile of membrane-bound 15-LOX-2 measured by X-ray reflectivity. The results match expected structural changes, including the amphipathic alpha helix rotating to expose hydrophobic residues that drive membrane binding. Overall, we propose a reasonable structure for membrane-bound 15-LOX-2 obtained through combination of complementary simulation and experimental methods. Altogether, this work helps build foundational knowledge towards pharmaceutical research for prevention and treatments of atherosclerotic plaques.

Keywords: Atherosclerosis, Molecular Dynamics, Electron Density, Conformational Change, Lipoxygenase

---

Presenters: Jacob Voris Undergraduate Student College of Letters, Arts and Sciences Department of Chemistry & Biochemistry

Authors: Andrew Reckard, Abhishek Pandeya, Carlos Gonzalez Cruz, Andrew Klocko,

Title: A Constitutive Heterochromatic Region Shapes Genome Organization and Impacts Gene Expression in Neurospora crassa

Abstract: Organization of the eukaryotic genome is essential for proper function, including gene expression. In metazoans, chromatin loops and Topologically Associated Domains (TADs) organize genes into transcription factories, while chromosomes occupy nuclear territories in which silent heterochromatin is compartmentalized at the nuclear periphery and active euchromatin localizes to the nucleus center. A similar hierarchical organization occurs in the fungus Neurospora crassa where its seven chromosomes form a Rabl conformation typified by heterochromatic centromeres and telomeres independently clustering at the nuclear membrane, while interspersed heterochromatic loci aggregate across Megabases of linear genomic distance to loop chromatin in TAD-like structures. However, the role of individual heterochromatic loci in normal genome organization and function is unknown.

We examined the genome organization of a Neurospora strain harboring a ~47.4 kilobase deletion within a temporarily silent, facultative heterochromatic region, as well as the genome organization of a strain deleted of a 110.6 kilobase permanently silent constitutive heterochromatic region. While the facultative heterochromatin deletion minimally effects local chromatin structure or telomere clustering, the constitutive heterochromatin deletion alters local chromatin structure, the predicted three-dimensional chromosome conformation, and the

expression of some genes, which are qualitatively repositioned into the nucleus center, while increasing Hi-C variability.

Our work elucidates how an individual constitutive heterochromatic region impacts genome organization and function. Specifically, one silent region indirectly assists in the hierarchical folding of the entire Neurospora genome by aggregating into the “typical” heterochromatin bundle normally observed in wild type nuclei, which may promote normal gene expression by positioning euchromatin in the nucleus center.

Keywords: genome organization, chromosome conformation, heterochromatin, Neurospora crassa, gene expression

---

Presenters: David Weiss | Faculty | College of Letters, Arts and Sciences | Department of Chemistry & Biochemistry

Authors: Jake Marcotte, Kailene Black, Aidan Burke, & Najla Vasquez

Title: Do Learning Assistants Improve Outcomes in General Chemistry 2? Exploring Impact Across Courses and Student Groups

Abstract: Learning Assistants (LAs) have been shown to improve student performance and retention in high-enrollment courses such as General Chemistry 1 (GC1), but their impact on General Chemistry 2 (GC2) students is less clear. Not all students who complete GC1 continue to GC2, as the latter typically includes fewer students who need only one semester of laboratory credit and a lower proportion of first-year students. GC2 students are often STEM majors and are more likely to be a mix of students beyond their first year in college, in contrast to GC1, where many students are in their first semester. This study investigates whether LAs have a similar influence on student outcomes in GC2 compared to GC1, with a focus on subgroups such as on- and off-sequence students, first-generation, minority, and military students.

We analyzed course performance (average course grade) and DFW rates for two semesters of both GC1 and GC2, comparing sections with LAs to those without. In GC1, LA-supported sections saw a 22% reduction in DFW rates compared to non-LA sections, while in GC2, there was still a measurable improvement in DFW rates, although less pronounced. We explore whether the timing of course enrollment (on-sequence vs. off-sequence) or student demographics are significant factors in LA impact, and examine student perceptions of LAs across different groups. Preliminary results suggest that while LAs consistently improve outcomes for GC1 students, their influence in GC2 may depend on specific student characteristics and sequence timing.

Keywords: Learning Assistant, Chemical Education

Computer Science Presentations

Presenters:	Austin Byrd	Undergraduate Student	College of Engineering	Computer Science

Authors: Austin Byrd, Colton Hill, & Keith Paarporn
Title: Conditions for Altruistic Perversity under Evolutionary Dynamics

Abstract: Evolutionary game theory studies the collective behaviors in populations of decision-making agents. Analyzing their interactions sheds light onto many social scenarios, from resource consumption, epidemics, and traffic congestion. This paper investigates the outcomes of interactions within heterogeneous populations. Specifically, we examine the interaction between self-interested (selfish) agents and societally-interested (altruistic) agents. While the actions of altruistic agents are intuitively expected to enhance societal welfare; this study demonstrates that under certain circumstances the presence of altruistic agents can result in suboptimal societal outcomes. These outcomes are termed "Altruistically Perverse". Our results characterize conditions for altruistic perversity in the context of evolutionary game dynamics. In particular, we find there are stable outcomes under a heterogeneous population that exhibits worse social welfare compared to the stable outcomes under a homogeneous population with no altruists.

Keywords: Evolutionary Dynamics, Game Theory, Altruistic Perversity, Stable Fixed Points

---

Presenters:	Jared Carruthers	Undergraduate Student	College of Engineering	Computer Science

Authors: Jared Carruthers & Dana Wortman
Title: Evaluating Dynamic Non-player Character Behavior Based on the Theory of Basic Values

Abstract: This research aims to look into enhancing a player's experience playing a video game by discovering the effects of having dynamic Non Player Characters versus static Non Player Characters. The method used for finding data involved creating 2 versions of a game. One game without dynamic NPCs and one with dynamic npcs. Then this game was played by a control group and a variable group. Testing also included a pre- game survey and a post-game survey. Decisions and gameplay were recorded automatically by the game. This data was then used to pinpoint points in the game with dynamic interactions to then compare to the control group. The overall data suggests that participants from the variable group enjoyed the game by a greater percentage than the control group. This may imply that the dynamic NPCs increased player enjoyment. However, The variable group on average found the characters less realistic which may imply that player enjoyment is not dependent on the realism of the NPCS. Players in the control group had a preference for Barnabus, Getrude ,and Sally. The control group however had a preference toward Theodore and Timothy. This may imply a difference in test groups, or a preference to the dynamic changing of Timothy and Theodore over the others.

Keywords: Dynamic, Enjoyment, Values, Personality, Change,

Presenters:	Michael Hanna	Undergraduate Student	College of Engineering	Computer Science

Authors: Michael Hanna
Title: DoS and DDoS
Abstract: This presentation explores threats produced by Denial of Service (DoS) and Distributed Denial of Service (DDoS) attacks highlighting how common they are, ease in their execution, and the consequences these attacks bring. DoS and DDoS attacks are cyberattacks designed to overwhelm a server, network, or website rendering it inaccessible. DoS and DDoS attacks can severely disrupt network availability impacting businesses, government services, and critical systems. Using tools like LOIC and Hping3, our project simulates flood attacks including TCO SYN, HTTP, and ICM flooding in a virtual environment to show their impact on packet loss, latency, and overall network traffic. By identifying and addressing weaknesses in our virtual machine environment we can provide strategies to mitigate these intrusions. For example, optimizing firewall rules and rate limiting or getting even more advanced with machine learning-based anomaly detection to further protect against the ever-evolving threats. This project shows the importance of strong defense and ongoing efforts to protect our systems from the growing threats of DoS and DDoS attacks.

Keywords: Denial-of-Service course project

Presenters:	Heather Lawrence	Graduate Student	College of Engineering	Computer Science

Authors: Heather Lawrence, Yanyan Zhuang, & Gedare Bloom
Title: Colorado University Kubernetes Testbed for Modbus Encrypted with TLS (CUBE-METLS)

Abstract: Modbus, an open-source protocol developed by Modicon in 1979, has been widely adopted in industrial control systems (ICS) for its simplicity and interoperability. However, it lacks essential security features, such as confidentiality and authorization, transmitting data over cleartext. In 2018, Modbus/TCP Security was introduced to address these vulnerabilities by adding encryption and authentication through Transport Layer Security (TLS). While several Modbus datasets are available for research purposes, they contain unencrypted traffic captured from virtual, physical, or hybrid testbeds. There is a lack of publicly available datasets that include Modbus traffic encrypted with TLS. Datasets without encrypted traffic do not reflect current protocol standards. Our dataset, the Colorado University Kubernetes Testbed for Modbus Encrypted with TLS (CUBE-METLS), contains both baseline and attack traffic captured in a simulated water treatment plant network deployed on a Kubernetes cluster.

The biggest challenge in literature is generating attack and benign traffic for Modbus networks. In this work, we use a virtualized cluster for CUBE-METLS that allows automatic deployment and teardown of endpoints used to generate benign and attack traffic with and without encryption. The dataset includes benign and attack traffic both with and without TLS encryption, managed through a certificate authority, providing a comprehensive view of encrypted and unencrypted communication. The data was preprocessed to facilitate machine learning model development, focusing on classification-based intrusion detection. The CUBE-METLS dataset offers a unique opportunity for researchers to explore the impact of encryption on feature availability and the efficacy of ML-based intrusion detection in ICS networks.

Keywords: Modbus, TLS, ICS, Machine Learning

Presenters:	Mark Maldonado	Graduate Student	College of Engineering	Computer Science

Authors: Mark Maldonado, Aaron Wegert, & Joshua Muller
Title: Towards Quantifying the Mission Assurance Utility of Honeypot and LLMs to Cyber Operations

Abstract: Cyber deception, especially honeypot, platforms / tools have great potential in assuring mission assurance and achieving operational, and possibly strategic, advantages over adversaries. Large Language Model (LLM) also has great potential in enhancing mission assurance and elevating cyber operations. However, the mission assurance utility of collectively using cyber deception and LLM in the real world has yet to be understood. In this paper we fill the void by conducting experimental studies to quantify their mission assurance utility in real cyber environments, especially wasting adversaries' time and resources, via two metrics: success in disguising the presence of honeypots so as to not be evaded by adversaries who may also use LLM as an offensive tool, and the degree that honeypots can slow down adversaries in accomplishing their offensive cyber missions.

Keywords: Honeypot, Cyber Exploitation, Hacking, Machine Learning, Large Language Model, Cyber Security

---

Presenters:	Ryan Montgomery	Undergraduate Student	College of Engineering	Computer Science

Authors: Ryan Montgomery & Zakery Snider
Title: Datalus - Steganographic Password Manager

Abstract: Password managers such as LastPass and BitWarden present an attractive target to attackers by storing user data in a single identifiable vault. To address this vulnerability, our project introduces Datalus, an innovative steganographic password manager that embeds encrypted user data into PNG files using least significant bit (LSB) steganography. With this approach, user credentials are concealed from existence.

Datalus implements a distributed password vault model where a user's account data is stored in an image that is used for authentication. Each credential a user creates is stored in a different image, and no credential can be decrypted without authenticating against the account image. This model provides security through obfuscation and offers a robust alternative to conventional password vaults. Data in use is safeguarded by utilizing the Windows API for memory protection, limiting the possibility of memory-based attacks. By applying 3 layers of AES-256 encryption to steganographically stored user data, bcrypt hashing for authentication, and entropy-based random number generation, the solution maximizes data protection and brute force resistance.

Developed in C++ with efficient utilization of its libraries, this tool is catered to Windows users, offering a streamlined and secure password management experience. The working prototype has demonstrated secure password storage and resisted simulated attacks, and there are plans to perform penetration testing against it in the future. By combining encryption, steganography, and memory protection, this solution provides a secure, hidden, and innovative alternative to traditional password managers.

Keywords: Cybersecurity, Computer Science, Software Engineering, Steganography, Password Manager, Encryption, Ciphertext, Data Security, C++

Presenters:	Naomi Rodriguez	Undergraduate Student	College of Engineering	Computer Science

Authors: Naomi Rodriguez
Title: Kindly Make Way for the Selfish Self Driving Cars

Abstract: In many American cities, road infrastructure dominates urban space as personal vehicles remain the primary mode of transportation. With growing populations, travel times continue to increase, often leading to the expansion of road networks and tolls as a primary response to traffic congestion. Recently, autonomous vehicles have emerged as a promising solution, offering the potential to enhance traffic flow through mechanisms such as platooning– where self-driving cars travel in close proximity to one another. This approach has the potential to improve travel times, increase road capacity, and reduce congestion. However, a critical question arises: What behaviors should self-driving cars prioritize? Should they optimize individual travel times or consider broader, collective impacts?

Studies of routing behavior in transportation networks have shown that the introduction of dithering– randomly selecting among a set of optimal routes– can lead to improved overall network performance. This research examines the contrast between individualistic (selfish) routing behaviors and altruistic ones, exploring how dithering, when combined with these behavioral strategies, impacts congestion for users across the network.

This study utilizes two network models to simulate the effects of dithering and varying levels of dithering within a transportation system. Contrary to prior research, which warned that altruistic behaviors could exacerbate traffic congestion by up to threefold, our findings suggest that in practical applications, this outcome is not observed.

Keywords: Game Theory, Computer Science, Graph Theory

Presenters:	Alan Sanchez	Undergraduate Student	College of Engineering	Computer Science

Authors: Alan Sanchez & Irving Reyes
Title: Satellite Jamming Model: Jamming from one satellite to another

Abstract: Satellite jamming is one of the most common vulnerabilities in aerospace. Many basic radio frequency interference scenarios could affect the signal of the satellite. The scenario of one satellite jamming another satellite will demonstrate the attack model's construct and the risk assessment approach. The goal of this project was to determine the variables required to jam another satellite successfully and how efficient the attack is by studying the relative positions and the effectiveness change over time. The purpose of this project is to model the satellite jamming attack by using the calculations of free space path loss, earth-centered inertia position and velocity, earth-centered earth-fixed, latitude/longitude/altitude, and ground station angles from TLE data. These calculations help determine the distance between two satellites and the signal strength needed. We will use the STK- System Tool Kit to recreate a simulation create a simulation in where low-orbit satellite is being used to jam another satellite.

Keywords: Aerospace, Jamming, Satellite, Cyber security and models

---

Presenters:	Evan Schilling	Undergraduate Student	College of Engineering	Computer Science

Authors: Evan Schilling & Dana Wortman
Title: Analyzing Brain Training Mobile Applications and their Minigames' Design in Maintaining Cognitive Ability

Abstract: Video games have previously shown potential to be used as tools for learning practical skills, such as cognitive abilities and mechanisms to deal with negative emotions. This research aims to analyze mobile applications marketed as brain trainers (or "brain training apps", for short) to see if they are actually effective tools for retaining cognitive abilities. Additionally, the study aims to provide feedback from both a scientific and game design perspective on improvements to the apps to further their usefulness regarding potential cognitive benefits. Prior research has yielded mixed results on the efficacy of these apps, which could be a result of analyzing the brain training apps as a whole instead of viewing them as a sum of many minigames. As such, factoring in the individual game design of each minigame may assist in determining these apps' efficacy. After careful analysis of a selection of commonly used brain training apps and the games within, it was found that there was potential, as many games did show some cognitive stimulation. However, it was also found that games that utilized more puzzle elements that required more constant thinking and reasoning resulted in sustained cognitive stimulation for a longer period of time when compared to games whose rulesets allowed for more (though not entirely) mindless repetition. Thus, while the brain training apps show promise, the best improvement they can make would be to incorporate more minigames that utilize puzzle elements that requires players to consistently apply reasoning and critical thinking.

Keywords: game design, cognitive ability, mobile applications, brain training, video game

---

Presenters:	Klaus Streicher	Graduate Student	College of Engineering	Computer Science

Authors: Klaus Streicher, Ekzhin Ear, Jared Slayer, & Shouhuai Xu
Title: Analyzing Real World Cyber Threat Frameworks

Abstract: Cyber threat frameworks are popular, widely used tools for evaluating threats to systems. The goal of a threat framework is to provide a structured frameworks that enables consistent and standardized communication of threats. In practice, cyber threat frameworks frequently inform cyber defense strategy, risk assessments, and incident response. Little previous work has been conducted to identify practitioner usage of cyber threat frameworks. We systematically investigate practitioner usage of cyber threat frameworks by conducting an online survey of 100 practitioners. We show that overlapping frameworks are often used, without clear distinction between strengths and weaknesses of each framework. Our study reveals that MITRE ATT&CK framework is the most used threat framework in industry, and that many industries have a niche threat framework. We show opportunities for improvement of current threat frameworks by characterizing desirable attributes and analyzing the gap. We discuss possible reasons for the state of threat frameworks across practitioner industry.

Keywords: Cyber Threat Frameworks, Computer Security, MITRE Att&ck, SPARTA

Presenters: Wesley Hileman | Graduate Student | College of Engineering | Electrical and Computer Engineering

Authors: Wesley Hileman, Byeong Lee, m. Scott Trimboli, & Gregory Plett

Title: Improving Lithium-Metal Battery Cell Models by Combining Physics with Machine Learning

Abstract: The dynamics of lithium-ion and lithium-metal battery cells are often represented with physics-based single-particle models (SPMs). SPMs are efficient enough to embed in applications such as electric vehicles but suffer from loss of accuracy due to the assumption that electrochemical variables remain uniform across the thickness of a cell's porous electrodes. This problem is amplified in cells with thick electrodes, which may be employed in weight-critical applications due to higher energy density. As a particular area of interest, SPMs do not model variation in the solid-surface stoichiometry variable across the thickness of the electrodes, which leads to significant error in the cell voltage prediction. To enable controls that maximize the lifespan and performance of lithium battery cells, we need a model that produces accurate predictions while remaining efficient enough to embed in end applications. To this end, we hybridize an existing enhanced single-particle model (SPMe) for lithium-metal battery (LMB) cells with a feedforward neural network (FNN) to better predict solid-surface stoichiometry at the edge of the porous electrode. We feed the state of the physics-based SPMe into the FNN as the input, resulting in a hybrid model that we call a "physics informed" neural network. We train the hybrid model using the "ground truth" predictions of a partial-differential-equation (PDE) model implemented with the PyBaMM package. The prediction error of the trained hybrid model is 93.8% less than the plain SPMe model for an EPA US06 drive profile, which we consider a significant improvement for control applications.

Keywords: Lithium-metal batteries, single-particle model, deep learning, machine learning, feedforward neural network

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

Authors: Sabir Ali Kalhoro
Title: Optimal Planning of Hybrid Fuel Cell-Battery System for Zero-Emission Microgrid Applications

Abstract: Zero-emission microgrids (MGs) have emerged as effective platforms for deploying renewable energy resources. In this context, integrating a battery-fuel cell (FC) system offers a promising solution to eliminate fossil fuel-based distributed generation (DG) and achieve zero-emission MGs. This work presents a comprehensive planning model for the optimal sizing of a battery-FC system in zero-emission MGs, with the objective of minimizing storage investment and microgrid operation costs. The model optimizes the sizing of hybrid storage components, including the hydrogen storage tank, FC, electrolyzer (EL), stack voltage, and the number of hydrogen fuel cells required. It also uniquely optimizes hydrogen flow rate to reduce FC degradation and improve efficiency while accounting for battery replacement costs.
This integrated approach minimizes FC degradation, maximizes efficiency, and addresses long-term battery replacement costs, thereby enhancing the system's overall sustainability and economic viability. By balancing these factors, the model supports a more reliable energy supply and reduces dependency on fossil fuel-based DG, while enabling high penetration of renewable energy. These optimizations collectively lower operational costs, improve system resilience, and make zero-emission microgrids a more viable and effective solution for sustainable energy.

Keywords: Zero-Emission Microgrid, Battery, Fuel Cell, Hybrid Storage System

---

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

Authors: Sina Sabotokin
Title: Optimal Planning of Wind-Based Distributed Generation in Distribution Network: Correlating Penetration Factor, Turbine Selection, and Power Factor for Line Loss Minimization

Abstract: As wind energy penetration in power distribution networks grows, advanced planning models are crucial for ensuring efficient integration and reliable network operation. This paper introduces an optimization model designed to determine the optimal sizing and placement of wind distributed generators (DGs) to minimize investment costs, reduce line losses, and support a higher penetration of renewable energy. The model calculates the optimal operating power factor for DGs, which is essential for minimizing line losses and enhancing voltage stability. Unlike traditional methods, this model uniquely considers the complex interdependencies between turbine selection, capacity factor, and DG sizing—key factors for maximizing the benefits of DG integration. It also accounts for the relationships between DG penetration factor, corrected power factor, and line loss reduction.

By incorporating these critical elements, the model provides a comprehensive framework for efficient wind DG deployment, significantly reducing line losses, enhancing voltage stability, and lowering investment costs. Additionally, it addresses the uncertainties associated with wind power generation and system demand through a probabilistic approach, ensuring robust performance under variable conditions. Simulations on IEEE 33-bus test systems validate the model’s effectiveness, highlighting its potential to enhance network efficiency and stability while optimizing DG placement and sizing. This model supports a sustainable energy future by facilitating higher renewable energy integration and reducing reliance on conventional power sources, making it an impactful tool for advancing renewable penetration in power distribution networks.

Keywords: Wind-based DG, penetration factor, loss minimization.

Geography and Environmental Studies Presentations

Presenters:	Kailene Black	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Authors: Emily Skop & Kailene Black
Title: Fostering more equitable relationships with our research collaborations through an ethos of care framework

Abstract: Collaborative research provides highly impactful experiences and opportunities for growth in both the name of discovery and connections. However, well-intentioned collaborations can reinforce "unkind and aggressive" research conditions and further an academic culture that embeds a sense of isolation and loneliness at work. This promotes the question: How can we foster and sustain more equitable relationships with our research collaborations? In order to address this, the inaugural "Ethos of Care Credential for Transformational Change" credential and the inaugural "Convening of Care" was developed to discuss strategies to mitigate implicit bias and promote an ethos of care in the academic research enterprise. Early career faculty, academic research leaders, and academic research enterprise professionals engaged in deep conversations about the intractable and systematically entrenched problems of underrepresentation and carelessness in the academic research enterprise. The key obstacles we identified included 1) resource distribution is predicated on a range of factors, including but not limited to institutional type, mission, size, even geography, and 2) unequal power dynamics that exist within and between higher education institutions and their partners. Our charge to the broader community to address these issues and infuse an ethos of care is to listen, encourage, and uplift collaborators, and foster discussions about critical incidents, vulnerabilities, and lived experiences. Ultimately, the goal is to build more inclusive, diverse relationships and untangle systemic injustices in the academic research enterprise.

Keywords: Care, research, collaborations, research enterprise

---

Presenters:	Campbell Curcio	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Authors: Campbell Curcio & Eric Billmeyer
Title: Volcanic Landscapes of Tenerife: Lava Flow Characteristics and Monitoring Techniques

Abstract: Tenerife, the largest of Spain's Canary Islands, is a geological wonder shaped by volcanic activity over millions of years. This research explores the island's volcanic landscape, focusing on lava flow types, historical eruptions, and modern monitoring techniques. Field observations highlighted diverse lava formations, including pahoehoe, and a'a, revealing the processes that have sculpted the terrain. A timeline of eruptions, particularly the role of Mount Teide and historical events like the 1909 Chinyero eruption, underscores how volcanism has shaped the island's natural and human history. Additionally, the research delves into volcanic monitoring practices, emphasizing tools such as leveling devices, gas analyzers, and seismic sensors that assess activity and mitigate risks. Insights gained during this study show how understanding past lava flows informs present-day monitoring and disaster preparedness strategies, ensuring the safety of both residents and visitors. The research combines fieldwork, historical analysis, and

technical exploration to provide a holistic view of Tenerife's dynamic volcanic systems. It highlights the island as a case study for balancing geological processes with societal resilience, offering broader implications for volcanic monitoring and management in similar settings worldwide.

Keywords: Tenerife, volcanic landscape, lava flows, Mount Teide, historical eruptions, volcanic monitoring, disaster preparedness, pahoehoe, a'a, Canary Islands.

Presenters:	Lauren DeLeonardis	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Authors: Lauren DeLeonardis

Title: Paleocene Microvertebrate Fossils of the Denver Basin

Abstract: The Coral Bluffs Research team at the Denver Museum of Nature and Science studies the fauna of the late Cretaceous-Paleogene D1 Sequence within the Denver Formation, located in the Denver Basin. This formation spans the Front Range from Greeley to Colorado Springs and eastward to Limon. Sediments deposited into the basin during mountain uplift and erosion have created fossil-rich sites such as Corral Bluffs, South Table Mountain, Littleton, and West Bijou Creek. The K-Pg boundary, preserved in this formation, is particularly significant as it provides critical evidence of Earth's biotic recovery following the mass extinction event 66 million years ago. Mammal fossils are especially notable, documenting the rise of mammals after the extinction of non-avian dinosaurs.

My involvement in this research included fieldwork during the summer, where I helped collect sediment of interest. These samples were later processed through detailed sorting techniques. Microscopic analysis of the sorted material allowed for the identification of microfossils such as mammal teeth, bones, and other fragments.

Health Sciences Presentations

Presenters:	Maggie Baird	Graduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Maggie Baird

Title: Strength Differences in Unilateral Ankle Sprainers: A Within-Subject Analysis

Abstract: Context: Dynamic ankle stability is achieved through the lower leg musculature. Of this musculature, the invertors and plantar flexors are known to be involved in lateral ankle sprains. The aim of this study was to compare strength differences in plantar flexion, dorsiflexion, inversion, and eversion between the limbs of participants with a history of unilateral ankle sprains. Methods: Utilizing a cross-sectional study design, 207 Division I student-athletes (114 males, 93 females; age: 18.4±0.7yrs) took part in this study. Inclusion criteria included a history of unilateral ankle sprain with exclusion criteria including any lower extremity injury within 6 months prior to data collection. Using a KinCom isokinetic dynamometer (Isokinetic International, East Ridge, TN), average torque measurements were collected for concentric and eccentric plantar flexion, dorsiflexion, inversion, and eversion strength at 30o/sec and 120o/sec. Paired t-tests were utilized to compare strength between the involved and uninvolved limbs. Results: A total of 16 strength measurements were compared in this current study. All 4 measures in plantar flexion, dorsiflexion, and eversion were statistically significant with the involved limb producing less torque than the uninvolved limb. Three of four inversion measurements produced significantly reduced strength in the involved legs. Conclusions: Residual deficits in concentric and eccentric plantar flexion, dorsiflexion, inversion, and eversion strength exist in limbs with a previous history of an ankle sprain resulting in a significantly weaker involved side. This indicates a need for continued rehabilitation exercises post return to sport in collegiate student-athletes.

Keywords:

Presenters:	Yvette Beltran Guzman	Graduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Yvette Beltran Guzman & Kathy Liu

Title: Collegiate Athletes with a Previous Thigh Strain have High Rates of Re-injury

Abstract: Introduction: Muscular thigh injuries are common in sports involving sprinting and acceleration, leading to substantial loss of playing time. Athletes typically return to play (RTP) after 2-3 weeks, but recurrent injuries can extend recovery.

Methods: Medical records over a 10-year period of collegiate student-athletes were reviewed for thigh strains (quadriceps, hamstrings, adductor/groin). Of 712 records, 157 student-athletes (106 males, 51 females) had documented thigh strains. Subsequent recurrent injuries to the same muscle group were also recorded. Descriptive analyses, Chi- squared, and ANOVAs evaluated reinjury rates.

Results: Out of the 157 individuals with initial strains, 140 experienced a recurrent strain (89%). Location of recurrent strains were: 100 hamstrings, 24 quadriceps, 23 adductor/groin, and 10 non-specific thigh strains. There were no significant differences in reinjury rates among muscle groups (p=0.108). Of the 106 males, 90 of them sustained a recurrent strain to the same muscle group, while 16 of them did not (LR+:89.961). Of the 51 females, 50 of them sustained a recurrent strain to the same muscle group, while 1 of them did not (LR+:9.844). The average days between the first and second strains were 190±362 days (range: 5-3852).

Conclusions: High reinjury rates in thigh muscle strains can cause significant challenges for athletes. Pressure to return early may lead to reinjury, suggesting a need for a more cautious RTP strategy. Understanding risk factors and injury patterns can help clinicians manage rehabilitation effectively and support safer RTP.

Keywords:

Presenters:	Kathryn Bond	Undergraduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Katheryn Bond, Faith Roth-Broske, Margaret Harris, Andrea Hutchins, Jessica Kirby

Title: Face and content validation of a tool designed to study the dietary habits of weightlifters

Abstract: This study seeks to validate a nutrition questionnaire using a sample of athletes across several weightlifting disciplines, including powerlifting, Olympic lifting, CrossFit, Strongman, and the Scottish Highland Games. Despite the physical demands of these sports, little research compares nutrition practices across these weightlifting communities. Previous studies have highlighted certain dietary trends for bodybuilders and powerlifters, yet data for other sports, such as Strongman or Highland Games, are largely anecdotal. To address this gap, we created a survey tool using face and content validation. We adapted the Mini-Eating Assessment Tool (Mini-EAT) to capture the dietary practices of weightlifting athletes. This tool measures intake across key food categories to provide a comprehensive nutritional profile. Data collection is ongoing at gyms and healthcare facilities, with the purpose of addressing construct validity.

Keywords: weightlifting, diet, nutrition

Presenters:	Madeline Metzger	Undergraduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Madeline Metzger & Jennifer Zohn

Title: Suicide Prevention Continuing Education: State Requirements for RNs & ARNPs Across the U.S.

Abstract: To compare state licensure requirements for suicide prevention continuing education (CE) for Registered Nurses (RN) and Advanced Registered Nurse Practitioners (ARNP) across the U.S., Suicide is the eleventh leading cause of death in the U.S. (CDC, 2024). Despite its preventability, nurses often lack training in suicide care (Kotowski & Roye, 2017). Most states don't require suicide prevention CE after initial RN or ARNP licensure. Mandatory, evidence-based CE is essential for effective suicide prevention nationwide. This project utilized a descriptive review of U.S. state requirements for RN and ARNP re-licensure. This study updates Graves et al. (2018) in researching each state's requirement for suicide prevention CE. Descriptive statistics were used to analyze, compare, and summarize variations in state re-licensure requirements and each State Nursing Board's scope of practice. Six out of 50 states (Washington, Idaho, Utah, Nevada, Kentucky, and Connecticut) require CE in suicide prevention for RNs and ARNPs. Four states (Arizona, South Dakota, Indiana, and Maine) don't require any CE, while the remaining states require or encourage general CE credits for licensure renewal, varying in hours and focus. The lack of requirements for CE in suicide prevention highlights the need for greater continuity across the States. Challenges to continuity include a lack of transparency and uniformity across state databases. States must address the lack of mental health and suicide prevention CE for RNs and ARNPs. Improved, uniform CE requirements are crucial for equipping nurses in recognizing and managing suicide and performing the best, evidence-based, ethical practices.

Keywords: Continuing education, nurse, RN, ARNP, registered nurse, advanced registered nurse practitioner, suicide, suicide prevention training.

Presenters:	Kyra Miles	Graduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Kyra Miles & Kathy Liu

Title: Relationship of Chronic Ankle Instability and Ipsilateral Leg Injuries in Collegiate Student-Athletes

Abstract: Introduction: Chronic ankle instability (CAI) is defined as recurrent sprains to the ankle joint. CAI can lead to changes beyond the ankle, along the kinetic chain of the body, potentially increasing the risk of other injuries. Therefore, the purpose of this study was to analyze the relative risk of an athlete having an ipsilateral injury up the kinetic chain.

Methods: Medical records over a 10-year period of collegiate student-athletes were reviewed. A total of 711 records were reviewed for individuals who sustained 2 or more ankle sprains on the same leg. As a result, 79 individuals were included in this current analysis. The individual limbs of each participant were then categorized into one of four categories: multiple ankle sprains with subsequent injuries to the same leg (A), multiple ankle sprains without subsequent injuries to the same leg (B), no ankle sprains but with subsequent injuries to the same leg (C), no ankle sprains and no subsequent injuries (D). A biostatistical relative risk and odds ratio was utilized to calculate relative risk.

Results: A total of 158 limbs were included in this analysis; A: 43 limbs, B: 36 limbs, C: 46 limbs, and D: 33 limbs. The risk ratio was 0.93 with a p-value of 0.63.

Conclusion: An individual who is characterized as having CAI does not have an increased risk of subsequent injuries to the same leg. It seems that current rehabilitation protocols address not only the injury to the ankle but address other parts up the kinetic chain.

Presenters:	Rosemary Morrissey	Graduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Rosemary Morrissey & Kathy Liu

Title: Risk of Sustaining Knee or Hip Injury within 12 Months After an Ankle Sprain

Abstract: Context: Ankle sprains are one of the most common injuries in collegiate athletics, Ankle sprains result in kinematic changes could lead to an increased risk of other injuries higher in the kinetic chain This study aims the prevalence of subsequent injuries after an acute ankle sprain.

Methods: The medical records of athletic injuries of 725 collegiate student-athletes were reviewed over the course of a 10-year period (421 M, 289 F; height: 178.2 ± 10.6cm; mass: 79.6 ± 19.3kg; age:18.5 ± 0.82yrs). All documented ankle sprains were recorded along with any subsequent knee and hip injuries. Each limb of each participant was categorized into four groups: Ankle sprain with subsequent injury, sprain without subsequent injury, no ankle sprain with subsequent injury, ankle sprain without subsequent injury. An odds ratio was utilized to calculate the relative risk of subsequent injury along the kinetic chain.

Results: Of the 1450 limbs, there were 67 Ankle sprain with subsequent injury, 706 ankle sprains without subsequent injury, 98 with no ankle sprain and subsequent injury, 549 with ankle sprain without subsequent injury. The odds ratio was 0.531 with $p < 0.001$.

Conclusion: Individuals with a history of an ankle sprain are at significantly greater risk of sustaining a knee or hip injury. However, an odds ratio of 0.531 may not be clinically relevant. Since there is not a clinically relevant increased risk of sustaining a knee or hip injury, clinicians should continue utilizing current rehabilitation protocols to address kinematic changes after an acute ankle sprain.

Keywords: Ankle Sprain, Subsequent injury, Kinetic Chain

Presenters:	Faith Roth-Broske	Undergraduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Faith Roth-Broske, Kathryn Bond, Jessica Kirby, Margaret Harris, & Andrea Hutchins

Title: Face and content validation of a tool designed to compare the health outcomes of weightlifters

Abstract: This study is meant to design a readily available tool to compare the health behaviors of weightlifters across several disciplines. These weightlifting disciplines include powerlifting, Olympic lifting, CrossFit, Strongman, and the Scottish Highland Games. Each discipline emphasizes specific exercises and competition structures: powerlifters focus on maximizing strength in the bench press, squat, and deadlift; Olympic lifters perform the clean and jerk and snatch; CrossFit athletes complete high-intensity, varied workouts; Strongman competitors undertake dynamic strength challenges; and Highland Games athletes engage in heavy throwing events. While weightlifting sports have grown in popularity, empirical research on training practices across these varied forms remains sparse. To address this gap, this study employed face and content validation to create a survey designed to compare health behaviors and outcomes of weightlifters of different types. The following step is establishing construct validity, and data collection is ongoing at gyms and healthcare facilities. The tool will be used to gather insight into optimizing performance and health for weightlifting athletes.

Keywords: weightlifting, powerlifting, CrossFit, Strongman, Scottish Highland Games, health behaviors, health outcomes

Leadership, Research, & Foundations Presentations

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

Authors: Amy Akerman, Vernon James, Patty Witkowsky, Nicholas Fuselier, Phillip Morris

Title: Developing Digitally: Identity, Leadership, Knowledge, and Multicultural Competence in Student Affairs Professionals

Abstract:

Purpose

Student affairs professionals provide guidance, support, engagement, and co-curricular learning experiences for college students. In the 2015 Professional Competency Areas for Student Affairs Educators document developed from a collaboration between the major professional associations for student affairs, ACPA, and NASPA, technological knowledge, skills, and dispositions are listed as one of 10 competencies for student affairs professionals. Because of the growing importance of technological competence in the everchanging world of technology, this intervention was developed to educate three cohorts of student affairs graduate students and student affairs professionals from at least three Southern Colorado higher education institutions on 1) digital identity development, 2) cybersecurity literacy, 3) multicultural competence in technology, and 4) digital leadership. This study presents results from pre-post data related to knowledge about the four technology areas from both graduate students (n=25) and student affairs professionals (n=43) who received the intervention, as well as findings from focus groups with graduate student participants (n=9).

Results

Survey outcomes showed a statistically significant improvement in comprehension and confidence in using the material from each module ($p < .005$). Open-ended questions and focus group interviews revealed themes regarding the benefits of learning about digital leadership through these modules. As a result of the learning modules, students indicated taking steps to develop their digital leadership, which included cultivating their online presence in an authentic way, providing an accessible and equitable experience for populations served, protecting their data via password managers, and planning to attend future trainings to further develop their contributions in the digital space.

Conclusion

Interventions in digital identity, cybersecurity literacy, multicultural competence in technology, and digital leadership domains lead to improvement in participants' knowledge, skills, and confidence. This CSI-grant-funded project demonstrated that brief but robust modules with facilitated discussion provide strategic learning opportunities for student affairs graduate students and educators to enhance their digital and technology skills.

Keywords: Student Affairs, Digital Leadership, Multicultural Competence, Graduate Competencies, Digital Identity, Cybersecurity Literacy

---

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

Authors: Amy Akerman

Title: Knowledge and Use of Clinical Competencies in Physician Assistant Education

Abstract: An explanatory sequential mixed methods approach integrated with a social constructivism framework was used to develop an evidence-based theory regarding how clinical educators use program-defined competencies to evaluate Physician Assistant (PA) students during their 4-week clinical rotations. While competency-based medical education has become more commonplace in the past 20 years, many clinical educators have not learned how to use competencies when instructing and evaluating medical learners. This is an essential issue in PA education as many programs have undergone curricular reform to integrate competency-based education principles in the didactic setting, but clinical educators are asked to complete evaluations without receiving additional training.

Participants for this study (n=50) were selected because they were included in a database of clinical educators kept by one PA program as they had supervised at least one PA student in the past five years and were invited through email to complete an online survey. The survey helped to understand better how clinical educators, also known as preceptors, use competencies when teaching, providing student feedback, completing student clinical evaluations, and assessed their self-efficacy with performing the work of a clinical preceptor. Using criterion sampling, six respondents indicated they currently use the competencies, and they were recruited to participate in virtual interviews to gather additional information regarding how they use them with their learners, how they may best be utilized, and how PA programs can best educate preceptors about program-defined competencies. Preceptors did have a statistically significant improvement in self-efficacy scores after the brief intervention.

This mixed-methods study was the first to document the effectiveness of providing instruction about competencies to preceptors who teach PA students and measured an improvement in their self-efficacy. Experienced PA educators indicated that program-defined competencies and student evaluation tools that integrate sub-competencies were helpful. Programs that communicate frequently and provide instruction about competency-integrated evaluation tools could improve active learning in a social environment. This study may help reduce barriers when recruiting and retaining busy clinicians.

Keywords: physician assistant, competency-based medical education, preceptors, self-efficacy, social constructivism theory

---

Presenters:	Sean Dean	Faculty	College of Education	Leadership, Research, & Foundations

Authors: Sean Dean, Patty Witkowsky, Jessica Contreras, Michelle Kephart

Title: Structures, strategies, and skills for effective math intervention in higher education: A case study

Abstract: Many factors influence students' readiness for college math, and some students enter college unprepared for the demands of their math courses. Effective placement strategies and robust support systems are essential to remove barriers to student success and degree completion. This qualitative narrative case study explores the experiences of college students working with a Math Learning Strategies Specialist (MLSS) and the specific strategies taught by the MLSS. Through one-on-one interviews with students and the MLSS, three key themes emerged: learning structures, learning strategies, and interpersonal skills. The MLSS contributed to participants' enhanced learning experiences by providing structured yet flexible support, tailored learning strategies, and a positive interpersonal environment. These combined elements enabled participants to navigate initial challenges, build confidence, and achieve academic success. This study presents a unique approach to addressing barriers to college math learning, emphasizing the potential of innovative support structures to contribute to academic success in higher education.

Keywords: Math support, learning strategies, higher education, student success

---

Presenters:	Kriselda Craven	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Kriselda Craven, Evelyn Adams

Title: Rural perspectives: How rural school and district leaders view the present and future of American Education

Abstract: Rural schools in the United States are numerous and continue to be vital institutions in the towns and villages where they reside. As rural schools remain the focal point of many rural communities, the school principals and superintendents are often seen as community leaders and as individuals in control of a vital community resource. In America, rural school leaders frequently have decades of experience in public education and, as a result, have a unique perspective on the current state of education, as well as the future schools and learning. Using data from a survey of more than 100 school and school district leaders in one American state, it has been possible to understand this population's perception about what is going right in contemporary education, and more immediate concerns. Through the utilization of a constructivist lens, and basing the study in existing scholarship (Alexander & Doddington, 2010; Wastiau et al., 2013), it was possible to quantify these opinions and viewpoints and position them within a larger frame of education policies and challenges to schools, students, and teachers. Findings from this study demonstrate that, while these school leaders have great optimism in their own schools, they are quite concerned about the future of education and how well students are being prepared for a post-secondary vocation or education. Further, there are various facets of contemporary education that seem to be largely dismissed such as the status of LGBTQ+ students in rural schools and the challenges associated with students with unstable homes or homelessness.

Keywords: Educational leadership, rural education, policy perceptions
Presenters: Reeti Sharma | Graduate Student | College of Education | Leadership, Research, & Foundations

Authors: Reeti Sharma, Rame Hanna, & Karlye Enkler
Title: Academic, Social, and Cultural Experiences of International Students in Japan

Abstract: The internationalization of higher education has increased global student mobility and cross-cultural exchange (Guo & Chase, 2011; Huang & Horiuchi, 2019). Global academic exchange has prompted many countries to actively attract international students (Huang & Daizen, 2018). Japan, in particular, has advanced its efforts through initiatives like the 300,000 International Students Plan and the Top Global University Project, bringing in a diverse and growing student population (Hennings & Tanabe, 2018). This study examines the academic, social, and cultural experiences of international students in Japan, focusing on the role of institutional support in their success. Using a qualitative approach, the study examines student experiences and institutional practices through surveys and interviews. This study will help understand factors that support international students' integration and overall well-being. Findings from this research could inform efforts to enhance institutional support systems, ultimately contributing to improved academic and social outcomes for international students and fostering a more inclusive higher education environment in Japan.

Keywords: Global Education, International, International Students, Japan, Study Abroad

Mechanical and Aerospace Engineering Presentations

Presenters:	Angelo Hurtado	Graduate Student	College of Engineering	Department of Mechanical and Aerospace Engineering

Authors: Angelo Hurtado & Michel Calvisi
Title: Computational Modeling of Pulsatile Flow in Intracranial Aneurysms

Abstract: An aneurysm is a weakness in a blood vessel wall that causes it to bulge outwards. A common location for an aneurysm is at an arterial bifurcation in the vasculature of the brain, which is referred to as an intracranial saccular aneurysm (ISA). Such aneurysms are often asymptomatic unless they rupture, which can cause death in approximately 50% of patients and permanent neurological damage in a majority of those who survive. Therefore, detecting and monitoring the growth of ISAs prior to rupture is critical for proper treatment. This study uses computational fluid dynamics (CFD) to simulate the blood flow dynamics within an ISA. The flow of blood through a simplified 7 mm-diameter aneurysm in the basilar artery bifurcation is modeled using the CFD module in COMSOL Multiphysics to solve the Navier-Stokes equations for pulsatile flow. Hemodynamic quantities, such as the pressure distribution, wall shear stress (WSS), and streamlines, are analyzed in order to understand how they vary with ISA geometry and other flow variables. The results provide detailed insights into the hemodynamic stresses and flow patterns within the aneurysm, which are crucial for understanding the growth and potential rupture of the membrane wall. Future studies aim to extend this investigation by incorporating fluid-structure interaction (FSI) between the internal blood flow and surrounding aneurysmal membrane in order to analyze the vibration of the aneurysm walls for different blood flow parameters and ISA geometries. This work may enable the noninvasive detection of ISAs based on their acoustic emissions, which can lead to early detection and treatment.

Keywords: intracranial aneurysms; computational fluid dynamics

---

Presenters:	Evan Martin	Undergraduate Student	College of Engineering	Department of Mechanical and Aerospace Engineering

Authors: Evan Martin & Tristian Dwyer
Title: Exploring Artificial Gravity: Ethical Imperatives and Engineering Feasibility in Space Exploration

Abstract: Microgravity (μG) poses substantial challenges to astronaut health during long-duration space missions. Artificial gravity (AG) offers a promising solution, but its implementation requires a careful balance of ethical considerations and engineering feasibility. This paper evaluates four AG systems—rotating wheels, tethered systems, short-radius centrifuges, and dual rotating trusses—through trade studies focused on health impacts, cost, technological readiness, and ethics. Our research highlights the ethical imperative to protect astronaut well-being and the need for scalable designs that bridge current technological gaps.
This presentation emphasizes the innovative integration of engineering trade studies with ethical frameworks, showcasing a multidisciplinary approach to solving spaceflight challenges. Future research directions include refining AG system designs, understanding partial gravity's physiological effects, and developing policies for equitable access to AG technologies. By

addressing these challenges, this work contributes to the ongoing evolution of human space exploration.

Keywords: Artificial Gravity (AG), Microgravity (μG), Long-Duration Spaceflight

---

Presenters: Kinzy Pearson | Undergraduate Student | College of Engineering | Department of Mechanical and Aerospace Engineering

Authors: Kinzy Pearson

Title: Space Debris that Isn't Debris - Cybersecurity Analysis on Hidden Space Structures

Abstract: In 2014, the Russian satellite, Cosmos 2499, was launched into Lower Earth Orbit. However, it was tracked and cataloged as a piece of space debris by U.S. Space Command, lying dormant for 3-4 months, mimicking the behavior of space debris. It only spiked an investigation after the "debris" changed its trajectory, "springing to life" when other satellites were in its vicinity. Through further investigation, U.S. Space Command discovered the operational satellite, Cosmos 2499, and its mission intent, to disable and/or destroy satellites within its vicinity. This is not an isolated case. Due to the large quantities of unknown space objects in our orbits - hundreds of thousands, if not millions, of uncorrelated debris, the adversaries have used that fact to their advantage, hiding structures and leaving them dormant to be overlooked and undetected until needed. To counter such threats, at the end of this research, the goal is to produce an autonomous algorithm that would compare real-time debris positions from a catalog to a trajectory prediction program. This algorithm can then flag whether or not a piece of debris is positioned where it should be after a set period of time. If a piece of debris is not where it was predicted to be, we then approach the situation with a flowchart methodology to determine what the potential threats and risks that our assets in space may be facing. This research and result can become a pivotal asset to U.S. security processes and defense, eliminating the surprise prematurely and instigating appropriate defense procedures.

Keywords: Cybersecurity, Space Debris, National Security

Presenters: Josiah Rothwell | Undergraduate Student | College of Engineering | Electrical and Computer Engineering

Authors: Josiah Rothwell & Noor Yousuf

Title: Space Elevator Applications: Automated Asteroid Selection and Efficiency Analysis

Abstract: A space elevator is an innovative concept designed to transport materials between a celestial body and outer space. It consists of a long cable stretching from the surface to a point beyond synchronous orbit, stabilized by the tension created between a counterweight at the outer end and the rotation of the celestial body. This technology offers an efficient way to expand transfer opportunities and reduce fuel use for interplanetary missions.

One promising application of space elevators is asteroid mining, which could significantly lower the cost and difficulty of transporting valuable resources like metals and water across the solar system. This research focuses on developing an automated system to identify the best asteroids

for mining by analyzing their size, composition, and orbits using data from NASA. It also compares the fuel demands of conventional rockets with the efficiency of space elevators. By pinpointing energy-efficient transfer paths, the study sheds light on the practicality and affordability of space mining and logistics.
This work underscores the transformative potential of space elevators to make space exploration more sustainable. It highlights major improvements in cost-effectiveness and operational efficiency, paving the way for broader applications in space systems and resource utilization.

Keywords: Interplanetary trajectories, lambert's, space elevator, asteroid mining, Ceres

Physics Presentations

Presenters:	Laurel Powell	Undergraduate Student	College of Letters, Arts, & Sciences	Department of Physics and Energy Science

Authors: Laurel Powell & Robert Camley
Title: Effects of the Gravitational Quadrupole Moment on Objects in Low Orbits

Abstract: Many of the objects we think of as being spheres in the universe are not perfectly round but are oblate spheroids. These are spheres that are slightly compressed, meaning the diameter going through the equator is slightly greater than the diameter going through the poles. The Earth falls into this category and knowing how the quadrupole term affects the gravitational force is important because it influences the orbits of satellites, especially those in low Earth orbits. The quadrupole also plays a role in other low orbiting objects like Saturn's rings. Mathematically, oblate spheroids have a mass quadrupole term in addition to the monopole term. In this project we calculated the orbit of a low-earth satellite including both the monopole and quadrupole terms. The calculation was done numerically with a 2nd order Runge-Kutta approach using a time-step of 0.1 second. The results are surprising. Even if the satellite started with the parameters appropriate for a circular orbit (in the absence of the quadrupole) the orbits generally ended up being elliptical, with a precessional aspect where the position of the apogee changes from one orbit to another. Furthermore, North/South orbits are very different from orbits around the equator. The polar orbits are not pure ellipses, but have temporary reductions in the orbital radius, starting near the equator. We plan to continue by studying a special case: calculating the orbital motion around binary pulsars (the same stars which first gave evidence for gravitational waves) where the quadrupole moment varies in time.

Keywords: Quadrupole, Oblate Spheroids, Equatorial orbit, Polar orbit

---

Presenters:	Laurel Powell	Undergraduate Student	College of Letters, Arts, & Sciences	Department of Physics and Energy Science

Authors: Laurel Powell & Robert Camley
Title: Dramatic enhancement of nonlinear behavior of spin waves in a magnetic bar with Dzyaloshinskii-Moriya interactions: Harmonics and frequency combs

Abstract: Nonlinear behavior occurs in many different places in the natural world. This includes bird-songs, musical instruments, and thermal expansion of materials (this is why your roads are bad). We examine the effect of the Dzyaloshinskii-Moriya Interactions (DMI) on the nonlinear behavior of spin waves. Spin waves involve the wavelike motion of individual electron spins (like small magnets) in a wavelike manner. The DMI interaction is unique because a wave going in one direction is not equivalent to a wave going in the opposite direction. So, a wave going from right to left has a different wavelength than one going from left to right. This means that you would need antennas of different sizes to efficiently receive the waves travelling in these opposite directions. We investigate how DMI influences harmonic generation, where a wave at a frequency, f, generates waves at frequencies of 2f, 3f, or higher. This involves numerically solving the differential equation for the time-development of the spin system. Surprisingly, we find that in the magnetic system only the 3rd and 5th harmonic are generated. More importantly, with DMI each of these frequencies develops a frequency comb leading to multiple

generated frequencies. This could potentially lead to an increase in data transfer rates by factors near 100.

Keywords: spin waves, nonlinear, Dzyaloshinskii-Moriya interactions, ferromagnets, harmonics

---

Presenters:	Varun Vanga	Undergraduate Student	College of Letters, Arts, & Sciences	Department of Physics and Energy Science

Authors: Varun Vanga

Title: Investigating non-Hermitian behavior in trilayered artificial spin ices

Abstract: An artificial spin ice (ASI) is a metamaterial composed of nanoscopic magnetic elements arranged in a geometric lattice. ASIs have applications in microwave devices and unconventional computing. Although an ASI can be limited to one layer, they can be stacked on top of each other. One way to stack ASIs is to have islands directly over each other, separated by a gap of a magnetically insulating material. This is called a trilayer ASI. The goal of this project is to numerically study the dynamical behavior of trilayer ASIs. We first derive the eigenvalues from a set of coupled Landau–Lifshitz–Gilbert equation with different magnetic materials. This is a non-Hermitian matrix with complex eigenvalues that suggests the existence of exceptional point. To investigate the occurrence of such eigenvalues, numerical simulations are performed. We consider trilayers with permalloy and cobalt iron layers with varying gap distances. The normal modes show strong coupling for gaps of 5 nm, but non-Hermitian behavior was not observed due only to dipole interaction. We then explored the full ASI with and without a symmetry breaking term called the Dzyaloshinskii-Moriya interaction (DMI). Comparing FMR with and without DMI shows that DMI does have an impact on the system and shows promising non-Hermitian behavior that could host topologically protected edge modes. Future work will consider numerical simulations of extended trilayer ASI to seek such edge modes.

Keywords: Micromagnetism, Artificial Spin Ices, Non-Hermetian

Psychology Presentations

Presenters:	Karen Ahumada Villanueva	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Karen Ahumada Villanueva

Title: Exploring the Impact of Sexual Satisfaction and Relationship Dynamics on Overall Happiness in Romantic Relationships.

Abstract: Sexual satisfaction is a crucial component of romantic relationships, significantly shaping both individual and dyadic experiences. This study investigates the impact of sexual satisfaction and non-monogamy on relationship happiness. We hypothesize that higher sexual satisfaction is positively correlated with greater relationship happiness. Furthermore, we propose that the type of sexual relationship (whether monogamous or non-monogamous) has no effect on sexual satisfaction.

A linear regression analysis was used to capture the complexity of these dynamics and their implications for relationship satisfaction. Our findings reveal that sexual satisfaction has a significantly positive association with relationship happiness ($\beta = 0.508$, $p < .001$), with 25.8% of the variance in relationship happiness explained by sexual satisfaction. In addition, having other sexual partners decreased the association between these factors and relationship happiness ($F(2, 3397) = 684.25$, $p < .001$).
These results demonstrate that individuals who reported higher sexual satisfaction also reported greater relationship happiness. Monogamous partners also showed greater relationship happiness compared to non-monogamous partners. Future research could leverage dyadic collection methods to gain a better understanding among couples.

Keywords: Sexual satisfaction, relationship happiness, non-monogamy, relationship satisfaction

---

Presenters:	Karen Ahumada Villanueva	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Karen Ahumada Villanueva & Kristen Rudd

Title: Environmental Adversity on Children's Self-Esteem: Evaluating the Protective Effects of Ethnic-Racial Identity.

Abstract: Previous research has shown that environmental adversity such as poverty, overcrowding, and homelessness, can negatively impact children's psychological outcomes, including self-esteem (Copeland-Linder et. al., 2010). In order to prevent negative outcomes and bolster resilience, it is important to understand individual factors that may protect children from negative effects. In particular, minority children are disproportionately exposed to adversity, and early research suggests that ethnic-racial identity (ERI) may promote positive outcomes in children (Rivas-Drake et al., 2014). However, less is understood about how ERI (i.e., an individual's identification with a particular ethnic or racial group) can buffer the effects of adversity on children's self-esteem.

The proposed study explores the influences of environmental adversity on children's later self-esteem, and whether ERI modifies these associations, offering resilience against the negative impacts of environmental stressors.

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: Environmental adversity, self-esteem, ethnic-racial identity, children, protective factors, psychological resilience

---

Presenters: Makenzie Baca | Undergraduate Student | College of Letters, Arts and Sciences | Psychology

Authors: Makenzie Baca & Alexis Paton

Title: Childhood Trauma and its Effects on Interpersonal Functioning, Interpersonal Aggression, and Affective Processes

Abstract: In the world of psychology, trauma is defined as exposure to death, whether it be actual or threatened, serious bodily injury, or sexual violence (American Psychiatric Association, 2013). Trauma studies have seen a significant increase in the past few years, but one topic that has been neglected is the impact of trauma on interpersonal skills/prosocial behaviors, such as empathy. Previous research has yielded conflicting results. Lim et al. (2016) determined that there was a positive relationship between traumatic experiences and prosocial behaviors like empathy and compassion. Contradictory to this, Zhang et al. (2023) found that empathy and compassion-based skills were negatively associated with the experience of traumatic events. Previous research has also found that traumatic experiences in childhood lead to decreased affective processes and increased interpersonal aggression (Yöyen & Bozacı, 2023; Renn, 2002). The proposed study aims to look at the impacts of trauma, specifically childhood trauma, on interpersonal functioning, affective processes, and interpersonal aggression. Utilizing a cross-sectional study design, participants will be asked to complete a battery of surveys to assess for the previously stated variables. The experience of childhood traumatic events will be the independent variable, and empathy/compassion, emotional regulation, and perpetration of interpersonal aggression will be the dependent variables. Predicted results for this study based on previous research are as follows: childhood trauma will be negatively associated with affective processes, positively related with interpersonal functioning, and positively related to interpersonal aggression.

Keywords: childhood trauma; trauma; empathy; compassion; affective processes; interpersonal functioning; interpersonal aggression; intimate partner violence; emotional regulation

---

Presenters:	Makenzie Baca	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Makenzie Baca
Title: Sexual Trauma and its Effects on Religiosity

Abstract: Traumatic events can have many different impacts on a person's personal life regarding how they cope and learn to see the world. One topic that seems to elude researchers who look to find direct answers is how traumatic events (e.g., sexual assault/rape) impact religiosity. Results from past studies have had conflicting findings, some stating that religiosity is negatively correlated with trauma, others stating religiosity and trauma are positively correlated, all while others find that there is no relationship between the two variables (Ben-Ezra et al., 2010; Koenig et al., 2018; Perera & Frazier, 2013). Data collected by the National Longitudinal Study of Adolescent to Adult Health (ADD Health) was utilized, where participant (N=4,071) answers for sex assigned at birth, religiosity variables and rape were used to test the research question: does sex assigned at birth and the experience of rape impact religiosity in individuals? After completing a 2 x 3 factorial ANOVA, there was a statistically significant, but small ($h2 = .003$), main effect for sex assigned at birth with females ($M = 0.3824$, $SD = 2.574$) having higher levels of religiosity than males ($M = -0.5059$, $SD = 2.563$), $F(1, 4084) = 12.09$, $p < .001$. The findings of the current study show that sex impacts religiosity, where females have higher religiosity scores than males. There is no relationship between sex and rape experience or religiosity and rape experience, but more research will need to be conducted to gain further insight with narrowed definitions of religiosity.

Keywords: religiosity; forced sexual experience; rape; sex assigned at birth; religion; sexual trauma

---

Presenters:	Sean Barrientos	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Sean Barrientos
Title: Examining How Knowing More Than One Language Benefits Executive Functioning

Abstract: Billions of people across the world know more than one language. Beyond being able to communicate with new groups of people, research suggests that there are cognitive benefits to be had from learning a second language. Specifically, the research points to increased executive function for those who are bilingual. The hypothesized existence of these benefits is known as the Bilingual Advantage Theory. In one study conducted by Pelham & Abrams (2014), their findings supported the Bilingual Advantage Theory, suggesting that bilingual participants do indeed have enhanced executive function compared to monolinguals. The current study seeks to expand upon existing knowledge by tapping into the vast database provided by the UCCS Aging Center, where participants are referred for general cognitive assessments. This proposed study will correlate a patient's monolingual or bilingual status with their general executive function and assess whether or not there is a significant difference between the functionality of the two groups. We expect that the bilingual group will have stronger executive functioning abilities compared to the monolingual group.

Keywords: bilingual advantage theory, bilingual, multilingual, monolingual, executive function, cognitive function

---

Presenters:	Todd Collinsworth	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Todd Collinsworth, Adrienne Herzog, & Kristen Rudd

Title: Intrusive and Hostile Parenting and a Child's Self Worth: The Moderating Effects of Respiratory Sinus Arrhythmia

Abstract: Negative parenting behaviors such as intrusiveness and hostility are associated with lower self-esteem (Mcleod, 2011) which increases risk for psychopathology (McKee, 2008). However, not all children who experience negative parenting develop issues with self-esteem, and it is important to understand who is at increased risk for developing negative outcomes in these contexts. The Biological Sensitivity to Context model proposes that children's stress responses may make them more sensitive to the positive and negative aspects of their environment (Boyce, 2008). One potential measure of biological sensitivity is Respiratory Sinus Arrhythmia (RSA), which is a measure of stress regulation (Berntson, 1993). However, research has not yet examined whether RSA moderates the associations between both intrusive and hostile parenting and children's self-efficacy.

Therefore, the current study utilized data from an ongoing longitudinal sample of 181 mother-child dyads (41% Hispanic/Latine) to examine RSA as a moderator of the association between negative parenting and children's self-esteem. Negative parenting was behaviorally coded during teaching tasks at age 8, children reported on their self-esteem at age 12 using the Self-Perception Profile for Children [SPPC; Harter, 1985], and RSA was recorded across challenge tasks at age 10. Linear regression analyses identified a significant interaction ($\beta = 0.20$, $p = 0.04$) such children with low RSA (i.e., high reactivity) had the lowest self-esteem scores when they were exposed to higher negative parenting. Results suggest that RSA may be an early indicator of increased risk for negative outcomes in the face of stress, and thus could inform preventative interventions.

Keywords: Parenting, self-worth, parasympathetic nervous system

Presenters:	Gabrielle Faggionato	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Gabrielle Faggionato & Michel Kisley

Title: The Relationship Between Emotion Beliefs and Seeking Mental Health Services

Abstract: Untreated mental health can have negative consequences for one's physical health and economic situation. These consequences worsen as the time for which one does not seek mental health help prolongs. This is why it is impertinent to understand what prevents people from seeking mental health treatment. The proposed study will examine if one's beliefs about positive and negative emotions, specifically whether they are believed to be useful and controllable, predict one's willingness to seek mental health services through a regression analysis. Ajzen's Theory of Planned Behavior, which explains that one's intentions towards a behavior predicts that behavior, will be used to frame the study design. In an online survey, participants will be asked to self-report on the Emotion Beliefs Questionnaire and Shortened Attitudes Toward Seeking Professional Psychological Help Scale, as well as whether they have used mental health services in the past. We predict that believing emotions are controllable and useful will predict greater willingness to seek mental health services, regardless of past mental health service use.

Keywords: emotion beliefs, mental health help, mental health services

---

Presenters:	Gabrielle Faggionato	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Gabrielle Faggionato

Title: The Relationship Between Talking to Friends And Self-Efficacy

Abstract: Research on social support acknowledges that it has positive effects and negative consequences. For instance, excessively talking to friends about anxieties can increase one's feeling of worry, while social support can increase one's self-efficacy. The current study examined if part of social support (talking to friends about worries) correlates with their level of self-efficacy, how often one feels confident in handling their own problems. This was done through examining preexisting data from the National Longitudinal Study of Adolescent to Adult Health Wave V in a correlational design with a large sample size of 4196. The results from a correlation analysis found that those who feel like they can talk to their friends about their worries felt confident in handling their own problems more often than those who feel like they cannot talk to their friends about their worries, $r(N = 3940) = 0.162$, $p < .001$. While past research indicates that talking to friends about worries has negative effects, the current study shows that talking to friends about worries has positive effects as well.

Keywords: talking to friends about worries, confidence, self-efficacy

---

Presenters:	Holli Fullbright	Graduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Holli Fullbright, Zara Kenigsberg, Paige Klein, Melissa Mikolaitis, & Steve Bistricky

Title: Examining Possible Mediation Effects of Emotion Regulation and Sleep Hygiene between Self-Compassion and Sleep-Related Variables Among Trauma Survivors

Abstract: This study examines how self-compassion may improve sleep by investigating how emotion regulation and sleep hygiene function as mediators among trauma survivors. Results indicate self-compassion positively influences sleep hygiene, and emotional dysregulation was associated with poor sleep quality.

Keywords: Trauma, Self-Compassion, Emotion Regulation, Sleep Hygiene, Bedtime Procrastination, Sleep Quality

---

Presenters:	Elise Robb	Graduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Elise Robb & Kristen Rudd

Title: The Role of Maternal Co-Regulation in Infant Cortisol Reactivity Across Sexes

Abstract: Cortisol, a key hormone for stress regulation, originates from the hypothalamic-pituitary-adrenal (HPA) axis (Stansbury & Gunnar, 1994). Infants who evidence high levels of cortisol are at increased risk for later adjustment problems, making it critical to identify factors associated with infants' physiologic activity (Bush & Boyce, 2014). Research suggests caregiver behaviors, particularly co-regulation, influence the development of infant stress responses (Haley & Stansbury, 2003). Early work suggests that parenting behaviors may have differential impacts on infant sex, though findings remain mixed (Provenzi et al., 2016). Therefore, the current study sought to examine the association between maternal regulation of distress and infant sex on infant cortisol reactivity to identify mother-infant interactions linked to stress regulation.
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: Infant Stress Regulation, Salivary Cortisol, Still-Face Paradigm, Parent-Infant Interactions, Co-Regulation, Sex Differences in Stress

---

Presenters: Jonathan Sundby Graduate Student College of Letters, Arts and Sciences Psychology

Authors: Jonathan Sundby & Leilani Feliciano

Title: Examining the Relationships Between Existential Issues and Disease Severity in People Living with Diabetes Mellitus.

Abstract: Existential issues are concerns related to a person's experience in the world and the broader themes of their existence – such as meaning, purpose, and death (Schnipke & Mackay, 2023). Existential issues and distress are common experiences upon diagnosis of a medical condition and have often been studied in the context of acute conditions such as cancer (Henoch & Danielson, 2009; Bauereiß et al., 2018). However, there has been a comparative lack of research into the existential experiences of people living with chronic conditions, such as diabetes, despite the widespread prevalence of these disorders. The following is a proposal for a study in which I will measure existential variables such as death anxiety (Templer, 1970), existential isolation (Pinel et al., 2017), and ego integrity (Janis et al., 2011), and look for connections between these variables and physical health indicators in people living with diabetes. In particular, health indicators that measure disease severity, such as A1C levels, as well as self-reported health activity (e.g., daily exercise, diet), will be investigated. Mental health indicators (e.g., depressive and anxiety symptoms) will also be measured and treated as correlates. A Structural Equation Model (SEM) will be used for the analysis, in order for the connections between these variables to be mapped, latent variables established, and mediational relationships explored. It is hypothesized that participants with greater disease severity will experience greater levels of existential distress and that previously established associations between diabetes disease severity and greater depression risk will partially explain these relationships (Kao et al., 2020).

Keywords: Health Psychology, Existential Psychology, Diabetes, Chronic Conditions

Presenters:	Michelle Wilke	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Michelle Wilke & Frederick Coolidge
Title: A Revision of the Coolidge Axis II Inventory

Abstract: The 260-item Coolidge Axis II Inventory (CATI) assesses a wide variety of psychopathology and neurocognitive problems (memory, attention, language, executive functions) in adults ages 15 years and older. Google Scholar lists 3,150 CATI citations, and it has been translated into 10+ languages. The CATI items are aligned with the criteria in the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR; 2022). The CATI has been used in clinical and educational settings to assess psychotic disorders, concussions and neurocognitive issues, ADHD, PTSD, and other clinical syndromes. The present study was a major revision according to the changes in the DSM, and it was re-normed on 1,277 adults who were recruited online with UCCS IRB approval. This revision included establishing new internal scale reliabilities on all of the original and new subscales. The CATI contains 72 scales and subscales measuring 14 personality disorders, anxiety, depression, PTSD, schizophrenia, ADHD, and the sequelae of brain injury and damage. Internal scale reliabilities were assessed with Cronbach's alpha, which is a measure of how well each item on a scale predicts every other item, and it is dependent on the number of items, the number of participants, and a high first-factor scale concentration. Overall, our results demonstrated that nearly all of the scales and facets had acceptable internal reliabilities. This revised CATI is currently being used to assess the sequelae of repeated concussions, ADHD in adults and children, PTSD in women GIs, teachers, victimized by violent children, autistic children, and adult prison inmates.

Keywords: Psychological Assessment, Psychopathology, Personality Disorders, ADHD, PTSD, Neurocognitive Problems, DSM-5-TR

Presenters:	Alexis Patton	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Alexis Patton & Makenzie Baca
Title: The Effect of Childhood Experiences on Psychosocial Functioning and Physical Health

Abstract: Adverse Childhood Experiences (ACEs) are potentially traumatic events which occurred prior to the age of 18 that impact a child's health and/or well-being. Traumatic events are harmful or life-threatening experiences that affect an individual emotionally and/or physically. Both ACEs and traumatic events in childhood are known to be related to difficult experiences and detrimental physical health and psychosocial outcomes in adulthood. However, there is a lack of understanding of the cumulative effects of both traumatic events and ACEs and their respective impacts in comparison to ACEs alone. This proposed study focuses on the interaction between these different types of experiences during childhood and their impacts on one's psychosocial functioning and physical health outcomes in adulthood. In order to expand understanding of the long-term impact of these experiences on functional impairment and quality of physical health, a cross-sectional study will assess ACEs, childhood trauma history, psychosocial functioning, and physical health activity and functioning. A battery of self-report questionnaires will be administered online including the Adverse Childhood Experiences Questionnaire (ACE), the Stressful Life Events Screening Questionnaire (SLESQ), the SF-12 Short Form Survey (SF-12), and the Inventory of Psychosocial Functioning Questionnaire (IPF). We hypothesize that individuals who experienced both traumatic events and adverse childhood experiences will experience a greater risk of impacts on physical health and psychosocial functioning (i.e., social, occupational,

academic) compared to individuals who experienced only ACEs. Preliminary findings will be presented and clinical implications will be discussed.

Keywords: adverse childhood experiences, trauma, physical health, psychosocial functioning

---

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

Authors: Lauren Suiter & Tom Francis

Title: The Impact of Religious Upbringing on Sexual Development

Abstract: Research shows that there is an association between sexual development, specifically the progression of sexual identity and religious membership. While most research has been conducted on LGBTQ+ individuals, sexual minority groups and heterosexual individuals are still underrepresented. This proposed study will seek to understand the impact of religious upbringing on sexual development by comparing data from both heterosexual and non-heterosexual college students. In order to explore this effect, UCCS students will take an online survey. We expect that both groups of students, both heterosexual and non-heterosexual, will likely report religiosity as a negative effect on their sexual development. In particular, we expect this interaction to be stronger for non-heterosexual students. This proposed study will also have a second component regarding sexual identity and religion. In one study researchers developed a seven-stage model pertaining to sexual identity development of individuals in the Mormon church (Shuler, et al., 2023). This Model of Sexual Identity will be incorporated into the current study to further understand how sexual identity can be impacted by non-affirming religious organizations beyond the Mormon church. In order to explore this effect, students who identify as LGBTQ+ will have the opportunity to answer questions from all seven stages of the Sexual Identity Model. We expect the Sexual Identity Model (Shuler, et al., 2023) to generalize to other religious organizations beyond the Mormon church.

Keywords: sexual development, religious upbringing, LGBTQ+, sexual identity model

---

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

Authors: Lauren Suiter

Title: The Association Between Age of Depression Diagnosis and Relationship Satisfaction.

Abstract: Accumulating evidence shows that people who are diagnosed with depression at a younger age have less relationship satisfaction in the future. However, it appears that individuals who are younger than eighteen who have been diagnosed with depression have been underrepresented in past research. This study will explore comparisons between individuals who have been diagnosed with depression between the ages of 11 and 20, younger adults who have been diagnosed between the ages of 21 and 30, adults who have been diagnosed between the ages of 31 and 40, and individuals who have not reported a depression diagnosis. In order to explore this effect, participants from the National Longitudinal Study of Adolescent to Adult Health completed surveys on age of depression diagnosis and relationship satisfaction. A one-way ANOVA was then conducted. In terms of the research question, there was an overall effect of age of depression diagnosis on relationship satisfaction, $F(3, 3437) = 15.302$, $P < .001$, $\eta 2 = .013$. Interestingly, people without a depression diagnosis had significantly lower relationship satisfaction scores than the other 3 groups which were not statistically significant. This could

indicate that people who are not diagnosed with depression could be less satisfied in their relationships because of other external or internal conflicts. Whereas, people who have been diagnosed with depression could be more satisfied in their relationships because of depression treatment. However, more research needs to be conducted in order to explore these and other possible group differences.

Keywords: depression diagnosis, adolescent depression, adult depression, relationship satisfaction

Public Administration Presentations

Presenters:	Renee Wilkerson	Graduate Student	College of Public Service	Public Administration

Authors: Renee Wilkerson

Title: Leadership Characteristics of Inspectors General

Abstract: In the United States, Offices of Inspectors General (OIGs) serve as vital guardians of government accountability, uncovering fraud, waste, abuse, and mismanagement within local, state, and federal agencies. Their efforts often encounter resistance, requiring steadfast and dependable leadership from the heads of the offices, Inspectors General (IGs), to achieve meaningful reform. Yet, the essential qualities that make IGs effective leaders remain poorly defined and underexamined. This research identifies the general qualities of successful leaders described in academic literature. It then utilizes qualitative content analysis to compare these qualities to the professional requirements placed on IGs. By integrating both empirical research and practical guidelines, this research establishes a well-rounded framework of eleven leadership characteristics essential for IG effectiveness. It also lays the groundwork for future studies on IG effectiveness and supports the development of targeted leadership training within government oversight.

Keywords: Inspectors General, Offices of Inspector General, government oversight, government accountability, leadership characteristics, leadership effectiveness, public administration, leadership framework

Social Work Presentations

Presenters:	Lillian Brown	Graduate Student	College of Public Service	Social Work

Authors: Lillian Brown

Title: An Interpretative Phenomenological Analysis of Clinicians' Experiences Treating People Impacted by The Club Q Mass Shooting

Abstract: This study explores the lived experiences of clinicians treating individuals affected by the Club Q mass shooting, employing an Interpretative Phenomenological Analysis (IPA) framework. With mass shootings becoming more frequent in the United States, clinicians are increasingly confronted with the unique challenges of treating those impacted by such traumatic events. This research highlights the experiences of LGBTQIA2+ clinicians, who not only face the professional demands of their roles but also navigate the shared trauma and minority stress associated with their marginalized identities.

The study aims to uncover the nuanced experiences of these clinicians, highlighting their stories of pain, trauma, and resilience. By doing so, it seeks to provide insights into best practices for treatment and strategies for promoting post-traumatic growth and resilience among clinicians. The research is grounded in an anti-oppressive, feminist lens, emphasizing the importance of elevating voices that are often underrepresented in clinical research.

Through in-depth interviews with six clinicians who treated individuals impacted by the Club Q shooting, this qualitative study aims to contribute to the limited body of knowledge on the intersection of shared trauma and minority stress within the LGBTQIA2+ community. The findings are expected to inform organizational practices and support systems that enhance the well-being and professional sustainability of clinicians working in high-stress, trauma-exposed environments.

Keywords: LGBTQIA2+, Mass Shooting, Gun Violence, Trauma

Sociology Presentations

Presenters:	Teresa miller	Undergraduate Student	College of Letters, Arts and Sciences	Sociology

Authors: Teresa Miller

Title: Techno-nationalism and Re-industrialization: Discourse analysis of the CHIPS & Science Act

Abstract: This project analyzes how the discourse surrounding the CHIPS & Science Act of 2022 exemplifies techno-nationalism that reinforces U.S. hegemony. Techno-nationalism refers to the integration of technological development as central to a nation's economic security, leadership, sovereignty, and global influence. Through a qualitative analysis of White House publications, multinational corporate materials, and popular news media, the study investigates the discourse surrounding the Act, specifically examining what is emphasized, what is promoted, and what is obscured. By employing critical discourse analysis, two key findings emerge: first, the claim of universal benefits of the Act, emphasized through the liberal notion of the abstract human condition; and second, its promotion as a solution to geopolitical issues like deindustrialization and competition with China. These findings show that U.S. hegemony is reproduced through a discursive strategy that consolidates dominant nationalism, linking a techno-national identity to the colonial discourse of universalism and a utopian narrative of American resurgence. This process of consolidation reflects a relational view of nationalism, where discourse constructs and unifies multiple social, political, and economic elements into a cohesive national identity that reinforces U.S. power both domestically and globally. These findings contribute to the literature on techno-nationalism by highlighting the connection between the creation of national identity and techno-national policies, an area that has been understudied.

Keywords: Techno-nationalism, U.S. hegemony, CHIPS & Science Act, Nationalism, Critical discourse analysis

Teaching and Learning Presentations

Presenters:	Christine Hermina	Undergraduate Student	College of Education	Teaching and Learning

Authors: Christine Hermina & Pat McGuire

Title: The Rise of AI in the Classroom: Pre-Service Teachers' Perspectives

Abstract: Generative Artificial Intelligence (AI) tools are being increasingly integrated into K-12 classrooms; however, their application in university-based teacher preparation programs remains largely under-explored. Addressing this gap, this study examines how pre-service teachers (PSTs) at the University of Colorado Colorado Springs (UCCS) are engaging with AI in their teacher preparation programs. Using a mixed-methods design, the study gathered data from online surveys (N = 39) and follow-up focus groups to analyze AI usage and pattern, perceived benefits, challenges, and ethical considerations among PSTs. Results reveal that while PSTs show a high level of awareness and curiosity about AI's potential in education, actual usage rates for teaching-related purposes remain relatively low. Some study participants highlighted concerns over ethical implications and requested more structured training on AI tools to ensure responsible and effective classroom application. These findings underscore the importance of integrating AI education and ethical discussions into teacher preparation to support PSTs in future classroom integration confidently and responsibly.

Keywords: Generative AI, Technology Acceptance Model, pre-service teachers, mixed methods

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.

———————————————————————————————————————

Acknowledgements

We extend our thanks to Jennifer Poe of the Center for Student Research and Lindsay Coppa of the Office of Research for their leadership in organizing the event this year. We also thank Amez Khidr of the Office of Research for their dedication and assistance with the abstract book. We also thank the Research Faculty Advisory Board and members of the Office of Sponsored Programs and Research Integrity for their service as judges for the Top Scholar Awards and thank our Interim Provost, Lynn Vidler, for being our research champion. Finally we thank Event Services for their support in making Mountain Lion Research Day a success. The Office of Research is led by Acting Associate Vice Chancellor for Research, Hillary Fouts.