



University of Colorado
Colorado Springs

OFFICE OF RESEARCH

*15th
Annual
Mountain
Lion
Research
Day*

DECEMBER 8th, 2023

12:00-4:00PM

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



Contents

Welcome!	3
Land Acknowledgement	4
List of Presenters	5
Biology Presentations	9
Chemistry and Biochemistry Presentations.....	22
Computer Science Presentations.....	32
Criminal Justice	34
Electrical and Computer Engineering Presentations	35
Health Sciences Presentations.....	40
History.....	47
Human Physiology and Nutrition.....	48
Mechanical and Aerospace Engineering Presentations.....	49
Nursing Presentations.....	52
Philosophy.....	58
Physics & Energy Science Presentations.....	59
Psychology Presentations	61
Social Work Presentations	77
Technical Communication and Information Design.....	79
Women’s & Ethnic Studies (WEST)	81
The History of Mountain Lion Research Day	82
Acknowledgements	82

Welcome!

Welcome to the 15th annual Mountain Lion Research Day! Today, we come together to commemorate the outstanding scholarly achievements of our students and faculty. While this event highlights a single day of celebration, we recognize that research is an enduring journey. At UCCS, we take great pride in our vibrant research and creative community. Active involvement in research is not only a high-impact practice for students but also a catalyst for the discovery, creation, and innovation that has the power to change the world.

However, the transformative potential of new knowledge can only be realized through sharing. That's precisely why we gather today – to learn collaboratively, establish connections, share our passions, and celebrate the invaluable contributions of our campus researchers. Whether you're a presenter, judge, or audience member, your presence and engagement contribute significantly to fostering a culture of knowledge exchange at UCCS.

Thank you for being a cherished member of our UCCS Research Community. Together, let us continue this journey of exploration, discovery, and positive impact.

Jessi L. Smith, Ph.D. Associate Vice Chancellor for Research



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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.

[Nuuchiu](#) is pronounced (New-chew), meaning "the people"

Tava-Kaavi is pronounced (Tah-vah Kaav), meaning "sun mountain"

List of Presenters

Last Name	First name	Faculty Advisor	Department	Poster
Aken	Anahi	Tre Wentling	Women's & Ethnic Studies	99
Apricio	Haley	Hayley Blackburn	Technical Communication and Information Design	96
Avila Gutierrez	Karla	Deborah Pina-Thomas	Nursing	61
Barhydt	Abigail	Deborá Pina-Thomas	Nursing	62
Beitle	Nicole	Allen Schoffstall	Chemistry and Biochemistry	21
Benavidez	Marissa	Jeremy Bono	Biology	1
Blough	Kimberly	Marissa Baranauskas	Human Physiology and Nutrition	55
Bockelmann	Jason	Michael Scott Trimboli	Electrical and Computer Engineering	41
Bondarchuk	Natalie	Dr. Amy Klocko	Biology	2
~Breuer	Molly	Joey A. Lee	Health Sciences	45
*Britt	Velette	Brynn Ad	Health Sciences	46
Broen	Tiana	Leilani Feliciano	Psychology	70
Brom	Gemma	Steven Bistricky	Psychology	71
~Camarena	Sandy	Sandy Camarena	Mechanical and Aerospace Engineering	56
Chowdhury	H M A Mohit	Oluwatosin	Computer Science	35
Coddington	Brooklyn	Deborah Pina-Thomas	Nursing	63
~*Cruz	Brenda	Kristen Rudd	Psychology	72
Davis	Nissa	Amanda Elder	Health Sciences	48
Dayes	Caleb	Kristen Rudd	Psychology	73
DeBlieck	Marissa	Lisa Hines	Biology	3
Decker	Maddie	Kathy Liu	Health Sciences	47
Deist	Alli	Emily Mooney	Biology	4
Elmore	Logan	Kevin Tvrdy	Chemistry and Biochemistry	22
~Ervin	Alissa	Ronald Ruminski	Chemistry and Biochemistry	23

Fahland	Audrey	Emily H. Mooney	Biology	5
Felipe	Abigail	Arlene Bjugstad	Social Work	94
Forst	Azahra	Jeremy Bono	Biology	6
Fouts	Maria	Kelli Klebe	Psychology	74
~Garbrick	Jon	Lynanne George	Mechanical and Aerospace Engineering	58
Gilart	Luis	Amy Klocko	Biology	7
~Glidden	Jonathon	Chris Foley	Mechanical and Aerospace Engineering	57
~Green	Clinton	Jeremy Bono	Biology	8
Hamilton	Joey	Guy Hagen	Chemistry and Biochemistry	24
Hamilton	Sage	Kelli Klebe	Psychology	75
Hamilton	Sage	Steve Bistricky	Psychology	76
Hassan	Aya	Douglas Risser	Biology	9
Hatcher	Kyle	Diana Selmeczy	Psychology	77
Herzog	Adrienne	Kristen Rudd	Psychology	78
Hileman	Wesley	Gregory Plett	Electrical and Computer Engineering	42
*Hill	Colton	Philip Brown	Computer Science	36
Hull-Crew	Clayton	Andrew Klocko	Chemistry and Biochemistry	25
Jackson	Jourdan	Emily Mooney	Biology	14
Jenkins	Garrett	Douglas Risser	Biology	10
Kaddar	Farh	Andrew Klocko	Chemistry and Biochemistry	26
Kalhor	Sabir Ali	D. Tarek Masaud	Electrical and Computer Engineering	43
Kenigsberg	Zara	Steven Bistricky	Psychology	79
Klein	Paige	Steven Bistricky	Psychology	80
Kuespert	Jennifer	Haley Blackburn	Technical Communication and Information Design	97
Kyle	Alison	Deborah Pina- Thomas	Nursing	64
Lenz	Heron	Emily Mooney	Biology	11
Lenz	Heron	Emily Mooney	Biology	12
~Martin	Halie	Andrew Klocko	Chemistry and Biochemistry	27

Matteson	Conrad	Sarah McInerney	Psychology	93
*McAllister	Kaitlin	Dmytro Bozhko	Physics and Energy Science	67
~McLane	Elisabeth	Kelli Klebe	Psychology	81
~McLane	Elisabeth	Diana Selmeczy	Psychology	82
~McLaughlin	Hayden	Xin Yee	Mechanical and Aerospace Engineering	59
Metzger	Madeline	Deborah Pina Thomas	Health Sciences	49
Mewada	Hetal	Allen Schoffstall	Chemistry and Biochemistry	28
Michael	Carol	Eugenia Olesnicky	Biology	13
~Mikolaitis	Melissa	Steven Bistricky	Psychology	83
Milliron	Kyrie	James Kovacs	Chemistry and Biochemistry	29
*Miteff	Bella	Jen Kling	Philosophy	40
Montañez Villafañe	Laura	Joey Lee	Health Sciences	50
Morrison	Dylan	Hayley Blackburn	Technical Communication and Information Design	98
Mortensen	Ari	Lisa Hollis-Brown	Biology	15
Moyer	Caleb	Kelli Klebe	Psychology	84
Murphy	Lindsey	Amanda Elder	Health Sciences	51
Nelson	James	Keith Paarporn	Computer Science	37
Nemri	Jamil	Crystal Vander Zanden	Chemistry and Biochemistry	30
*Nightshade	Mallory	Amy Klocko	Biology	16
*Nwaulu	Emmanuel	Tarek Masaud	Electrical and Computer Engineering	44
Olowofila	Samuel	Oluwatosin Oluwadare	Computer Science	38
*Panique	Jasmin	Johanna Baez	Social Work	95
~Pavkov	Alexandria	Tom Francis	Psychology	85
Peck	Rachael	Heather Littleton	Psychology	86
Phillips	Nadan	Christina Jimenez	History	54
*~Raiger	Jillian	Judith Scott	Nursing	66
Reed	Cody	Lisa Hollis-Brown	Biology	17
Robe	Hailey	Lisa Hollis Brown	Biology	18

Roxburgh	Alison	Ezio Iacocca	Physics and Energy Science	68
Rudolph	Walker	Lisa Hines and Lisa Hollis-Brown	Biology	19
~Ruiz	Alexander	Allen Schoffstall	Chemistry and Biochemistry	31
~Scafuri	Lawrence	Ezio Iacocca	Physics and Energy Science	69
Shamess	Miriam	Diana Selmeczy	Psychology	87
Smith	Evan	Kelli Klebe	Psychology	88
Soriano	Anna Marie	Helen Graham	Nursing	65
Spann	Isabel	Lisa Hollis-Brown	Biology	20
Sueltz	Keegan	Keegan Sueltz	Health Sciences	52
Talley	Kyle	Crystal Vander Zanden	Chemistry and Biochemistry	34
*Tamarez	Leah	Crystal Vander Zanden	Chemistry and Biochemistry	32
~*Thorne	Jackson	Lynanne George	Mechanical and Aerospace Engineering	60
~Trent	Camden	James Kovacs	Chemistry and Biochemistry	33
Trujillo	Alyssa	Colin Mahoney	Psychology	89
Trujillo	Alyssa	Kelli Klebe	Psychology	90
Villacis	Mike	Kelli Klebe	Psychology	91
Wathen	Milly M.	Michael Kisley	Psychology	92
Week	Ashlyn	Amanda Elder	Health Sciences	53
Whitekus	Christian	Henriikka Weir	Criminal Justice	39

~URA Member; **Top Scholar Finalist

Abstracts in alphabetical order by department

Biology Presentations

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

Co-Authors: Clinton Green, Jeremy Bono

Title: Investigation of the role of ARI23009 in formation and persistence of the insemination reaction in *Drosophila arizonae*

Abstract: Insights into reproductive mechanisms contribute to our understanding of factors influencing reproductive success and, ultimately, evolutionary biology. Recent research in our lab has shown that female *Drosophila* translate male-derived RNA that is transferred during copulation. This research sparks the exploration of whether these male-derived, female-translated proteins (mdFTP) are functionally significant. Our focus lies in understanding the role of the mdFTP ARI23009 in the formation of an insemination reaction (IR), a critical reproductive component that holds importance in remating and ovipositing. Additionally, the IR is an opaque mass that is developed in the female reproductive tract after mating. To investigate the role of this gene on the IR, we used CRISPR to generate a mutant line of *Drosophila arizonae* with a non-functional ARI23009 gene. The IR size was measured between crosses of virgin females with wildtype males and virgin females with mutant males. The results revealed statistical differences between these crosses, showing that females mated to mutant males had a smaller IR compared to females mated to wildtype males. This indicates that ARI23009 does play a functionally significant role in the female after copulation.

Presenters: Natalie Bondarchuk Undergraduate College of Letters, Arts, & Sciences Biology

Co-Authors: Allison Canada, Logan McCord

Title: Apple CRISPR-Cas9-A Recipe for Successful Targeting of AGAMOUS-like Genes in Domestic Apple

Abstract: CRISPR-Cas9 can edit genes and potentially update the genome. This technology can be used to make desired changes in (theoretically) any organism. Application of gene editing requires knowledge of the effectiveness of this approach. The goal of this project was using CRISPR to target the AGAMOUS (AG) genes in domestic apples, while the AG genes are very similar to one another, the project's purpose is to determine how efficient the editing is and discover the amount of shared function of the AG genes. As a commercial crop, genetically modified apples could lead to improved varieties, disease resistance (such as fire blight), and other practical horticultural improvements. We collaborated with the USDA to create 44 independent genetically modified examples of apple trees. Then, we used gene cloning and sequencings to determine exact changes to each AG gene and gene copy. The compiled data reported several totally genetically modified events, specifically 37% of trees were completely edited. The findings validated our proposal that CRISPR editing is possible and efficient within apple trees, and completed data has been published in the scientific journal 'Plants'. Trees with complete changes to the AG genes are predicted to produce flowers with petals in place of the anthers and pistils. Such flowers would be highly ornamental and would also be unable to reproduce by pollen and seeds. As apple trees are propagated by branch cuttings, such trees could still be multiplied by standard methods. Planned future work includes phenotypical characterization of overall tree form, health, and growth.

Keywords: CRISPR, AG genes, apple trees, domestic apple, gene editing

Presenters: Marissa DeBlieck Undergraduate College of Letters, Arts, & Sciences Biology

Co-Authors: Kyla Magar, Lisa Hines, Lisa Hollis-Brown

Title: The Effects of Horse Manure on Native Plant Growth in Garden of the Gods Park

Abstract: This research project was done to analyze the effects of horse manure on native Colorado plant growth to preserve native plants in Garden of the Gods Park. Previously, concern has been expressed by park guests and park rangers that the horse manure, from frequent horse tours, will inhibit native plant growth. The soil was obtained from two different trails within Garden of the Gods; one trail was exclusively used by pedestrians while the other was used, frequently, for horse tours. These soil types created control samples (pedestrian trail) and experimental samples (horse tour trail) in which Blue Grama grass (*bouteloua gracilis*), a grass native to Colorado, was grown. The vertical height of the grass and the number of seeds germinated were recorded over three weeks with two rounds of the control and experimental samples. It was found that both the experimental and the control group's averages of the vertical heights and germination counts were not significantly different from each other according to multiple two-sample t-tests; therefore, it was found that the presence of horse manure did not have a substantial effect on native plant growth according to this experiment. Chemical tests were also conducted on both soil types which concluded there was no significant difference in the pH or the amount of nitrogen, phosphorus, and potassium between the two soil samples.

Keywords: Garden of the Gods, native plant growth, horse manure, environmental impact

Presenters: Alli Deist Undergraduate College of Letters, Biology
Arts, & Sciences

Co-Authors: Aria Kelly, Audrey Fahland, Emily Mooney

Title: Changing Lipid Accumulation by Euxoa Moths at High Elevation

Abstract: Our objective was to track changes in lipid storage over a 40-year period by two species of Euxoa moths. *Euxoa auxiliaris* are migratory moths that move from the plains in the spring to high elevations in the summer to feed on floral nectar of white flowers in the Rocky Mountains. *Euxoa lewisi* are non-migratory moths who are also found feeding on nectar from white flowers at high elevations. We repeated sampling of moths in 2021, 2022 and 2023 at Pennsylvania Mountain, Colorado following protocols performed from 1978 through 1980. The non-migratory Oregon dart moth (*Euxoa lewisi*) showed no significant change in lipid accumulation. However, we observed that the migratory army cutworm moth (*Euxoa auxiliaris*) no longer accumulates lipids while feeding at high elevation (Ordinal Date*Study Year: $F = 8.550$, $P < 0.001$). These findings suggest a potential impact on the migration of *Euxoa auxiliaris*, as fewer moths complete their migration journeys back to the plains to reproduce. This has the potential to affect both crops in the plains, where the army cutworm is considered a pest, and high elevation ecosystems, where the moths serve as important pollinators and a food source to bird and mammal populations.

Keywords: conservation biology, migratory moths

Presenters: Audrey Fahland Undergraduate College of Letters, Biology
Arts, & Sciences

Co-Authors: Alli Deist, Aria Kelly

Title: Changing Diversity and Abundance of Macrolepidoptera at High Elevation Colorado

Abstract: Our objective was to document changes in diversity and abundance of macrolepidoptera on high elevation gradient. We repeated sampling of moths in 2021, 2022 and 2023 at Pennsylvania Mountain, Colorado. This followed protocols first performed from 1978 through 1980 and used in our other study of lipid accumulation in Miller moths (*Euxoa auxiliaris*).

Original macrolepidoptera families of moths included Sphingidae, Noctuidae, Pyralidae, Geometridae and Notodontidae. In 2021-2023, moths belonging to the family Lasiocampidae appeared at this site. In addition, we found new species representing agricultural pests (*Trichoplusia ni*) and non-native species (*Noctua pronuba*) at this remote tundra site. It appears that the number of species present is continuing to increase every year.

Keywords: diversity, moths, lepidoptera, entomology, mountain, ecology, change, Pennsylvania Mountain, Colorado, Rocky Mountains, elevation, elevation gradient

Presenters: Azahra Frost Undergraduate College of Letters, Arts, & Sciences Biology

Co-Authors: Clinton Green, Marissa Benavidez, Jeremy Bono

Title: Investigation of the functional significance of ARI14644 on reproductive outcomes in *Drosophila arizonae*

Abstract: Previously the lab has investigated and deduced the complexities of male seminal fluid and its ability to transfer over RNA transcripts in *Drosophila*. Since it is seen in many other species we know that RNA is a common feature of male ejaculates. We know that when the male sends over RNA transcripts through ejaculate that it is then translated into a protein by the female following copulation. Our current focal point with this research is to investigate the functional effects of ARI14664 on reproductive outcomes. This gene belongs to a family of proteins involved in reproduction in diverse organisms ranging from insects to mammals. Our previous work has shown that transcripts of this gene are transferred by males and translated by the females. To investigate the functional significance of this gene, we will generate a knockout mutation using CRISPR gene editing. To investigate the function of ARI14664, 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 IR size to evaluate any phenotypic changes. An integral differential aspect of this gene compared to the others previously studied in the lab is that it does not transfer over proteins with it. This means that if we observe the expected outcome that it can be deduced that the proteins in the female came solely from the translation of RNA from the gene ARI14664 derived from the male.

Keywords: mutation of ARI14664, heterozygous knockout, male derived female transcribed, proteins involved in reproduction

Presenters: Luis Gilart Undergraduate College of Letters, Arts, & Sciences Biology

Co-Authors: Mallory Nightshade, Cathleen Ma, Steven H. Strauss, Amy Klocko

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

Abstract: The LEAFY gene is a key transcription factor in plants. It is an ancient gene, found in the ancestor to land plants and all modern plants. In flowering plants, LEAFY is critical for coordinating the transition from vegetative to reproduction growth. LEAFY is also expressed in vegetative tissues. Very little is known of the role of LEAFY outside of flowers, and we are interested in investigating overall LEAFY function. We are using a dominant negative gene fusion of LEAFY where we have fused the EAR motif from another transcription factor to generation a LEAFY:EAR fusion protein. Dominant negative mutations are different from standard loss-of-function changes because the altered protein function takes over standard protein function. This allowed for the mutation to exert a dominant effect. We will be comparing our findings with prior studies of loss of LEAFY function and overexpression of LEAFY. Loss of LEAFY function generally leads to short bushy plants with small leaves and late flowering. By contrast, overexpression of LEAFY can lead to tall narrow plants with early flowering. We are studying our LEAFY:EAR fusion in hybrid poplar trees as part of a long-term field trial. Trees were planted in 2019 and have yet to start flowering. We have 84 total trees, 14 non-transgenic control trees and 70 LEAFY:EAR trees from 10 different independent genetic insertion events. We are currently charactering traits such as leaf structure, mass, chlorophyll content, and size. Once trees mature, we will analyze flower form.

Keywords: LEAFY, dominant negative, gene function, plant genetics

Presenters: Clinton Green Undergraduate College of Letters, Arts, & Sciences Biology

Co-Authors: John Mccoy, Jeremy Bono

Title: Investigation of GI26471 RNA in *Drosophila arizonae* Seminal Fluid

Abstract: Recent research has revealed that the composition of male seminal fluid is more complex than initially believed. Since our lab's discovery of RNA transcripts in the seminal fluid of *Drosophila arizonae*, this has been confirmed in several other organisms, indicating RNA is a conserved feature of male ejaculates. Our current research aims to elucidate the function of this RNA in the reproductive process. We discovered that the transcript of the gene GI26471 is passed to the female during copulation where it is subsequently translated into a protein by the female. The function of this protein still unknown, but a targeted mutation of this gene with the use of CRISPR may reveal its function. Of its many possible roles, one of interest is the protein's potential involvement in the formation of an opaque structure that manifests within the reproductive tract of the female post copulation known as the insemination reaction (IR). Currently, we are investigating a CRISPR-generated mutant line of *D. arizonae*. The mutation is an in-frame 12 bp deletion. Three assays, IR size, egg hatching, and fecundity. To observe any phenotypic changes, mutant male virgins are mated with wild type (WT) virgin females then compared to WT male and female matings. Thus far, the findings indicate no statistically significant difference between these crosses for any of the phenotypes. This suggests that the in-frame deletion failed to impede GI26471's functionality or that the gene's function lies outside of the scope of this investigation.

Keywords: Seminal fluid, CRISPR, mating

Presenters: Aya Hassan Undergraduate College of Letters, Arts, & Sciences Biology

Co-Authors:

Title: The role of ebsA in Nostoc punctiforme hormogonia and motility

Abstract: Nostoc punctiforme is a species of cyanobacteria known for its ability to fix nitrogen. This capability enables N. punctiforme to establish nitrogen-fixing symbioses with eukaryotes. N. punctiforme consists of vegetative filaments that give rise to three distinct cell types: akinetes, heterocyst, and hormogonia. Hormogonia are specialized motile filaments produced by certain cyanobacteria that enable movement across surfaces. This movement is advantageous because it allows the organism to navigate towards optimal light condition for photosynthesis or towards a plant partner with which it may have a symbiotic relationship. The production of a hormogonium-specific polysaccharide is associated with motility. Cyanobacteria utilize a common motor, the type IV pilus, to power motility. EbsA has been shown to be an essential component of the type IV pilus system in unicellular cyanobacteria. To determine its role in N. punctiforme, the ortholog of ebsA was deleted. The ebsA strain was non-motile but still produced filaments with hormogonium morphology. The mutant strain also failed to produce hormogonium polysaccharide or type IV pili on the cell surface. These results are similar to those seen for another T4P mutant strain of N. punctiforme, and thus indicates that ebsA is critical for T4P function in N. punctiforme like in unicellular cyanobacteria.

Keywords: ebsA, Nostoc punctiforme, Type IV pili

Presenters: Garrett Jenkins Graduate College of Letters, Arts, & Sciences Biology

Co-Authors: Alicia Nguyen, Douglas Risser

Title: A parMRC System Regulates Cell Morphology in Nostoc punctiforme

Abstract: Nostoc punctiforme is a filamentous, nitrogen-fixing cyanobacterium that differentiates into three different cell types: hormogonia, akinetes, and heterocysts. When vegetative filaments differentiate into hormogonia, the cells morphologically change from more round to more cylindrical. The Mre system, including the bacterial actin-like protein (BALP) MreB, controls the rod morphology in other species of bacteria, and the Mre system is upregulated in hormogonia. Here, we identify and characterize a pair of genes, designated fcmB and fcmC, that comprise a second system essential for rod morphology in N. punctiforme. The fcmB gene is predicted to encode a BALP that is evolutionarily distinct from MreB, and most closely related to a group of BALPs typically involved in plasmid partitioning. Deletion of fcmB or fcmC resulted in the loss of rod-morphology, similar to the phenotypes reported for other rod complex mutants. Vancomycin-FL labeling indicated a reduction of cell wall synthesis along the length of the filament, also similar to that reported for rod complex mutants. Bacterial two-hybrid analysis demonstrated that FcmB and FcmC interact with each other, but not other rod-complex proteins tested. FcmB-GFP was also found to form filaments that were associated with the membrane. Collectively, these results imply that fcmB and fcmC comprise a discrete system, separate from the rod-complex, that is essential for rod-shaped morphology in N. punctiforme.

Keywords: Nostoc punctiforme parMRC morphology

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

Co-Authors: Sloane Petrasek, Spencer Wright

Title: Temperature Responses in a Linked Plant-Herbivore-Parasitoid System

Abstract: Climate change is impacting trophic interactions, especially those involving ectotherms whose behaviors are largely dependent on temperature. In this system, an alpine flower, *Ligusticum porteri*, serves as a host plant on which aphids feed, and Aphidiinae parasitize aphids, creating mummies. From 2017 to 2023, 200 *Ligusticum* individuals among 20 populations along an elevation gradient were surveyed. Throughout each summer, weekly observational data was collected on the number of aphid colonies and aphid mummies occurring in each population, and host plant seed set was counted at the end of each season. Temperature data collected at the population level was plotted against these observations and curves were fit to determine the temperature optima of host plant quality, aphid colonization, and parasitism rate. While these temperature optima describe the temperature at which these responses are strongest, the optima curves may also help predict how these multitrophic interactions will change as climate change progresses.

Keywords: aphids, tritrophic interactions, temperature optima

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

Co-Authors: Sloane Petrasek, Spencer Wright

Title: Environmental Determinants of Parasitoid Abundance

Abstract: Aphids form colonies on stems, roots, and leaves that feed on, and inhibit the growth of, the host plant. Parasitoid wasps parasitize the aphids, which may limit aphid colony growth. Due to the role of aphids in managing plant health, most research conducted on aphid-parasitoid interactions has taken place in agricultural settings, and little is known about the biotic and abiotic factors that drive parasitoid wasp abundance. Insects were sampled from vegetation at 20 sites along an elevation gradient near Crested Butte, CO in 2017, 2018, 2019, 2020 and 2023. In fall 2023, we sorted these insects by taxonomic order and counted individuals in the families Aphelinidae and Aphidiinae. We found site-to-site variation in the abundance of parasitic wasps and fit a model to determine the drivers of that variation. Parasitoid abundance was greatest in sites with fewer aphids, which may suggest top-down effects limiting aphid colony establishment.

Keywords: aphid-parasitoid interactions, top-down effects

Presenters: Carolin Michael Graduate College of Letters, Arts, & Sciences Biology

Co-Authors:

Title: Interactive effects between caper and foraging in *Drosophila*

Abstract: Alternative splicing significantly increases the transcriptomic and proteomic complexity by generating multiple different products from a single genetic locus. RNA binding proteins can regulate the mechanisms of RNA processing, including alternative splicing. The RNA binding protein Caper is involved in alternative splicing and has a conserved role in dendrite development in *Drosophila* and *C. elegans*. Furthermore, caper has been shown to regulate the development of the larval neuromuscular junction and aspects of adult and larval locomotion. Specifically, caper dysfunction leads to aberrant larval locomotion, where caper deficient larvae explore a much smaller area, as compared to age matched controls. Another gene that has been well-established to influence larval behavior is the gene foraging. Foraging has two naturally occurring alleles called rover and sitter, where larvae with the rover allele roam further than larvae with the sitter allele. Since both caper and foraging impact larval locomotion, we hypothesized that an interaction between the two might exist. To better characterize these possible interactions, additional neuromuscular junction, muscle atrophy, and larval locomotion assays were performed. The results support a genetic interaction between caper and foraging in neuromuscular junction morphology, muscle atrophy, and larval locomotion.

Keywords: Caper, acinus, foraging, RNA binding proteins, mechanosensory neurons, neuromuscular junction, locomotor behavior

Presenters: Emily Mooney Faculty College of Letters, Arts, & Sciences Biology

Co-Authors: Jourdan Jackson

Title: Tracking Phenology of Host Plants and Insects along a Geographic Gradient

Abstract: Variation in temperature can accelerate the timing of biological events, or phenology. For example, we may see earlier flowering of plants and or accelerated development of animals with warmer temperatures. Ecologists often use spatial gradients to study the effects of variation in temperature and its associated effects on phenology. This study investigated the phenological patterns of both plants and insects along a geographic gradient from north to south, spanning a 1.5 km section of Monument Creek in Colorado Springs. Sites at the northern end of the gradient are warmer than those at the southern end. We collected data in 2021 and 2022 on the timing of key life cycle events for a host plant (Western hops) and its specialist herbivore (*Celastrina humulus*). We assessed their phenological synchronization along this gradient. Preliminary findings suggest significant variation in phenological events between plants and herbivores, but with earlier occurrences observed in southern points compared to their northern points.

Keywords: phenology, host plant, geographic gradient, celastrina, ecology, colorado

Presenters: Ari Mortensen Undergraduate College of Letters, Biology
Arts, & Sciences

Co-Authors: Cameron Rea

Title: The Effects of Ozone Exposure on Juvenile *Vanessa cardui*

Abstract: Extensive research has shown ground-level ozone to have detrimental effects on the health of animals at concentrations of 120 parts per billion for the duration of an hour, as established by the National Ambient Air Quality Standards for ozone. At this exposure level, acute effects in humans, such as eye and lung irritation, may be observed. Ozone is an effective pesticide that has been used commercially to control the presence of bacteria, fungi, and insects within food storage. However, ozone produced by anthropocentric activity is not well contained, and thus may spread via wind to non-urban regions. This can have negative impacts on the developmental rates and mortality of insects in non-urban areas. Painted lady butterflies (*Vanessa cardui*) are one such insect with little literature surrounding them regarding how ozone affects them. This study investigated the impacts that exposure to ozone has on the development of *Vanessa cardui* larvae. Our results showed that repeated exposure to ozone at concentrations of roughly five parts per million for a duration of 20 minutes had negligible effect on the development of the painted lady larvae when compared to a non-exposed control. This was measured through the recorded masses of ozone exposed and non-ozone exposed painted lady juveniles prior to and after pupation. Additionally, no significant correlation between ozone exposure and increased mortality rate was observed. These results suggest that repeated exposures to low ozone concentrations are not enough to significantly alter the development and longevity of this species of butterfly.

Keywords: *Vanessa cardui*, caterpillars, ozone exposure

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

Co-Authors: Amy Klocko, Steven Strauss, Cathleen Ma, Lisa Hargest

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

Abstract: Genetic engineering can be used to create new and improved varieties of trees with useful novel traits such as insect and disease resistance. However, adding traits via new genes is genetic modification and the use of such organisms is regulated and controversial. A main concern is the risk of genes moving. In the case of poplar trees, our species of interest, pollen can move long distances and release genetically modified material into the environment via breeding with wild trees. However, it is possible to prevent gene flow by containment approaches. Developing efficient and reliable genetic containment strategies is crucial for the safe use of transgenic trees. Our goal is to utilize CRISPR-Cas9 technology as a possible approach to mitigate this gene flow.

CRISPR-Cas9 editing can be used to make changes to genes of interest. Our research focuses on changing two key floral genes AGAMOUS (AG) and LEAFY (LFY). Changes to these genes typically results in sterility. The research aims to assess the stability and efficacy of these mutations over time.

The experimental plan is comprehensive analysis of 360 CRISPR-modified poplar trees planted in the field. We are focusing on characterizing genetic changes to targeted genes, analyzing floral form and fertility, and assessing overall tree performance. Trees were planted in 2017 and 2019, providing us with several years of growth data, trees are just now reaching maturity. By addressing important ecological and regulatory concerns, this research aims to provide a comprehensive understanding of CRISPR-Cas application in tree genetics.

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

Presenters: Cody Reed Undergraduate College of Letters, Arts, & Sciences Biology

Co-Authors: Chris Joiner

Title: Does sugar content of *M. percizae* diet impact *H. convergens* predation preference

Abstract: *M. percizae* is a common type of aphid found throughout the United States, (Cranshaw, 2019). Since these aphids feed on many different types of plants (Capinara, 2020), this means that the amount of sugar in their diet can vary depending on what their current food source is, (Aksic, et. Al, 2019). *H. convergens* are a popular predator for *M. percizae* control, (Silvia et. al., 2004). While *H. convergens* have a preference for prey in the *M. percizae* between main strawberry pests, there may be a possibility of confounding variables such as sucrose content within the aphid diet that was the underlying result of studies conducted in “The Feeding Behavior of the Bigeyed Bug, Minute Pirate Bug, and Pink Spotted Lady Beetle Relative to Main Strawberry Pests,” (Silvia et. al, 2004). Other confounding variables could be present in this specific study; for example, the overall health/nutritional quality of the aphids. We wanted to determine if a measured change in *M. percizae* diet could have an impact on *H. convergens* preference when feeding on aphids that have a higher sugar content in their diet. While most feeding strategies of predators relate to the abundance of prey (Svanback et. al., 2017), the food source of the prey itself has yet to be observed in a manner that can be presented as a factor of predation habits. If our hypothesis is supported, further research can be conducted for a more in-depth understanding of the broad idea of predation habits in not only insects, but herbivores, omnivores, and larger carnivores. To determine this, we placed *M. percizae* on leaves that had been kept in a substrate on hydrogel with a particular sugar content (0%, 25%, and 75%). After giving the *M. percizae* at least 24 hours to feed on their particular food source with a certain percentage of sugar we then isolated 16 aphids per trial along with two *H. convergens* and gave them an hour to feed. The subjects of each trial were isolated by placing them in a clean petri dish lined with a damp paper towel to observe with no confounding variables present. After two trials we noticed a preference towards the *M. percizae* with a high-sugar diet, however, after these trials, this preference was not as defined. It did not appear that the sugar content of the aphids’ diet seems to have an impact on *H. convergens* preference.

Keywords: Predation preference, Lady Beetles Aphids

Presenters: Hailey Robe Undergraduate College of Letters, Arts, & Sciences Biology

Co-Authors: Tyler Kaess, Cheryl Doughty, Andrew Ernst, Lisa Hollis-Brown

Title: Pure and Clean vs. Bleach: Which One Gets the Gold?

Abstract: Wrestlers are frequently in close contact with each other and with their training mats, which results in a higher-than-average rate of skin infections (often contagious). In fact, a 2017 study calculated a skin infection rate of 14.23 infections per 10,000 athlete exposures. Therefore, thoroughly and effectively disinfecting mats is extremely important for wrestlers' health. The US Olympic Training Center (OTC) recently transitioned from using bleach to a hypochlorous acid-based cleaning product called Pure and Clean; however, wrestlers and coaches observed an increase in skin infections shortly thereafter. In this experiment, we aimed to determine which of the cleaning products were more effective at eliminating bacteria. We tested a 10% bleach solution and 460ppm Pure and Clean provided by the OTC. Based on previous studies demonstrating the efficacy of bleach in killing a wide range of microorganisms, as well as the coach's observations, we hypothesized that bleach will be most effective at eliminating bacteria. We collected 240+ samples from wrestling mats at the OTC and analyzed the samples to quantify bacterial growth. Further, we used the gram staining method to determine which species of bacteria could be found on plates after cleaning. We performed chi² statistical tests at a 0.05 significance threshold to determine which product was more effective. Ultimately, our work shows that Pure and Clean is the more effective cleaner, and we recommend that the Olympic Training Center continue using it rather than bleach.

Keywords: bacteria, Olympic Training Center, cleaning products

Presenters: Walker Rudolph Undergraduate College of Letters, Arts, & Sciences Biology

Co-Authors: Lisa Hines, Lisa Hollis-Brown

Title: Using Gene-Editing Tools to Investigate the Role of Genes Involved in Various DNA Damage Response Processes

Abstract: To monitor DNA integrity, cells are equipped with DNA damage response (DDR) processes that detect and repair DNA damage. The DDR process is executed by a set of proteins that are encoded by genes within the cell. In fission yeast, *Schizosaccharomyces pombe*, it is known that Rad32, Ku70, and Mst1 encode proteins that serve critical roles in DDR. We decided to study the role of these DDR genes based on the criteria that they have observable and measurable phenotypes when they do not function properly, and thus, are ideal for undergraduate level biology classes to study gene function. Genome editing is a common molecular biology technique that allows researchers to study the function of a gene. Due to its simplicity and high efficiency, the CRISPR-Cas system is the most widely used genome editing tool in the world. Using CRISPR/Cas gene editing, we can investigate the function of these genes in DDR, which can provide undergraduates with the opportunity to learn about DDR and the CRISPR-Cas system while acquiring laboratory skills that are useful in many research laboratories. The goal of this research project is to develop the experimental protocols, in a modular and easily adaptable format, so that this technology can be implemented in any undergraduate laboratory classroom.

Keywords: DNA Damage, *Schizosaccharomyces pombe*, CRISPR-Cas system, phenotypes

Presenters: Isabel Spann Undergraduate College of Letters, Arts, & Sciences Biology

Co-Authors: Kali Carlson, Gia Servin

Title: The Effects of Supplemental Amino Acids on body mass and CO₂ production in *Vanessa cardui* larvae

Abstract: We investigated the subsequent developmental effects on *Vanessa cardui* caterpillar larvae following the addition of amino acid supplementation to their standard diet when reared in captivity. The *cardui* larvae has been found to exhibit a protein-biased dietary selection preference when compared to carbohydrate-skewed diets; furthermore, the pupal masses decreased at a higher rate when consuming carbohydrate-biased diets than when consuming protein-biased diets. (VanOverbeke et al.) This study found that larvae lost mass when the nutrient ratio skewed too far from a 1C:1P ratio, but it was by a smaller amount when in favor of protein. Amino acids are the building blocks of proteins in living organisms and are essential for bodily processes, including growth. An increase in amino acids will increase the concentration of ingredients required to build proteins and perform the cellular functions necessary for physical growth. Therefore, the addition of amino acid supplements to the standard diet will ultimately result in larger mass development and higher CO₂ output (standardized per gram of body mass) in mature larvae when compared to those treated with H₂O. Our experiment was compromised by two groups: one group was given food treated with liquid amino acid supplements, while the other was treated with water to use as a comparison. The data showed a slight trend of increased CO₂. While a modest trend is discernable, the calculated p-values were not of a notable level. However, the trend could be indicative of altered metabolic processes.

Keywords: Amino acids/Proteins, Larvae, Increased respiration rate

Chemistry and Biochemistry Presentations

Presenters: Nicole Beitle Undergraduate College of Letters, Arts, & Sciences Chemistry and Biochemistry

Co-Authors:

Title: Synthesis and optimization of 3,5-disubstituted isoxazoles and transfer hydrogenation with hydrazobenzene

Abstract: A one-pot procedure for the preparation of 3,5-disubstituted isoxazoles was utilized. This reaction involved cycloaddition of hydroximoyl chlorides with acetylenes in the presence of base forms isoxazoles. Two novel isoxazoles were synthesized through this method. The reduction of model isoxazoles were tested through a transfer hydrogenation method. The transfer hydrogenation method 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 enamines. Experimentation showed that the excess hydrazobenzene over reduced a ketone to an alcohol instead of the desired enamine. This reaction is continuing to be optimized with different solvents, molar equivalents, and transfer hydrogenation reagents.

Keywords: A one-pot procedure, disubstituted isoxazoles, cycloaddition, hydroximoyl chlorides, transfer hydrogenation, hydrazobenzene, copper on iron catalyst, reductive ring opening, enamines.

Presenters: Logan Elmore Undergraduate College of Letters, Arts, & Sciences Chemistry and Biochemistry

Co-Authors: Laurique Hughes, Kevin Tvrdy

Title: Automated Mechanical Separation of Hydrogel Microparticles

Abstract: Single-walled carbon nano tubes (SWCNTs) are purified based on chirality using hydrogel microparticles of varying chemical composition. The surface area presented by the microparticles affect SWCNT-gel interactions and single-chirality separation efficiency. Gel formations are important as the basis for how separation and purification interacts based on size, shape, and formation of lab synthesized gels. The process for making consistent and uniform gel particles has been a tedious and time-consuming process. Through the involvement of automated mechanical agitation and blending the process has been streamlined, resulting in a more consistent formation of hydrogels with uniform size distribution. Quantitation of particle size distribution and surface area is now a more streamlined process, with further improvements of the automated system planned.

Keywords: Chemistry, Hydrogels, microparticles, robotics

Presenters: Alissa Ervin Undergraduate College of Letters, Arts, & Sciences Chemistry and Biochemistry

Co-Authors:

Title: Stepwise Building Block Os(II) Complexes for Potential use in Photodynamic Therapy

Abstract: Photodynamic therapy (PDT) is an area of research that aims to incorporate photosensitizing agents into cancer treatment to provide a less invasive treatment and improve patients' quality of life. Similar to past research with ruthenium complexes, osmium metal-ligand complexes have shown promising opportunity in PDT. The proximal and distal [Os(dpop')(3,6-dppn)(Cl)]⁺ isomers were synthesized, separated, purified, and characterized in order to develop a preparative method for future complexes capable of binding Pt(Cl)₂ for potential use in PDT. The complexes were purified through column chromatography using a Sephadex LH-20 column. Characterization of the complexes through ¹H, ¹³C NMR and COSY and HSQC NMR, and HRMS verified the successful syntheses of proximal and distal [Os(dpop')(3,6-dppn)(Cl)]⁺ isomers. Quantitative UV-Vis spectra showed that the metal-to-ligand charge transfer transitions in both isomers are compatible with the wavelength of light necessary to penetrate the skin.

Keywords: Photodynamic Therapy, Metal-ligand Complexes

Presenters: Joey Hamilton Undergraduate College of Letters, Arts, & Sciences Chemistry and Biochemistry

Co-Authors: Summer Levis, Warren Brokaw, Ian Bulbertson, Tristan Paul

Title: Imaging cells and tissues with spinning disk confocal microscopy

Abstract: There are numerous phenomena that occur in biological systems that are not visible to the naked human eye, which catalyzed the invention of the first microscopes in the 16th century. This was the genesis of many significant advances in scientific research, including the creation of spinning disk confocal microscopy in 1968 by Hadravsky and Petran. Spinning disk confocal microscopy (SDCM) describes the use of a Petran disk with an array of pinholes set in an Archimedean Spiral which allows the incoming laser to move through the disk to excite the sample. As the laser illuminates the spinning disk, the resulting beam is split into hundreds of beamlets which scan the entire sample to aid in producing a clear image. The fluorescence emission from the sample is then imaged back through the spinning disk, preventing any out of focus light from reaching the camera. In lab the SDCM technique is used to capture high resolution images of cells and tissues. The SDCM technique has applications in biomedical research to further understand cell structure/ function using cells or tissues tagged with fluorescent proteins that are able to emit light when excited with a laser.

Keywords: microscopy, fluorescence

Presenters: Farh Kaddar Undergraduate College of Letters, Arts, & Sciences Chemistry and Biochemistry

Co-Authors: Nickolas Lande

Title: Characterizing the landscape of histone post-translational modifications in strains of *Neurospora crassa* with single translocations

Abstract: Large genome rearrangements (e.g., “translocations”), are where a double-strand DNA break is improperly repaired, causing the movement of a large section of DNA from a donor chromosome into a different genomic location. Translocations are often seen in human cancers, but the effect of these large genome rearrangements on genome function are not well understood. In particular, little information exists about how translocations affect the deposition of post-translational modifications (PTMs) on histones, including the methylation of lysine residues, many of which are considered “epigenetic” in nature. To understand how large genome rearrangements affect eukaryotic genome function, we examined the enrichment of histone PTMs in strains of the filamentous fungus *Neurospora crassa*, each of which containing a single translocation. Previous work has shown that the di- or tri-methylation of lysine 27 on histone H3 (H3K27me_{2/3}), which demarcates facultative heterochromatin in *Neurospora*, can be altered in translocation strains. Here, we examined the enrichment of unique PTMs and their relation to translocation breaks in *Neurospora crassa*. We performed Chromatin Immunoprecipitation-sequencing (ChIP-seq) to analyze enrichment levels of the tri-methylation of lysine 9 on histone H3 (H3K9me₃), which demarcates silent heterochromatic regions, as well as the tri-methylation on lysine 4 on histone H3 (H3K4me₃), a histone mark that is associated with actively transcribed genomic loci. Comparative analysis of the ChIP-seq data between a wildtype (WT) strain and several translocation strains could highlight changes in the silent or active histone PTMs, which might elucidate how translocations impact genome function. We will present our most recent analysis of the deposition of histone PTMs in single-translocation strains, which may provide more insight into how translocations influence epigenetic genome function in higher eukaryotes.

Keywords: *Neurospora crassa*, histone post-translational modifications, epigenetics, genome organization, chromosome

Presenters: Halie Martin Undergraduate College of Letters, Arts & Sciences Chemistry and Biochemistry
Co-Authors: Clayton Hull-Crew, Nathan Ramirez, Molly Weir, Brent Windebank

Title: Determining the impact of Perfluorinated Compounds on microbial species diversity

Abstract: Perfluorinated Compounds (PFCs) are chemicals characterized by multiple extremely strong carbon-fluorine bonds that convey lipophobic and hydrophobic properties to industrial products. PFCs are used in a wide range of products from fire extinguishers and waterproof clothing to food wrappers and non-stick pans. Due to its prevalence within many industries, PFCs have extensively accumulated within the environment. Currently, there is no efficient way to clean PFCs from soil and water sources after sites are contaminated. This poses a health risk to the human population surrounding contaminated areas, as PFCs can bioaccumulate in the body and can cause adverse health effects. In fact, increased cancer rates have been well documented in PFC contaminated regions. In Colorado Springs, the release of fire retardants into the Fountain Creek Watershed has caused documented PFC contamination requiring the urgent development of remediation strategies. Thus, there is a critical need for remediating acute PFC contamination from our local environment. Unfortunately, current methods for PFC removal are expensive and energetically costly. However, microbes (bacteria or fungi) found in PFC contaminated environments hypothetically would have developed biochemical pathways that metabolize PFCs into nontoxic byproducts. To identify microbes that potentially could bioremediate PFCs, we are comparing the bacterial and fungal communities of collected soil samples from areas with presumed clean and known PFCs contamination. By examining the microbiome diversity, we may identify a particular microbial genus that thrives in PFC contaminated areas that could be used for bioremediation. We present our characterization of microbial community diversity in PFC contaminated soil.

Keywords: Microbiology, Microbiome analysis, environmental, Biochemistry

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

Co-Authors: Dr. Allen Schoffstall

Title: Syntheses of Isoxazoles and oximes derivatives

Abstract: Isoxazole derivatives are five-membered heterocycles which contain adjacent nitrogen and oxygen atoms. Isoxazoles have diverse applications in the medicinal industry as anti-cancer and anti-fungal agents. To synthesize isoxazoles, first an aldehyde was converted to an oxime, and the oxime chlorinated with NCS. The chlorinated oxime was converted to a nitrile oxide, which underwent a nitrile oxide-alkyne cycloaddition in the presence of a terminal alkyne. Some of our novel isoxazoles were synthesized in low yield or purity in the past. To improve the yield and purity of these novel products, the bases DBU and TEA were tested in an attempt to increase the yield and purity of the novel isoxazoles. The final crude products were purified via flash column chromatography. Future work with these isoxazole products should include reactions with hydrazine and phenylhydrazine to form pyrazoles.

Keywords: Organic Chemistry, Heterocycles, Oximes, Isoxazole

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

Co-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 and triggers many cancers and autoimmune diseases. EBV infections result in an asymptomatic response during infancy or a symptomatic response of infectious mono later in life. After the primary infection a person will have lifelong immunity, but EBV establishes a lifelong latency where the virus can reactivate triggering a severe disease. Currently there are no therapeutics or vaccines against EBV. Complement Receptor 2 (CR2), on the surface of B-cells, is where EBV binds. The crucial interaction between EBV's surface glycoprotein 350 (gp350) and CR2 results in the viral infection. The results we present are the first steps in our understanding of the molecular interactions between CR2 and gp350. Thus far we have expressed CR2 and gp350 proteins in 293T cells, a derivative of human embryonic kidney cells, and purified them for use in binding assays. This is the first time these proteins have been fully expressed in a human cell line for binding experimentation. The binding assay gave a K_D value of $1.9 \pm 0.9 \mu\text{M}$. HADDOCK docking data for the proteins has been collected and visualized in ChimeraX. The Van der Waals interactions, hydrogen bonds, and electrostatic interactions have been analyzed. The most common amino acids in each dock have been identified and highlighted. Together the data allow for a better biophysical and computation understanding of how EBV interacts with the body and sets up the basis for inhibition assay experiments.

Keywords: Epstein-Barr Virus (EBV), Complement Receptor 2 (CR2), Virology, Biophysical and Computational Methods, Protein-Protein Binding Interactions, HADDOCK, BLItz

Presenters: Jamil Nemri Undergraduate College of Letters, Arts, & Sciences Chemistry and Biochemistry

Co-Authors:

Title: Structure of membrane-bound human lipoxygenase protein

Abstract: Lipoxygenase protein 15-LOX-2 has been linked to atherosclerosis because it transforms white blood cells into foam cells, which form plaques in arteries. When 15-LOX-2 binds a membrane, it oxidizes arachidonic acid, which signals the formation of foam cells. Therefore, understanding the structure of the membrane-bound 15-LOX-2 would aid efforts to design effective drugs to inhibit 15-LOX-2 activity and treat heart disease. To determine the structure of membrane-bound 15-LOX-2, X-ray reflectivity (XR) measurements were collected from a pure membrane containing 80% 1,2-distearoyl-sn-glycero-3-phosphocholine lipids (DSPC) and 1-stearoyl-2-arachidonoyl-sn-glycero-3-phosphocholine 20% (SAPC). Additional measurements were collected with catalytically inactive Mn-bound 15-LOX-2. XR data were fit to determine a profile of electron density normal to the membrane surface, illustrating the position of the bound protein. The protein was membrane-bound with an overall length of 40 Å. Due to the conserved structure of lipoxygenase proteins, the protein length was comparable to that of a membrane-bound coral lipoxygenase, whose length was determined in a previous experiment. The XR data was modeled using two separate methods, and the results from each method were similar, indicating the protein parameters were accurate. Preliminary molecular dynamics simulations also show agreement with the structure determined from XR. Determining the structure of membrane-bound human lipoxygenase will allow further research towards developing drugs which can inhibit the activity of the protein, leading to reduced arterial plaque formation.

Keywords: Structure, Membrane-bound, Human Lipoxygenase Protein

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

Co-Authors:

Title: Synthesis of bis-triazole diacids and dialdehydes

Abstract: Lipoxygenase protein 15-LOX-2 has been linked to atherosclerosis because it transforms white blood cells into foam cells, which form plaques in arteries. When 15-LOX-2 binds a membrane, it oxidizes arachidonic acid, which signals the formation of foam cells. Therefore, understanding the structure of the membrane-bound 15-LOX-2 would aid efforts to design effective drugs to inhibit 15-LOX-2 activity and treat heart disease. To determine the structure of membrane-bound 15-LOX-2, X-ray reflectivity (XR) measurements were collected from a pure membrane containing 80% 1,2-distearoyl-sn-glycero-3-phosphocholine lipids (DSPC) and 1-stearoyl-2-arachidonoyl-sn-glycero-3-phosphocholine 20% (SAPC). Additional measurements were collected with catalytically inactive Mn-bound 15-LOX-2. XR data were fit to determine a profile of electron density normal to the membrane surface, illustrating the position of the bound protein. The protein was membrane-bound with an overall length of 40 Å. Due to the conserved structure of lipoxygenase proteins, the protein length was comparable to that of a membrane-bound coral lipoxygenase, whose length was determined in a previous experiment. The XR data was modeled using two separate methods, and the results from each method were similar, indicating the protein parameters were accurate. Preliminary molecular dynamics simulations also show agreement with the structure determined from XR. Determining the structure of membrane-bound human lipoxygenase will allow further research towards developing drugs which can inhibit the activity of the protein, leading to reduced arterial plaque formation.

Keywords: Organic synthesis, bis-1,4-triazole derivatives

Presenters: Leah Tamarez Undergraduate College of Letters, Arts, & Sciences Chemistry and Biochemistry

Co-Authors:

Title: Determining Molecular Interactions Between Galectin-4 and a Membrane Containing Cholesterol 3-Sulfate.

Abstract: Galectins are carbohydrate-binding proteins that bind to sugar molecules present on cell surfaces. Galectins are involved in various functions such as immune response, cell adhesion, and tissue repair. Other research has determined that cancer patients display elevated levels of a specific galectin protein called galectin-4 (Gal-4). Interestingly, Gal-4 also exhibits binding to cholesterol 3-sulfate, a lipid molecule whose specific biological functions are yet undefined but have been associated with atherosclerotic lesions to the human aorta. Their binding is suggested in research, but the biological reasoning for this interaction is not clear. In this research, the goal was to investigate this binding between Gal-4 and cholesterol 3-sulfate on a lipid monolayer composed of 80% 1,2-dipalmitoyl-sn-glycero-3-phosphocholine (DPPC) phospholipid and 20% cholesterol 3-sulfate. The experiment used X-ray reflectivity (XR) in a Langmuir trough with a lipid monolayer, employing incident angle variations to measure reflected X-ray intensity. XR data was modeled to produce a profile of electron density that can be interpreted to understand protein binding to the membrane. Results revealed the expected discrete layers of electron density for lipid tails and heads in the pure membrane. When Gal-4 was added, an additional area of electron density of approximately 38 Angstroms in length appeared on the membrane, suggesting Gal-4's binding. This research sheds light on the molecular structure of this unique interaction, deepening our comprehension of the binding dynamics between Gal-4 and cholesterol 3-sulfate in membranes, potentially paving the way for further investigations into their functional implications in biological systems.

Keywords: Galectin-4 and Cholesterol 3-Sulfate Binding

Presenters: Camden Trent Undergraduate College of Letters, Arts, & Sciences Chemistry and Biochemistry

Co-Authors:

Title: Understanding the Molecular Interactions of a Potential Lupus Therapeutic

Abstract: Systemic Lupus Erythematosus, or SLE, is an inflammatory autoimmune disease and presents in about 200,000 new cases every year. The current treatment plans only focus on the symptoms of the disease and not the underlying biochemical level issues. The compliment system is a target for therapeutic treatments of SLE, given the production of auto-antibodies from mature B cells. Along with our collaborators, we have identified two antibodies that have been shown to halt and reverse the effects of Lupus in mouse models, 3d29 and 3d8b. This therapeutic approach stems from engineering a single chain variable fragment (scFv). The expression of the 3d29 scFv in mammalian resulted in high levels of pure protein after purification. The binding affinities of this protein with C3D, a biomolecule present in Lupus, have been studied.

Keywords: Biochemistry, medical research, molecular docking, BLItz, therapeutic treatment

Presenters: Kyle Talley Graduate College of Letters, Arts, & Sciences Chemistry and Biochemistry

Co-Authors: Crystal Vander Zanden

Title: Importance of Disordered Linker on Structure of Tandem-Repeat Galectins Bound to a Model Membrane

Abstract: Cell signaling is essential to healthy cellular activity and function. Galectins are carbohydrate binding proteins that have been found to interact with several of these signaling pathways such as cell adhesion and growth. Galectin proteins contain at least one carbohydrate recognition domain (CRD) that drives their affinity to various carbohydrates. Galectin-8 (Gal-8) and galectin-4 (Gal-4) are two of these proteins belonging to the tandem-repeat type class of galectins. They contain two CRDs attached by a disordered linker peptide. The linker's role in galectin function is not fully understood as it is difficult to crystallize due to the disordered nature of the peptide. It is important therefore to study how binding is impacted by linker shortening and/or deletion. Here, we used X-ray reflectivity to obtain a model of how wild type Gal-8 and Gal-4 are bound to a model lipid monolayer composed of combinations of dipalmitoyl phosphatidylcholine (DPPC) and glycolipids GM3 or GM1. The same model membrane was then used to investigate the effects of shortened linkers on protein binding. The results suggest one CRD bound more tightly to the membrane than the other for Gal-8. This was evident by large (~70 Å) protein layer thicknesses in the generated electron density plots. For Gal-4, the results indicate that both CRDs are bound to the membrane as there was a protein layer about half the size of the Gal-8 protein layer (~39 Å.) Finally, the linker is seemingly important for protein function as binding ability is greatly affected by linker deletion.

Keywords: Protein structure, X-ray reflectivity, galectins, cell-signaling, membrane binding.

Computer Science Presentations

Presenters: H M A Mohit Chowdhury Graduate College of Computer Science
Engineering

Co-Authors: Terrance Boulton, Oluwatosin Oluwadare

Title: Comparative study on chromatin loop callers using Hi-C data reveals their effectiveness

Abstract: The chromosome is a fundamental component of cell biology, housing DNA that encapsulates hierarchical genetic information. DNA compresses its size by forming loops, and these loop regions contain numerous protein particles, including CTCF, SMC3, H3 histone, and Topologically Associating Domains (TADs). In this study, we conducted a comprehensive study of 22 loop calling methods. Additionally, we have provided detailed insights into the methodologies underlying these algorithms for loop detection, categorizing them into five distinct groups based on their fundamental approaches. Furthermore, we have included critical information such as resolution, input and output formats, and parameters. For this analysis, we utilized the primary and replicate GM12878 Hi-C datasets at 5KB and 10KB resolutions. Our evaluation criteria encompassed various factors, including loop count, reproducibility, overlap, running time, Aggregated Peak Analysis (APA), and recovery of protein-specific sites such as CTCF, H3K27ac, and RNAPII. This analysis offers insights into the loop detection processes of each method, along with the strengths and weaknesses of each, enabling readers to effectively choose suitable methods for their datasets. We evaluate the capabilities of these tools and introduce a novel Biological, Consistency, and Computational robustness score (BCC_score) to measure their overall robustness ensuring a comprehensive evaluation of their performance.

Keywords: Chromosome, Loop, Hi-C, Comparison, Classification, Probability, Computer Vision, Probability, ML

Presenters: Colton Hill Graduate College of Engineering Computer Science

Co-Authors: Philip Brown

Title: The Tradeoff Between Altruism and Anarchy in Transportation Networks

Abstract: In this paper, we ask how a system designer should endow autonomous vehicles with general routing policies that are guaranteed to prove beneficial in a wide variety of networks and adoption rates. Previous work has found that programming autonomous vehicles to be altruistic (i.e., choosing routes in consideration of their impact on aggregate congestion) can guarantee improvements in traffic congestion, provided that enough of the vehicles are autonomous. On the other hand, it is known that if not all vehicles are autonomous, altruistic autonomous vehicles can actually cause significant increases in traffic congestion. Moreover, the benefits of altruistic autonomous vehicles depend in complex ways on the fraction of vehicles that are autonomous, complicating the designer's decision. In this paper, we derive the optimal altruism levels for autonomous vehicles which obtain significant benefits while limiting the perverse effects of partial adoption, all without requiring the designer to know the fraction of vehicles that are autonomous. We demonstrate that our proposed altruism levels ensure significant improvements in routing efficiency with respect to previously-known worst-case guarantees.

Keywords: game theory, agents-based systems, transportation networks

Presenters: James Nelson Graduate College of Engineering Computer Science

Co-Authors:

Title: Co-eco evolutionary dynamics models indirect strategic interactions between populations

Abstract: Evolutionary game theory (EGT) studies the dynamics of strategic interactions within a large population as they are shaped by selective pressures. This is an effective framework for modeling decision-making based on suitable fixed incentives. Such decisions often have consequences for the surrounding environment, however, and as the environment changes, so will external selective pressures. Many have studied the dynamics of behavior-environment feedback in single-population models; here, we seek to understand the interplay between multiple populations co-evolving with spatially-local environments. We focus in particular on fully characterizing the dynamics of two populations interacting through diffusion between their respective environments. In our preliminary results we analyze the stability properties of the critical points of this system when the incentive structure is symmetric with respect to the environment state. Current work is dedicated to generalizing these findings to arbitrary incentive structures, which would allow developing principled approaches to the influence of such parameters in order to achieve desirable environmental outcomes.

Keywords: Evolutionary game theory, Nonlinear systems, Multi-agent systems, Differential equations

Presenters: Samuel Olowofila Graduate College of Engineering Computer Science

Co-Authors: Oluwatosin Oluwadare, Jugal Kalita

Title: HiC-Capsule: A CapsNet-based Approach for HiC Data Resolution Enhancement

Abstract: In this study, we address the challenge of high-resolution (HR) Hi-C data scarcity in genetics research, due to the prohibitive cost of deep genome sequencing, which is essential for analyzing 3D chromatin organization. Consequently, we propose two deep learning (DL) models based on Capsule Neural Network (CapsNet) and U-Net architectures to enhance low-resolution Hi-C data to high-resolution. CapsNet employs capsules that signify genomic interactions combined with convolutional layers. U-Net uses an encoder-decoder structure with skip connections to retain spatial information during up-sampling. Preliminary results from our U-Net model show promising performance, with a best-case average PSNR/SSIM score of 35.19/0.9209, marginally surpassing the current advanced CARN-based and cascaded-GNN-based models. This suggests a potential advancement in computational methods for high-resolution Hi-C data generation, facilitating broader research into genomic structures and disease prevention.

Keywords: Hi-C, 3D genomic structure, resolution enhancement

Criminal Justice

Presenters: Christian Whitekus Graduate College of Criminal Justice

Co-Authors:

Title: The Mental Health Project

Abstract: The Mental Health Project (MHP) seeks to understand how underserved communities and minority populations can gain better access to mental health services. In addition, the project seeks to mitigate stigma surrounding mental health by educating communities, build trust between mental healthcare professionals, and emphasize both community and professional advocacy. The MHP will be done in three distinct phases, the test pilot phase will be conducted at the University of Colorado, Colorado Springs campus and will have a purposive sampling of 28 students over the age of eighteen. For comparative purposes there will be six to seven cis-heteronormative Caucasian students, while twenty-one to twenty-two will be of various multicultural and/or multiethnic backgrounds. A mental health survey will be created and will review marginalized community members thoughts on mental health services, the disparities they have personally faced, and what they want to see in mental healthcare. Research on barriers that minorities and underserved communities face has been reviewed in addition to the disparities in minority mental healthcare.

Keywords: Mental Health, Minority Population and Underserved Communities, Social Work, Cultural Competency, Education, Advocacy, Ethical, Stopping Stigma, Acknowledgement

Electrical and Computer Engineering Presentations

Presenters: Jason Bockelmann Undergraduate College of Electrical & Computer Engineering

Abstract: Lithium-ion batteries (LIB) are well-established for energy storage in light-duty electric vehicle applications with typical cell-level energy densities in the range of 100-265 Wh/kg. Through the development of physics-based models and controls, the performance and lifetime of LIB technology has approached theoretical limits. Nevertheless, a storage technology with greater energy density, on the order of 500 Wh/kg, is needed to make electrification of heavy-duty class 4-8 trucks and busses feasible. Rechargeable lithium-metal batteries (LMB) offer theoretical densities in the range of 300-500 Wh/kg, which could enable these heavy-duty applications. Until recently, however, short cycle life and safety issues stemming from poor control of the lithium plating and stripping processes at the lithium-metal anode have prevented commercial use of LMB technology. Recent advances in material science and pack design, including stack pressure, surface coatings, improved electrolytes, and pulse charging, are overcoming these issues. However, physics-based models (PMBs) of LMB cells that predict internal electrochemical variables as well as methods to estimate the values of model parameters have been slow to develop in the literature. PBMs are needed to apply advanced control strategies such as model-predictive control to maximize the performance and cycle life of LMB. To that end, we develop a controls-oriented PBM for LMB and nondestructive strategies to estimate the values of most of the model parameters for fresh and aged cells.

Keywords: Lithium metal battery, pouch cell, physics-based model, transfer function, nonlinear impedance, electrochemical impedance, perturbation analysis, state-space model, parameter estimation, particle swarm optimizer, genetic algorithm

Presenters: Sabir Ali Kalhoro Graduate College of Electrical & Computer Engineering

Co-Authors:

Title: Optimal Planning of Hybrid Fuel Cell-Battery System for Microgrid Applications

Abstract: Developing hybrid fuel cell-battery storage for electric power grid applications brings multifaceted benefits. Firstly, it offers enhanced flexibility and reliability to the grid by combining the strengths of both technologies. Fuel cells provide consistent, long-duration power generation, ideal for maintaining a stable baseline supply. Meanwhile, batteries excel in rapid response and short-duration energy needs, swiftly meeting peak demands or balancing intermittent renewable sources. This hybrid approach optimizes the use of renewable energy by storing excess power from sources like solar or wind in batteries while utilizing fuel cells as a backup during high-demand periods or when renewables are insufficient. Moreover, it contributes to grid stability, reducing reliance on fossil fuels, cutting emissions, and fostering a more sustainable energy ecosystem. The synergy between fuel cells and batteries presents a promising pathway towards a more efficient, resilient, and eco-friendly grid infrastructure. To this end, this research work proposes a novel model for optimal sizing and energy management of hybrid Fuel cell-lithium battery system for microgrid applications considering a trade-off between low cost and high efficiency of the lithium battery and the high energy density, and lifetime of fuel cell. Furthermore, the proposed approach considers the investment and operating costs of the hybrid system, the State-of-the Health (SOH) and dynamic efficiency of fuel cell, as well as battery degradation cost. Simulation results have demonstrated the effectiveness of the proposed approach. This research serves toward advancing renewable energy integration by optimizing storage capacities and providing adaptable, reliable power sources, thus enhancing grid stability.

Keywords: Hybrid Storage System, Microgrid, Fuel Cell, Battery

Presenters: Emmanuel Nwaulu Graduate College of Electrical & Computer
Engineering Engineering

Co-Authors:

Title: Risk-Managed Reserve Dispatch Strategy for Seamless Microgrid Islanding During Unplanned Islanding Events

Abstract: Microgrids are essential for transforming how we integrate renewable energy, providing adaptable, smaller-scale systems that work independently or alongside the main grid. They seamlessly combine diverse renewable sources like solar and wind, offering resilience during grid outages, optimizing renewable energy use, and lessening reliance on centralized fossil fuels. One of the key features of the microgrid is its ability to operate independently in islanded mode and rely on its local distributed energy resources (DER) in case of unplanned outage of the tie-line connecting the microgrid to the utility grid. However, assuring a seamless transition from grid-connected to islanded mode depends on the existence of enough installed DER capacity, proper energy management, and other issues related to grid dynamic behavior. In order to achieve a smooth transition to islanding mode and mitigate the disturbance effect, this research work proposes a novel energy management model for optimal scheduling of the microgrid reserve capacity to assure a seamless transition from grid connected to islanded mode under an unplanned islanding scenario. The model creates and detects islanding due to tie-line overload. Furthermore, it determines the optimal scheduling of battery reserve and distributed generators (DGs) spinning reserve as well as load shedding and power curtailment to ensure seamless transition and microgrid stability in the islanded mode. Finally, the scheduling problem is modeled as a risk-based stochastic problem to account for net load uncertainty by employing a conditional value-at-risk (CVaR) approach. Simulation results confirm the effectiveness of this model, contributing significantly to bolstering microgrid deployment, enhancing energy resilience, reducing the carbon footprint, and empowering local control over renewable energy usage.

Keywords: Microgrid, Spinning reserve, islanding, CVAR

Health Sciences Presentations

Presenters: Molly Breuer Undergraduate Helen & Arthur E. Johnson Beth-El
College of Nursing
& Health Science Health Science

Co-Authors: Joey Lee

Title: Comparison of Fitbit and Cellphone-Based Health Apps Step Count and Active Minutes in Controlled and Free-Living Conditions

Abstract: Introduction: Physical activity (PA) monitors have been touted as motivational tools for influencing individual's PA behaviors. As technology advances, activity monitors should be continuously evaluated to understand the utility of the PA data they provide. This study compared PA data between Fitbit Charge 4 and cellphone-based health app(s). Methods: A cross-sectional two-part study (controlled and free-living) was conducted with 32 participants with complete data. In Study 1, participants wore a Fitbit and cellphone while walking a controlled path while a researcher manually recorded steps. In Study 2, participants wore the Fitbit and cellphone for three days in their normal lives (i.e., free-living). A 3x1 repeated measures ANOVA was used to examine the accuracy of device step counts in the controlled setting. Two 3x2 (day by device) repeated measures ANOVAs were used to compare Fitbit and cellphone step counts and active minutes in free-living. Results: Study 1: Fitbit and cellphone step counts were significantly different than manually counted steps ($p=.03$) but counts between devices were similar (Fitbit Mean=446.8; cellphone=447.3). Study 2: There was a significant "day" main effect for step counts between devices ($p=.02$), however the "device" main effect and interaction term were not significant. There was no difference in active minutes between devices. Conclusions: Our findings suggest that there are similarities in step counts and active minutes reported between Fitbit and cellphone-based devices. However, the potential for using cellphone-based devices as motivational tools to improve PA behaviors may be limited as the devices may be less feasible to "wear" consistently.

Keywords: Activity tracker, step count, active minutes, Fitbit, cellphone

Presenters: Velette Britt Graduate Helen & Arthur E. Johnson Beth-El Health Science
College of Nursing
& Health Science

Co-Authors: Jessica Kirby, Amy Silva-Smith, Brynn Adamson

Title: Determinants of Physical Activity Self-Efficacy among those with Spinal Cord Injury: A Photo-Elicitation Study

Abstract: Physical activity (PA) in those with a spinal cord injury (SCI) is exceptionally low. Previous literature has outlined consistent barriers to PA participation, and despite growing knowledge, little change in participation rates has been observed. Self-regulation and PA self-efficacy (PASE) have been identified as moderately correlated with PA behavior, however, little is understood about how pre-SCI experiences of PASE affect post-SCI PASE. A photo-elicitation study was conducted to understand how pre-SCI PASE affects post-SCI PASE. The interview focused on the meanings of the photographs taken by participants, their insight into influences on their confidence to be PA, and their pre- vs. post- SCI self-efficacy sources. Deductive thematic analysis using Self-Efficacy Theory and Social Cognitive Theory was conducted to interpret participants' sources and barriers to PASE and how pre-injury SCI self-efficacy impacts post-injury self-efficacy. Twelve persons with SCI participated. Main themes influencing confidence were found to be accessibility/environmental barriers, social support, body judgments/functions, outcome expectations of PA, mastery/vicarious experiences, and self-regulation strategies. Pre-SCI mastery experiences related to post-SCI mastery experiences when the participant was optimally challenged. Vicarious experiences and verbal persuasion related to greater PASE when accompanied with an experience of mastery. Somatic experiences increased PASE when accompanied with positive outcome expectations of PA. This study adds nuance to how pre-SCI PASE experiences affect post-SCI PASE for those with SCI by describing specific barriers and facilitators to PASE. Understanding these sources and detractors of PASE will enable future programs in promoting PA in those who acquire a SCI later in life.

Keywords: physical activity, self-efficacy, spinal cord injury, disability, photo-elicitation, qualitative research

Presenters: Maddie Decker Graduate Helen & Arthur E. Johnson Beth-El Health Science
College of Nursing
& Health Science

Co-Authors: Kathy Liu

Title: Examination of Ankle Ligament Development in the Adolescent Population

Abstract: Context: Ankle sprains are the most common injury in sport. The anterior talofibular ligament (ATFL) is located on the lateral portion of the ankle and is responsible for resisting inversion and plantarflexion as well as anterior translation of the talus. With sports starting at a young age, it is important to examine the integrity of the ATFL as one ages, since it is the most commonly injured ligament during ankle sprains. Therefore, the purpose of this study is to examine ATFL measurements by age in the adolescent population.
Methods: In an ongoing study, ATFL measurements were taken from 13 youth participants (8 males, 5 females, age=13.7±2.2 years). Musculoskeletal ultrasound (MSUS) images were taken of each participant's right and left ATFL where the width was measured in centimeters. A correlation was used to analyze the relationship of ATFL thickness and age.
Results: The overall group correlation was 0.27. Further breakdown of female participants were - 0.07 and male participants were 0.41.
Conclusion: With a low subject pool, continued research is necessary to determine if ATFL measurements change as athletes mature musculoskeletally. A larger sample size would be recommended to obtain more accurate results. Understanding how the ATFL develops throughout the adolescent age may be able to provide insight into injury prevention of youth athletes.

Keywords: ATFL, Ankle sprain, Youth sports

Presenters: Nissa Davis Faculty Helen & Arthur E. Johnson Beth-El Health Science
College of Nursing
& Health Science

Co-Authors: Amanda Elder

Title: General Medical Conditions in Rodeo Athletes

Abstract: Rodeo athletes are susceptible to many general medical conditions, but the most common are thus far unknown. If it can be determined which conditions are most prevalent in the rodeo circuit, then the athletes can be given proper preventative care and medication to address these conditions. Over the span of twelve years – from 2010 to 2022 – data was collected at rodeos from 343 athletes on which general medical conditions were logged into an electronic medical record blindly. The only information known about the subjects is the condition they were diagnosed with as well as the event that they participated in. It was found that sinusitis, allergic rhinitis, upper respiratory infections, and gastrointestinal illnesses were the most common issues found in these athletes. The reasoning for the upper respiratory infections, sinusitis and allergic rhinitis may be due to the environment that the athletes compete in, with the dust being kicked up by the animals in a confined space. The prevalence of gastrointestinal illnesses may be due to the athlete's nomadic lifestyle and dietary choices. It should be noted that conditions such as sexually transmitted diseases were not reported in this dataset.

Keywords: Rodeo, general medical, athletes, sinusitis, gastrointestinal, upper respiratory infection, allergic rhinitis.

Presenters: Madeline Metzger Undergraduate Helen & Arthur E. Johnson Beth-El Health Science
College of Nursing
& Health Science

Co-Authors: Amanda Koos, Kylie Decker, Angel Dominguez, Elena Franco

Title: The Effect of Oral Care in Decreasing the Incidence of Hospital-acquired Pneumonia in Adult Hospitalized Patients

Abstract: Hospital-acquired pneumonia (HAP) is prevalent in the U.S., notably in the ICU where 9-24% of patients are affected. It contributes to 7.3% of total hospital deaths with a 10% mortality rate and imposes a substantial financial burden with a 75% increase (approx. \$27,543.76–\$28,778.13) in total hospital charges. This evidence-based practice (EBP) project systematically evaluates recent research to establish best practices for acute care. Using the revised Iowa Model of Evidence-Based Practice, we critically appraised 16 articles to answer the clinical question: In hospitalized adults, what is the effect of oral care in preventing HAP? Following the John Hopkins hierarchy of evidence, we identified 12 level ones, one level three, and one level five. The overall synthesis and appraisal of the evidence demonstrated consistency, low risk of bias, and ranked high on the evidence hierarchy pyramid. The evidence included eight randomized controlled trials, two meta-analyses, two systematic reviews, one retrospective study, and one quality improvement project, supports using 0.12% chlorhexidine oral rinse, increasing proper tooth brushing frequency, and standardized oral hygiene to decrease HAP. Current practice involves brushing teeth twice a day, elevating the head of the bed, and using mouth rinse. We recommend intensifying oral care interventions based on evidence indicating reduced HAP rates, costs, and hospital length of stay.

Keywords: hospital-acquired pneumonia, oral care, oral hygiene, interventions, best practice.

Presenters: Laura Montañez Villafañe Graduate Helen & Arthur E. Johnson Beth-El
College of Nursing
& Health Science Health Science

Co-Authors: Joey Lee

Title: Transforming Food Access: A Community-Driven Approach to Evaluate and Enhance Healthy Food Access in Utuado, Puerto Rico.

Abstract: Introduction: Tackling the pressing issue of healthy food accessibility in Utuado, Puerto Rico, is paramount. The purpose of this project was to utilize the Community Readiness Model to implement an upstream approach to identifying barriers and facilitators to accessing healthy foods in the Utuado community. Methods: This project used a revised version of the Community Readiness Assessment Tool (CRAT). The CRAT assessed four dimensions of community readiness: Community Efforts, Leadership, Knowledge About the Issue, and Resources for Prevention Efforts. Twenty-three questions across the four dimensions were asked in one-on-one interviews with seven key community stakeholders. Based on stakeholder responses, the interviewer scored community readiness for each dimension. Descriptive statistics were used to examine participant demographics and community readiness status. Qualitative themes related to healthy food accessibility were also identified. Results: Quantitative data revealed that community readiness scores across dimensions ranged from “pre-planning” (Community Efforts) to “initiation” (Leadership, Community Climate, Resources) with overall community readiness identified as “preparation.” Qualitative analysis revealed multifaceted themes, including cultural considerations, community-rooted challenges, and leadership dynamics. Cultural aspects highlighted the role of family in fostering healthy practices. Community-rooted challenges were linked to the impact of infrastructure, access to food, natural disasters, and governmental leadership that hindered progress. Conclusions: This project provides insight into Utuado's healthy food accessibility landscape. These findings may be useful in guiding the development of interventions to improve access to healthy food in Utuado by capitalizing on community strengths, such as community engagement and cultural relevance, to empower the community to act.

Keywords: Food access, Puerto Rico, Community, Empowerment, Leadership Dynamics, Community Readiness, Upstream Approach

Presenters: Ashlyn Week Graduate Helen & Arthur E. Johnson Beth-El Health Science
College of Nursing
& Health Science

Co-Authors:

Title: An Analysis of Knee Injuries in Professional Rodeo

Abstract: Background: Professional rodeo is a high-risk sport that can cause a multitude of injuries. The cowboys compete in bareback riding, bull riding, saddle bronc riding, steer wrestling, and team roping. To date, there have not been epidemiological studies specifically for knee conditions that are sustained in professional rodeo.

Purpose: Analyze and describe the epidemiology of knee injuries in professional rodeo.

Methods: Analyzed knee injury data from electronic medical records of the Justin Sports Medicine Team from 2015 to 2019. Data was analyzed for risk, frequency, type, location, mechanism, and the rodeo event in which the knee injury occurred. Results are still currently pending.

Keywords: knee, injuries, professional rodeo, epidemiology

History

Presenters: Nadan Phillips Undergraduate College of Letters, Arts, & Sciences History

Co-Authors:

Title: Mobilizing the Internet: An Analysis of the Mexican EZLN's Use of Social Media and the Internet in their Struggle for Independence.

Abstract: The Zapatista Army of National Liberation (EZLN) is a guerrilla militant group formed in response to NAFTA, which forced farmers to demand lower prices for crops. Signed in 1994, the North American Free Trade Agreement (NAFTA) eliminated trade obstacles between the United States, Mexico, and Canada, allowing businesses to sell commodities to Mexico at a lower cost. Therefore, the Zapatistas struggle on behalf of these farmers and other indigenous people whose voices have been stifled and advantages have been taken away by the government. My research seeks to determine the effectiveness of the Zapatistas in mobilizing their movement using the Internet, and if the inclusion of women and indigenous people(s) in their political campaigns boosted their popularity in Mexico and throughout the world. I contend that the Zapatistas' ability to organize their agenda and garner support from those who would not have known about their cause otherwise was greatly influenced by their utilization of the Internet during a period of increased social media consumption. The Zapatistas effectively utilized technology to communicate their message across several venues on the internet, allowing people from around the world to participate in their political endeavors. Furthermore, the Zapatistas' portrayal of women and indigenous people increased the group's popularity, leading to a surge in the number of films, documentaries, and books about them.

Keywords: EZLN/Zapatistas/Autonomy/Indigenous/Social Media/Internet

Human Physiology and Nutrition

Presenters: Kimberly Blough Undergraduate Helen & Arthur E. Johnson Beth-El College of Nursing & Health Science Human Physiology & Nutrition

Co-Authors: Katie Rainsberger, Sadie Luhman, Marissa Baranauskas

Title: On Your Mark, Get Set, Recover: Understanding Sex Differences in Recovery from Strenuous Aerobic Exercise

Abstract: As women's participation in sport continues to rise, the need for sex-specific, evidence-based exercise programming becomes more severe. Purpose: To evaluate potential differences in recovery from strenuous aerobic exercise between males and females tested during three phases of the menstrual cycle.
Methods: Following a maximal aerobic capacity (VO₂max) and familiarization test, 10 females (age: 28±7y, VO₂max: 42.5 ±7.0mL/kg/min) and 9 males (age: 32±9y, VO₂max: .4±8.2mL/kg/min) completed three sets of experimental visits, which included an 8km cycling time trial (8kmTT) and time to exhaustion (TTE) test on Day 1 followed by an 8kmTT on Day 2. The TTE consisted of two-minute intervals at 90%, 80%, and 70% VO₂max power with two-minutes active rest at 50% VO₂max power. Recovery was assessed as the relative difference in 8kmTT time from Day 1 to Day 2. Females completed a menstrual cycle symptom inventory (MSCI) before and after exercise. Results: There was an effect of sex on 8kmTT recovery (P=0.04), with a difference of 0.69[0.07,3.00] %. TTE at 90% VO₂max power differed by sex (P=0.03), with females fatiguing 303[31,575] seconds earlier. However, there was no effect of sex on TTE at 80% (P=0.37) or 70% (P=0.47) VO₂max power. There were strong correlations between average pre-exercise MSCI (P<0.01, R²=0.76) and post-exercise MSCI scores (P=0.02, R²=0.50). Conclusion: Recovery from strenuous aerobic exercise may be impaired for females who experience greater frequency and/or intensity of symptoms during the menstrual cycle. It may be beneficial to use the MSCI to guide high intensity exercise programming for the female athlete.

Keywords: sex differences, aerobic exercise, menstrual cycle symptoms, exercise recovery, time trial, time to exhaustion,

Mechanical and Aerospace Engineering Presentations

Presenters: Sandy Camarena Undergraduate College of Engineering Mechanical & Aerospace Engineering

Co-Authors: Lynnane George

Title: Enhancing Space Operations

Abstract: This study explores the feasibility of utilizing a robot manipulator on a small drone to facilitate in-space servicing and maintenance (ISAM) for satellites. The research involves developing simulations to model interactions between a multi-link robot and its drone base, which has three degrees of freedom. Through a MATLAB simulation and a torque force sensor, efforts are made to alleviate forces and torques between the drone and the robot, aiming to minimize undesired interactions. The practicality of the concept is verified experimentally using a robot mounted on a drone.

Keywords: Investigating Drone-Mounted Multi-Link Robot for In-Space Servicing

Presenters: Jonathon Glidden Undergraduate College of Engineering Mechanical & Aerospace Engineering

Co-Authors: Christopher Foley

Title: MEASUREMENTS OF BRUSHLESS DC MOTOR TORQUE PROFILES

Abstract: To comprehensively assess the impact of torque loss attributed to inductance, this experiment employs beam mechanics in conjunction with an electromagnet. The goal is to create low cost, high fidelity graphical representations of torque loss under controlled conditions by varying the angles of the electromagnet relative to the pivot point of the beam. This study is motivated by the need to understand and quantify torque losses caused by inductance, with expected outcomes contributing to a better comprehension of the relationship between electromagnet positioning and torque loss.

Keywords: Low-cost, brushless DC motor, permanent magnet synchronous motor, electric motor, SAE, electromagnet, permanent magnet, air gap

Presenters: Jon Garbrick Undergraduate College of Mechanical & Aerospace
Engineering Engineering

Co-Authors: Lynanne George

Title: A Tripartite Approach for Efficient Human Round Trip Missions to Mars and Ceres

Abstract: NASA's Artemis program looks to return to the moon and establish more presence on the moon to use as an aid for future Mars missions. NASA's Dawn mission, which successfully orbited the asteroid Vesta in 2011 and later visited the dwarf planet Ceres in 2015, utilized Mars for a gravity assist, revealing natural resources on Ceres which can potentially be used to aid. With advancements in interplanetary mission design, human travel to Mars and Ceres is now feasible within the next decade. This research outlines a low delta V round-trip human mission trajectory to Earth, Mars, and Ceres, using carefully selected low-energy routes and three key strategies to further decrease the required energy. These strategies include aerocapture and aerobraking at Mars and a gravity assist at Mars for the journey to Ceres. The mission concludes with a direct reentry to Earth. These strategies are all aimed at minimizing delta V without extending the time of flight of the mission. Additionally, the research includes optimal launch dates and times and explores the potential for using the resources found on both Mars and Ceres. Ultimately the mission design will reduce mission risk and enhance mission success over a 4.25 to 4.5-year mission duration. This technology is enabling for long-term human survival on other planets allowing for innovative research and resource sharing.

Keywords: Astrodynamics, Aerodynamics, Trajectories

Presenters: Hayden Undergraduate College of Mechanical & Aerospace
McLaughlin Engineering Engineering

Co-Authors:

Title: Identification of Geostationary Satellites Utilizing Machine Learning Algorithms

Abstract: Geostationary satellites (GEOs), which maintain a fixed position relative to the Earth, orbit at a slow pace, keeping them at a considerable distance from the planet's surface. This distance poses a challenge for precise satellite identification. The need to identify these geostationary satellites has become increasingly critical for national security and the management of space debris. For identification of GEOs, scientists extract spectral measurements of the visible spectrum reflected by these satellites. In our study, we analyzed spectral measurements of 19 GEOs for five nights. Our approach involves employing a combination of machine learning techniques, including Nearest Neighbor, Support Vector Machine, and Random Forest. Notably, K-Nearest Neighbor emerged as the most accurate method, achieving a 41% accuracy rate.

Keywords: Satellites, Machine Learning, Python, Support Vector Machine, Principal Component Analysis, Nearest Neighbor, Random Forest, Support Vector Classifier.

Presenters: Jackson Thorne Undergraduate College of Mechanical & Aerospace
Engineering Engineering

Co-Authors:

Title: Development of a Mars Rover Utilizing Decoupled Axis System Base

Abstract: Since its inception in 1988, the rocker-bogie suspension has singularly dominated vehicle design for rover exploration missions on Mars. This wheelbase mechanism is capable of negotiating obstacles on the order of the wheels' diameters, but its lack of actuating elements restricts rovers to low speeds with minimal means of recovery from "stuck" situations. By contrast, future use of active suspension will allow a higher degree of maneuverability and recovery options on the challenging Mars terrain. Due to complexity and cost, such methods have been avoided in the past, but as the space industry progresses toward human exploration of Mars, more flexible rover systems are required.

This research seeks to further the efforts of attaining a reliable, novel substitute to the rocker-bogie mechanism. To accomplish this, a wheelbase with four, servo-actuated robotic legs with wheels as end-effectors has been developed, simulated, and prototyped to explore the capabilities of a decoupled-axis system. Beginning with the review of existing literature, cues were taken from the adaptive, animal-inspired locomotion methods employed in projects like SherpaTT, European-Russian Rosalind Franklin, and JPL's ATHLETE [2] [3] [4]. At the University of Colorado Colorado Springs, a rover system has been conceived to allow similar walking and climbing capabilities driven by a network of servo motors. Simscape Multibody was used to simulate various design alternatives, culminating in a sixteen degree-of-freedom, wooden chassis prototype, run by Arduino microcontrollers. This project aims to contribute to the exploration of active suspension alternatives by providing proof-of-concept for further expansion with robotics at UCCS.

Keywords: Mechanical and aerospace engineering, Robotics, Simulation and design, Prototyping, Kinematics, Programming

Nursing Presentations

Presenters: Abigail Barhydt Undergraduate Helen & Arthur E. Johnson Beth-El Nursing
College of Nursing
& Health Science

Co-Authors: Abigail Barhydt, Isabel Van Horn, Jess Rittenhouse, Julie Klinefelter, Kelsey Chu, Leikela Lunt, Sage Nelson

Title: Managing Pain in Postoperative Patients: Non-opioid with Opioid vs. Opioid Monotherapy

Abstract: The opioid epidemic continues to worsen in the United States; this epidemic has also negatively impacted the state of Colorado. According to The Colorado Behavioral Health Administration (n.d.), 543 opioid overdose deaths were documented in Colorado in 2018. The Iowa Model of Evidence-Based Practice served as a framework for the project. The purpose of our EBP project is to critically appraise and synthesize the evidence for postoperative pain management interventions and make a decision about best practice. A clinical question was then developed to guide the EBP project: in postoperative patients, what is the effect of non-opioid interventions in conjunction with opioids in comparison to opioid monotherapy on pain management during hospitalization? The result of our literature search from CHINAL, PubMed, and Trip, includes 14 peer reviewed journal articles from 2013-2023. Of these articles, there are three systematic reviews, one meta-analysis, one scoping review, and nine randomized controlled trials. The preliminary analysis supports the use of non-opioid interventions in conjunction with opioids. A complete evaluation of the quality, strength, and consistency of the evidence as well as a comparison to current practice is needed to make a determination about best practice.

Keywords: Pain management, pain relief, complementary, holistic, post-operative.

Presenters: Brooklyn Undergraduate Helen & Arthur E. Nursing
Coddington Johnson Beth-El
College of Nursing
& Health Science

Co-Authors: Madison Fontenot, Jeannie Frisbie, Samya Lepki, Chloe Null, Ella Simon, Julia Thompson, Patricia Ward

Title: Assessing Fall Risk in Older Adults Admitted to the Hospital Using Johns Hopkins Fall Risk Assessment Tool

Abstract: Hospital research has shown an increase in fall incidents and falls with injuries. Evidence suggests that the common assessment tool, the Johns Hopkins Fall Risk Assessment Tool (JH-FRAT), may no longer be the best tool to evaluate a patient's fall risk. Geriatric falls are common and typically result in extended length of stay, increased cost for the hospital, patient injury, or death. The purpose of our Evidence-based project is to compare the use of the JH-FRAT to other fall risk assessment tools concerning geriatric falls in the acute care environment. The evidence-based practice model we used was the Johns Hopkins Nursing model which helped us synthesize our evidence. Our clinical question was, in older adult patients admitted to a med-surg floor, how does using the Johns Hopkins Fall Risk Assessment Tool, compared to using a standard assessment tool, result in a decrease in falls? We found 16 peer-reviewed articles: two systemic reviews/meta-analyses, one correlational study, two randomized control studies, four retrospective studies, one observational study, two case-control studies, one longitudinal study, one secondary data analysis, one quantitative study, and one evidence-based practice study, which collectively focused on the validity and effectiveness of the JH-FRAT. The outcome of this evidence-based project was determined to be that the JH-FRAT tool has high predictability and specificity, but low accuracy and sensitivity; therefore, it is most effective in clinical practice when used simultaneously with other fall risk assessment tools.

Keywords: fall risk assessment tool, fall risk assessment, acute care, fall reduction, analysis, geriatric, JHFRAT

Presenters: Karla Avila Undergraduate College of Mechanical & Aerospace
Gutierrez Engineering Engineering

Co-Authors: Sussana Argue, Juana Duran, Savannah Brown, Jessica Ramos

Title: Initiating Antibiotics and Infection Control Practices Pre-operatively, in Cesarean Section Patients to Reduce Surgical Site Infections

Abstract: Cesarean patients can suffer an increased risk of infections due to their surgical site. Cesarean sections are amongst the most common operations in the United States; however, they continue to have one of the highest incidents of post-op infections. This leads to increased hospital stays, which increases costs for both the hospital and the patients. The purpose of this evidence-based practice project is to identify if administering antibiotics and infection control interventions preoperatively helps to reduce surgical site infection after one month of a cesarean section. This EBP project critically appraised different research articles that implemented antibiotics and infection prevention practices such as: hospitals require sterile or clean procedures before surgeries, the use of antibacterial cloths, preoperative warming of the patient, skin hygiene, and addition of a second antibiotic. The Iowa Evidence-Based Practice model and clinical question guided our EBP project. "In cesarean patients, what is the effect of initiating antibiotics and infection control practices pre-operatively, on reducing the risk of surgical site infections one month after surgery?" The EBP team searched the literature for peer-reviewed research articles within the last 5-10 years based on our PICO. Of the 16 articles, seven were systemic reviews and meta-analyses, eight were randomized control trials, and one was quasi-experimental. Preliminary results support early initiation of infection control practices and antibiotics. Further synthesis and critical appraisal of the overall quality of the evidence, consistency, comparison with current practice, and cost are required to make a clinical decision about best practice.

Keywords: cesarean section, antibiotics, surgical site infection, infection control, and preoperative

Presenters: Alison Kyle Undergraduate College of Mechanical & Aerospace
Engineering Engineering

Co-Authors: Chris Bocci, Brooke Waller, Karissa Martinez, Luke Wagner

Title: Effectiveness of Pharmacological Treatments for Neonatal Abstinence Syndrome: Comparing Morphine with Other Treatments

Abstract: Background: There is conflicting data in the literature surrounding what is the most effective pharmacological treatment of infants with neonatal abstinence syndrome (NAS). In the US, there is one opioid-exposed neonate birth every fifteen minutes, with 50-80% going on to develop NAS. The average length of stay for pharmacologically treated neonates was 23 days, accounting for much of the estimated \$2.5 billion annual treatment cost for NAS. This evidence-based practice project aims to critically appraise and synthesize the evidence before making clinical decisions related to best practices in the pharmacological treatment of neonates with NAS. Methods: The Iowa EBP model guided the project. Our clinical question was, in neonates, what is the effect of substitution medications, in comparison to the standard practice treatment of morphine, on adverse outcomes and duration of treatment for NAS? The following databases, CINAHL, Cochrane Library, and PubMed, were searched. A literature review found two systematic reviews, nine randomized control trials, four cohort studies, and one mixed methods study. The 16 peer-reviewed studies received a cumulative moderate rating on the GRADE scale. Results: A preliminary appraisal of evidence found that other pharmacological agents were more effective than morphine in treating NAS. Other considerations like cost, quality, evidence consistency, clinical expertise, and patient preference should be further evaluated to determine best practice.

Keywords: Neonate, Pharmacological Treatment, Withdrawal, Opioids, Neonatal Abstinence Syndrome

Presenters: Anna Marie Soriano Undergraduate College of Engineering Mechanical & Aerospace Engineering

Co-Authors: Lauren Rice, Mackenzie Pepin, Braley Nelson, Holly Wiley

Title: Methods of Distraction During IV Insertion in Pediatrics: A Narrative Review

Abstract: The purpose of this narrative review was to analyze interventions used to reduce pain and anxiety in pediatric patients during IV placement. Secondly, we aimed to determine if these methods were currently used in clinical practice. We searched the literature for randomized control trials using Google Scholar, CINAHL, PubMed, TRIP, OneSearch, and EBSCO with the keywords pediatric, children, adolescent, AND IV insertions or IV placement, AND, emergency department, hospital, AND non-pharmacological, techniques and distraction. We identified 12 RCT studies published between 2008-2023. Age of the participants ranged from 3-18 years. Distraction methods for IV insertion included robotics, electronic devices, entertainment devices, medical clowns, virtual reality (VR), family presence, and Child Life Specialists. Pain measurements included the Wong Face Pain Rating Scale, Children's Anxiety Meter-Scale, and others. The Hierarchy of Evidence Model was used to assess the quality of the studies. Overwhelmingly the BUZZY, DITTO, virtual reality, medical clowns, and family presence proved to be the most effective methods of distraction. Robots and iPads showed limited changes in pain and anxiety. According to the Emergency Nurses Association, distraction methods such as virtual reality and cold vibration devices are recommended during IV interventions. Additional research focusing on age-specific categories will strengthen evidence of the effectiveness of different interventions. Limitations included a lack of ethnic diversity and the studies were not blinded. More research is needed to determine whether using distraction interventions versus standard of care is more effective.

Keywords: pediatric, children, adolescent, IV insertions or IV placement, emergency department, hospital, non-pharmacological, techniques and distraction

Presenters: Jillian Raiger Undergraduate College of Mechanical & Aerospace
Engineering Engineering

Co-Authors: Judith Scott, Joey Lee

Title: Communication skills training paired with an immersion experience for pre-service health professionals in preparation for working with older adults

Abstract: Introduction: The purpose of this research project was to provide therapeutic communication skill training and an immersion cooking class for students in preparation for working with older adults.
Methods: The education and cooking classes were presented to students enrolled in pre-health intent programs. A pre-post survey was administered to students, including a total of 30-questions based on Fraboni's Measure of Ageism scale, interest in careers working with older adults from Macdonald & Levy, and contact anxiety from Lytle & Levy. The Aging Perception Score (APS) was calculated by aggregating responses to the survey questions. APS scores ranged from 50-150 with higher scores indicating more positive perspectives about working with older adults.
Descriptive statistics were used to examine participant demographics. A paired samples t-test was used to examine changes in APS. Means were plotted to examine changes in APS following the cooking class. A one-way ANOVA was used to examine changes in APS based on prior experience with older adults.
Results: Demographic characteristics of the 72 participants are reported. The paired samples t-test revealed a significant increase in APS from pre-to-post education ($p < .001$). Scores increased from 108.6 pre-course to 117.8 post-course. Results of the one-way ANOVA examining changes in APS by prior experience with older adults revealed no significant association ($p = .11$).
Conclusion: The improved APS following student participation in the classroom education and the immersion cooking class suggests that these experiences may be effective for increasing APS in pre-health intent students. Further exploration is warranted.

Keywords: communication, Older adult, immersion experience, aging perception score.

Philosophy

Presenters: Bella Miteff Undergraduate College of Letters, Arts, & Sciences Philosophy

Co-Authors: Musa Brennan, Sarah Kamel, Max Shulman

Title: The Battlefield and Back Again

Abstract: This research project funded by the National Endowment for the Humanities was created to provide a platform for veterans and civilians to discuss first hand experiences related to life in and observing the military. The project is a podcast which focuses on a set of community conversations that involves veterans, active military personnel, their families, and civilians. Every episode discusses the issues facing our military and veteran communities. Each group involved in The Battlefield and Back Again has facilitators who were trained to lead discussions centered around these heavy topics. There has never been an archive of first-person experiences documented from veterans and civilians. Something like this would naturally show how the military influences people's world views.

Keywords: podcast, veteran, discussion, philosophy, civilians

Physics & Energy Science Presentations

Presenters: Kaitlin McAllister Undergraduate College of Letters, Physics & Energy Science
Arts, & Sciences

Co-Authors: Joey Espejo, Zbigniew Celinski, Maria Usanova, Dmytro Bozhko

Title: MiniMag: A Magnetometer Based on the Faraday Effect for Space Applications

Abstract: Accurate measurements of the magnetic fields of the Sun, Earth, and other planets are necessary to answer important questions in physics and better understand how these magnetic fields affect satellites and communications on Earth. Future space exploration will benefit from highly sensitive magnetometers able to measure magnetic fields over a wide range of frequencies. We present a concept of a magnetometer based on the Faraday effect that offers improvements over magnetometers currently used in space. Unlike other magnetometers, our design will be small enough to fit on a CubeSat, enabling easier and less expensive magnetic field measurements in space, and it offers better sensitivity over a larger range of frequencies. The Faraday effect is a phenomenon in which polarized light traveling through a magnetic material along the magnetization direction experiences a rotation of the polarization direction of the light. The magnetization depends on the applied magnetic field and rotates the polarization direction of the light. Our magnetometer uses infrared laser light traveling through a small sensing element of yttrium iron garnet, a magnetic material. By measuring the rotation of the light's polarization direction, we determine the magnetic field. We discuss the design of the magnetometer and its performance, including work done to improve its sensitivity and ability to measure magnetic fields at high frequencies, and future plans to further improve the magnetometer's sensitivity and develop a flight-ready design.

Acknowledgements:

This research was supported by the LASP Research and Development Program. The authors thank the LASP Instrument Engineering Group and the UCCS Physics Department for lab support. K. H. McAllister thanks the Boulder Solar Alliance Research Experience for Undergraduates, which was supported by the National Science Foundation REU program, Award #1950911. Prof. Bozhko acknowledges support from the UCCS Faculty Revitalization Fellowship Program.

Keywords: magnetometer, space instrumentation, magneto-optic

Psychology Presentations

Presenters: Tiana Broen Graduate College of Letters, Psychology
Arts, & Sciences

Co-Authors: Lelani Feliciano, Stephen Aichele

Title: Exploring barriers and facilitators to physical activity in European midlife and older adult samples

Abstract: Theoretical Background: Physical activity is a known health-promoting behavior that can support adults in living active and engaged lives. Despite being adaptable and accessible, only 24.3% of U.S. adults meet the physical activity guidelines of 150 minutes of moderate-intensity physical activity and 2 days of muscle strengthening activity per week (CDC, 2020). We also know that physical activity decreases with age, despite being a predictor of health outcomes such as diabetes, heart disease, and all-cause mortality. In order to support the health and wellbeing of aging adults, it is crucial to understand the significant barriers and facilitators to physical activity faced by the aging population. The current study aims to use a machine-learning design to better understand which predictors may be most impactful in supporting aging adults in keeping physically active.

Methods and Data: This study uses data collected from wave 6 of SHARE (the Survey of Health, Ageing and Retirement in Europe), which is a multinational, population-representative longitudinal study involving 28 countries in Europe and Israel.

Proposed Statistical Analysis: Data will be analyzed using a split sample methodology that combines a machine learning approach (random forest analysis, or RFA) along side a conventional parametric methodology (i.e., linear regression or generalized linear regression) to evaluate the relative importance of multiple risk/protective factors that have been shown to influence differences in physical activity in middle-aged and older adults.

Keywords: physical activity, older adulthood, aging

Presenters: Gemma Brom Graduate College of Letters, Psychology
Arts, & Sciences

Co-Authors: Jenna Happe, Paige Klien, Melissa Mikolaitis, Lelani Feliciano

Title: Sleep Hygiene Moderates the Relation Between Self-Compassion and Sleep Self-Efficacy in Trauma Survivors

Abstract: Sleep self-efficacy (SSE), one's confidence in their ability to engage in sleep behaviors to bring about healthy sleep, can be related to various facets of sleep and sleep-related behavior such as sleep quality and bedtime procrastination (BP), the volitional delay of going to bed at one's intended bedtime. High SSE can be positively associated with higher self-compassion (SC) sleep satisfaction, duration, and efficiency, whereas low SSE positively predicts BP (Liao et al., 2021; Przepiórka et al., 2019). SC has also been shown to improve sleep quality (Neff, 2003). Research examining the relation among self-compassion, SSE, and other sleep-related variables in trauma-exposed individuals is limited. Given benefits of SSE on sleep, it would be clinically useful to understand whether sleep hygiene behaviors affect how strongly SC and SSE are related. We hypothesized that sleep hygiene would moderate the relationship between SC and SSE, such that the relation between SC self-compassion and SSE would be strongest in those who practice better sleep hygiene. In this study, 235 college students completed an online survey assessing trauma exposure, SC, sleep hygiene, and SSE. As predicted, sleep hygiene moderated the relationship between SC and SSE ($R^2 = .28, p < .005$). Correlational analysis also demonstrated that SSE and sleep quality were correlated ($r = -.58, p < .001$). Results suggest that focusing on sleep hygiene could potentially help those practicing SC to have greater SSE, and perhaps, better sleep quality. Future studies should examine whether optimizing self-compassion and sleep hygiene bring about better sleep.

Keywords: Sleep, Sleep hygiene, Self-compassion, Sleep Self-Efficacy, Trauma

Presenters: Brenda Cruz Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors: Kristen Rudd

Title: Associations Between Adverse Childhood Experiences and Harsh Parenting for Understanding Children's Externalizing Behaviors and Academic Achievement

Abstract: Early adverse experiences can have profound and lasting effects on child developmental outcomes (Shonkoff, 2016; Liming & Grube, 2018). Traditional adverse experiences include abuse, neglect, or witnessing domestic violence; however, additional environmental factors such as poverty, instability, and negative parenting interactions can significantly impact a child's academic achievement, social-emotional well-being, and overall mental health (McKelvey et al., 2018; Hunt et al., 2017). However, relatively limited work has evaluated the combination of these types of exposures for children's outcomes. Therefore, the current study used data from a longitudinal study of 224 parent-child dyads to explore the relationships between environmental adversity exposure, intrusive parenting, academic achievement, and externalizing behavior problems.

A linear regression analysis revealed a significant main effect, indicating that increased environmental adversity was associated with decreased academic achievement. This effect was further modified by an interaction with intrusive parenting ($\beta = 16.7236$, $p = 0.0164$) such that in low adverse environments, low intrusiveness (i.e., less controlling and more supportive interactions) was associated with increased academic achievement; however, a protective effect was not present in high adverse environments. There was no statistically significant interaction between environmental adversity and intrusive parenting for children's externalizing outcomes. Findings suggest that parenting is an important factor for understanding child academic achievement, particularly in families not experiencing poverty. However, in under-resourced families, parenting factors may not be enough to offset the deficits associated with economic strain.

Keywords: Child development, poverty, instability, mental health, intrusive parenting, neglect.

Presenters: Caleb Dayes Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors: Kristen Rudd

Title: Adverse Childhood Experiences and Risk for Internalizing Symptoms Over the COVID-19 Pandemic

Abstract: Research shows that Adverse Childhood Experiences (ACEs; e.g., abuse, neglect, parental separation) are associated with negative mental and physical health outcomes (Bomysoad & Francis, 2020). Early adversity exposure may also increase the likelihood of susceptibility for developing negative health outcomes, particularly in the context of profound and prolonged negative environments (Tonmyr et. al., 2020). In particular, COVID-19 is a unique environmental stressor that amplified the strain on mental health worldwide, with some individuals being disproportionately impacted. Therefore, the current study sought to evaluate changes in internalizing symptoms over the first six months of COVID-19 and whether early adverse experiences predicted risk for developing internalizing symptoms. The current study utilized a longitudinal sample of mother-youth dyads (N = 133; 46.6% Latine). Mothers reported on their children's experiences of adversity from their birth to age 6. Youth self-reported their internalizing symptoms 6-9 months before the pandemic (Mage = 14 years 3 months) and once during the first 6 months of lockdowns (Mage = 15 years 2 months). Linear regression analyses identified a significant main effect of early adverse childhood experiences on youth change in depression over the pandemic ($\beta=.696, p=.04$). Specifically, youth who experienced more types of ACEs, were more likely to have increases in internalizing symptoms over the COVID-19 pandemic. Findings suggest that children who experience early adversity may be at increased risk for negative mental health outcomes following profound environmental stressors. Further, our results highlight the need for ACEs screening to identify youth who are most in need of support.

Keywords: Adverse, Childhood, Experiences, Internalizing, Symptoms, Mental, Health

Presenters: Maria Fouts Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors:

Title: Drugs, Religion and Criminal Involvement: An Investigation

Abstract: The current study investigates potential relationships between one's religiosity, criminal history and substance usage. Past studies indicate mixed results regarding the relationships between these variables. I utilized 4,196 participants from Wave-V of the National Longitudinal Study of Adolescent to Adult Health and created standardized variables representing religiosity, drug use and criminal involvement from the data set. I hypothesized that drug use and criminality would be positively correlated, and that one's level of religiosity would predict levels of substance use and criminal involvement. Significant relationships were found between drug use and criminal involvement and between one's religion and religiosity. ANOVA tests of drug use, criminal involvement, and religiosity were not significant. I conclude that the relationship between drug use and criminal involvement is stronger than religiosity's potential to influence those behaviors. Limitations to the study include a small number of participants who reported criminal behavior and drug use compared to participants who did not.

Keywords: Religion, Religiosity, Substance Use, Criminal Involvement

Presenters: Sage Hamilton Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors:

Title: A Gendered Analysis of Parental Closeness Following the Loss of a Mother or Father

Abstract: The purpose of this study was to investigate the loss of different parental figures (biological mother, mother figure, biological father, father figure) and gender influences on the degree of closeness to the respective parent. This study was conducted using a data sheet provided by The National Longitudinal Study of Adolescent to Adult Health (Add Health) which is a longitudinal survey of a nationally representative sample of U.S. adolescents in grades 7-12 during the 1994-95 school year. For this study, participants who had never lost a parent were excluded, leaving 1,297 participants who had lost at least one parental figure. Data was then recoded into four different variables: Gender and Death, Parental Loss, Degree of Closeness to Mother, and Degree of Closeness to Father. The variable Gender and Death was recoded into four different levels. The four levels then included males who lost a mother, males who lost a father, females who lost a mother, and females who lost a father. The variable Parental Loss was also recoded into four levels, those who lost a biological mother, biological father, father figure, and mother figure. Using SPSS, a chi-square analysis was used to determine gender differences (male lost a mother, male lost a father, female lost a mother, female lost a father). The chi-square test results indicate that there are statistically significant associations between the variables 'Degree of Closeness to Father' and 'Degree of Closeness to Mother' with 'Parental Loss' and 'Death and Gender'. All results were statistically significant ($p \leq 0.05$), suggesting that the loss of specific parental figures and gender play crucial roles in influencing the degree of closeness to the respective parent.

Keywords: Parental figures, parental loss, parental relationships, closeness to parent

Presenters: Sage Hamilton Undergraduate College of Letters, Arts, & Sciences Psychology

Co-Authors:

Title: From Injury to Intervention: Investigating Delays in Therapy Engagement Following Traumatic Injuries

Abstract: This proposed study seeks to explore factors influencing therapy engagement in survivors of physical injury, with a focus on identifying delays in patients engaging in the University of Colorado at Colorado Springs (UCCS) Veterans Health and Trauma Clinic BRIGHT (Building Resilience After Injury: A Growth and Healing Toolkit) program services. Conducted in collaboration with a UHealth level one trauma center in Colorado Springs, BRIGHT employs a three-phase intervention model encompassing referral, outreach, and treatment. Emergency department patients assessed as having mental health needs undergo referral and subsequent contact by UCCS Trauma-Track Clinical Psychology PhD students, ultimately receiving six brief, no-cost psychotherapy sessions. This study aims to investigate the intervals between each phase, particularly assessing whether the nature of trauma significantly influences the duration of service engagement delays. Specifically, we hypothesize that individuals who experience interpersonally inflicted injuries may demonstrate a prolonged duration between hospital presentation and the initiation of therapy services compared to those with non-interpersonal injuries. This research aims to contribute valuable insights into the dynamics of therapy engagement delays, with implications for optimizing interventions and support strategies for physical injury survivors.

Keywords: Treatment Delay, physical injury, trauma, therapy engagement

Presenters: Kyle Hatcher Undergraduate College of Letters, Arts, & Sciences Psychology

Co-Authors: Heidi Martinez, Diana Selmeczy

Title: Development of Selective Attention & Value-Based Remembering

Abstract: The ability to prioritize what information is learned is a critical skill that children must develop in order to appropriately adapt to the plethora of information they are exposed to on a daily basis. Previous research demonstrates that children between ages 5 to 9 are able to learn information that is explicitly deemed as more valuable (i.e., worth more points) relative to less valuable (worth less points) (Castel et al., 2011). Currently, there is very limited research suggesting an approximate age when this skill begins to develop and what factors may support its development. In the current study, 98 (M = 4.51, SD = .58), preschoolers between the ages of 3.5 to 5-years-old completed a value-based learning task during which they encoded images varying in value (worth 1 vs. 5 stickers). Preliminary analyses suggests that although children paid more attention to high compared to low value images as demonstrated by eye-tracking data during encoding, they struggled to actually recall more high value items during initial memory tests. These results suggest that preschoolers begin to engage in appropriate value-based encoding strategies, but their ability to translate these encoding behaviors into selective recall of higher value information is still developing.

Keywords: Children, Selective Attention, Cognition, Strategy, Value

Presenters: Adrienne Herzog Graduate College of Letters, Arts, & Sciences Psychology
Co-Authors: Ellie McLane, Kristen Rudd
Title: Evaluating the Impact of Different Types of Social Support on Women’s Depressive Symptoms Over the COVID-19 Pandemic
Abstract: The COVID-19 pandemic was associated with a significant increase in mental distress, with certain populations being disproportionately affected (Racine et al., 2021). Mothers may have been particularly vulnerable as many critical resources (e.g. childcare, medical care) were greatly impacted, adding increased strain to women’s lives (Racine et al., 2022, Cameron et al., 2020). To address these concerns, many institutions advised that individuals maintain social connections and “check-in” on friends and family. While early work suggests that this type of social support likely reduced feelings of social isolation (Choi et al., 2023), it is unclear if this approach was sufficient in addressing the multifaceted needs of mothers. Therefore, the current study sought to evaluate the impact of different types of social support (i.e., emotional/informational and tangible) on women’s depression over the first 6 months of the COVID-19 pandemic.
Keywords: Social Support, Maternal Depression, COVID-19

Presenters: Zara Kenigsberg Graduate College of Letters, Arts, & Science Psychology
Co-Authors: Paige Klein, Melissa Mikolaitis, Leilani Feliciano, Steven Bistricky
Title: Bedtime Procrastination and its Relations with Sleep and PTSD Symptoms Among Trauma Survivors
Abstract: It is increasingly recognized that healthy sleep is impeded by bedtime procrastination (BP), one’s delay of going to bed after their intended bedtime, despite this decision’s potential consequences and no external reasons for it. However, BP has not been studied in trauma survivors. This study characterizes BP presentations among trauma survivors with and without PTSD, and investigates how BP relates to sleep and mental health (MH) symptoms. We hypothesized that BP would negatively correlate with sleep hygiene, sleep quality, and MH symptoms. Adult trauma survivors (N = 126) completed an online battery of sleep and MH-related measures. As predicted, higher BP was associated with worse sleep hygiene ($r = .46, p < .001$), sleep insufficiency ($r = .58, p < .001$), and sleep quality ($r = .50, p = .01$). Consistent with existing literature, sleep insufficiency ($r = .26, p < .01$) and sleep quality ($r = .34, p < .01$) were associated with greater PTSD symptom severity. BP levels significantly differed between individuals with and without PTSD ($p < .05$). Findings suggest that reducing BP may improve sleep and, thus, mental health. Future studies should examine mechanisms by which BP may impair healthy sleep patterns in trauma-exposed populations, thus aiding development of cost-efficient, scalable trauma-informed sleep interventions that are beneficial to trauma survivors with and without PTSD.
Keywords: sleep, bedtime procrastination, PTSD, trauma

Presenters: Paige Klein Graduate College of Letters, Arts, & Sciences Psychology
Co-Authors: Zara Kenigsberg, Sophie Brickman, Melissa Mikolaitis, Leilani Feliciano
Title: Emotion Regulation Mediates Relations between Self-Compassion and PTSD symptoms, but in Which Clusters?
Abstract: Self-compassion (SC) can help a person disengage from harsh self-criticism and self-soothe around difficult emotions and experiences that characterize cluster D PTSD symptoms (PTSS) in trauma survivors. Studies show that SC can reduce overall PTSS through emotion regulation (ER), but relationships to specific PTSS clusters are unclear. The current study examined the hypothesis that SC may reduce troubling negative thoughts and emotions (cluster D PTSD symptoms) and reduce hyperarousal (cluster E PTSD symptoms) through ER. We hypothesized ER would not mediate SC's relation with avoidance and intrusion symptoms. College student trauma survivors (N = 235) completed an online survey including the Self-Compassion Scale, Difficulties with Emotion Regulation Scale, and PTSD Checklist for DSM-5. Findings supported that ER fully mediated the effect of SC on all symptom clusters at the 95th confidence interval. At the 99th confidence interval, cluster D and E remained significant: Negative Alterations ($\beta = -.21$, 99 CI [-.25, -.01], $R^2 = .25$) and Hyperarousal ($\beta = -.13$, 99 CI [-.37, -.07], $R^2 = .16$), whereas the remaining clusters proved insignificant. Self-compassion significantly impacts negative alterations in cognition and mood (Cluster D), and hyperarousal (Cluster E) clusters through emotion regulation. Most notably, cluster D and E evidenced larger effect sizes indicating practical implications for PTSD treatment. Individuals who endorse D and E clusters have difficulty regulating emotional responses and, therefore, may be particularly responsive to self-compassion skills. Maximizing emotion regulation skills may increase the efficacy of self-compassion interventions aimed to decrease PTSS.
Keywords: Self-Compassion, Emotion Regulation, PTSD Clusters

Presenters: Conrad Matteson Undergraduate College of Letters, Arts, & Sciences Psychology
Co-Authors: Sarah McInerney
Title: Comparative Study of Depression Levels in Commuter Students and Non-Residential Students During COVID-19 Pandemic
Abstract: The COVID-19 pandemic created an isolated environment for undergraduate students who were previously operating in highly socially interactive conditions (Wang, 2021). While under social distancing restrictions, many students lost regular social engagement through a lack of in-person interactions which potentially caused higher rates of depression. Research has shown that past quarantines such as the SARS outbreak have been associated with significantly higher levels of depression and trauma (Hawryluck, 2004). Furthermore, studies show that interpersonal relationships showed a significant decrease in quality during the COVID-19 quarantine (Goodwin, 2020). Because of these factors, undergraduates who lived in student housing were particularly vulnerable due to additional preventative measures that were carried out by colleges nationwide such as scheduled eating times, online courses, and the cancellation of extracurricular activities that limited social contact. Using a Two-Way ANOVA test, we will conduct a secondary analysis of students' depression levels compared to the general population during the COVID-19 pandemic; we will also compare the depression levels of residential students with non-residential students who live on-campus during the same time period.
Keywords: COVID-19, Isolated, interpersonal relationships, depression, college students, Psychology

Presenters: Elisabeth McLane Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors:

Title: Perpetrator or Victim: Gender Differences in how Role in Intimate Partner Violence Correlates to Relationship Satisfaction and Depression

Abstract: Approximately 1 in 3 women, and 1 in 4 men experience physical violence from an intimate partner in their lifetime (CDC, 2022). Previous studies have shown intimate partner violence (IPV) leads to poorer mental health and relationship satisfaction (Spencer et al., 2019; Ulloa & Hammett, 2016). However, previous studies have typically only focused on male-to-female violence and have not accounted for degree of victimization, by accounting for role, frequency, and bidirectional violence (Bates, 2016; Ulloa & Hammett, 2016). The current study examines data from participants of Wave 5 of the National Longitudinal Study of Adolescent Health who experienced physical IPV in the last twelve months (N = 367, N_{females} = 184). Participants provided information on their perpetrator-victim role, frequency of the violence, and relationship satisfaction and depression. Results show gender differences in how physical violence may impact relationship satisfaction such that male victims and female perpetrators show higher relationship satisfaction than their counterparts in both unilateral and bidirectionally violent relationships. However, victims overall tend to report higher rates of depression diagnosis than perpetrators. Findings suggest that although men and women who are victims of physical IPV may share similar depression outcomes, men and women in nontraditional “gender IPV roles” may not be able identify the relationship as unhealthy or abusive.

Keywords: Intimate Partner Violence, Gender Differences, Relationship Satisfaction, Depression

Presenters: Elisabeth McLane Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors: Diana Selmeczy

Title: Investigating Help-seeking as an Active Learning Strategy in Memory Integration

Abstract: Active learning is the process of actively engaging and participating in one's own learning and has been found to increase student's academic performance (Freeman et al., 2014). However, previous literature has typically studied active learning using self-report and correlational contexts (Hao et al., 2016; Huet et al., 2011, 2016; Karabenick, 2003, 2004), and has not causally investigated how specific active learning strategies (e.g., help-seeking) can improve memory. The current study investigates help-seeking as an active learning strategy during an integration memory task. During the task, college-aged students' study two separate but related lists of facts, then take a practice test where they are given help or must answer the question independently. In one condition, students select when they receive help, and in another help is given unsolicited. We predict that students will be able to better integrate knowledge when help is received than when help is not received, and that actively sought help will be more beneficial to knowledge integration and long-term retention than unsolicited help. We also predict that students with better metacognitive ability will achieve greater benefits from active help-seeking.

Keywords: Help-seeking, Active learning, Memory, Integration

Presenters: Melissa Mikolaitis Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors: Paige Klein, Zara Kenigsberg, Gemma Brom, Steven Bistricky

Title: Ecological Momentary Assessment and Capturing Dynamic Change in Resilience Research: A Study of Adversity, Self-Related Experiences, and Sleep

Abstract: Ecological momentary assessment (EMA) is a collection of measurement techniques gaining interest within psychology research. EMA is conducted by repeatedly measuring variables of interest amidst time-varying experiences, feelings, and behaviors within a participant's natural environment, thus, capturing more accurate representations of the nuances of participants' lives. Data collection may occur via diary entries, assessments administered through personal devices, or through fitness trackers and wearable sensors tracking sleep and heart rate data for example. EMA is particularly valuable for assessing the effects of intervention studies, albeit a relatively new method for the field. It minimizes limitations associated with single or two-time point administration of self-report measures, such as recency effects and mood congruence, limited reflection of day-to-day variations in mood and cognition, and artificial influences such as the lab environment that may impact natural responses and behaviors during surveys. This conceptual poster will describe the utility of EMA as a practical and innovative tool in psychological research, as well as its application in an ongoing intervention study conducted by the UCCS Cognition, Emotion, and Well-being lab. Specifically, college students who have experienced significant life adversity or trauma will complete three weekly group trainings about sleep and self-compassion topics, and between meetings self-report EMA questionnaires will assess self-compassion and sleep habits, whilst fitness trackers will collect objective sleep and heart rate data. The poster will highlight benefits and limitations for the novel use of EMA in trauma, stress, and sleep intervention studies more broadly, as well its use within the ongoing intervention.

Keywords: Adversity, Sleep, Intervention, Ecological Momentary Assessment

Presenters: Caleb Moyer Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors:

Title: Work and Cognition: Unveiling the Optimal Balance for Peak Mental Performance

Abstract: Work is a significant aspect of Americans' lives, profoundly influencing their health. This study explored the impact of work on cognitive ability, utilizing data from the Add Health Wave V Public-Use dataset (N = 4,196). Participants who were included had both information for their hours worked and scores from a backward-digit span task (N = 625) which tests working memory. A correlational analysis was used and found the relationship between hours worked (M = 35.51, SD = 19.56) and working memory scores (M = 4.15, SD = 1.55) to be statistically significant, $r(N = 625) = .10$, $p = .010$, with a medium effect, r^2 quadratic = .04 and with 95% CI [.02, .18]. The study revealed an inverted U-shaped correlation between work hours and working memory scores. Working memory scores increased initially, plateaued near 40 hours, and decreased with higher hours, aligning with the Yerkes-Dodson Law. This law suggests an optimal stress level for cognitive function, seen here at around 40 hours of work per week. This suggests that additional cognitive training could be performed by those who work fewer hours and efforts should be made to reduce the amount of overtime people perform in order to maximize one's cognitive function. This research contributes valuable insights into the nuanced relationship between work hours and cognitive performance, informing strategies for optimizing mental well-being in the workforce.

Keywords: work, stress, cognition, Yerkes-Dodson Law

Presenters: Alexandria Pavkov Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors:

Title: Neurodivergent Informed Workplace Model

Abstract: This study focused on neurodivergence in the workplace including reviewing current and past research in this area as well as developing a Neurodivergent Workplace Model that offers possible solutions to the problems that are faced in the workplace today. While many well-known companies have been adapting and evolving to best support their neurodivergent staff, many have yet to do so. This has resulted in the neurodiverse working population facing disproportionate career opportunities, discrimination, sexual harassment, and increased psychological stress compared to their neurotypical peers. Solutions moving forward include educating employee leadership to best create a neurodiverse inclusive workplace environment that fosters both psychological and physical safety and updating ADA regulations to decrease the likelihood of discrimination due to lack of education.

Keywords: Autism, ADHD, Neurodivergent, Workplace, Dyslexia

Presenters: Rachael Peck Graduate College of Letters, Psychology
Arts, & Sciences

Co-Authors: Heather Littleton

Title: Sexual Exploitation Among Women: Identification of Latent Classes and Analysis of Impact on Body Image

Abstract: Sexual Exploitation (SE) is a public health crisis that disproportionately affects women. SE is defined as using someone sexually to one's own advantage and includes a full continuum of exploitive acts ranging from online comments and street harassment to violent rape. Shockingly, over 80% of U.S. women experience some form of SE in their lifetime, and more than half have experienced SE involving physical violation. All forms of SE are harmful and can lead to a host of deleterious mental health outcomes including PTSD and depression. Notably, women often have multiple SE experiences, but the cumulative impact of these experiences is largely unknown. Examining SE's cumulative impact is critical to understanding long-term outcomes. Further, because SE involves violation of one's body, it holds the potential to lead to negative body-related outcomes including negative body image, body shame, and disordered eating. Again, however, the impact of SE on body image remains understudied. This study therefore used latent class analysis to investigate co-occurrences of SE across its spectrum and its relations with body image among a sample of 330 emerging adult women who had experienced SE. Three distinct patterns of SE experiences were identified: poly-victimization, primarily coercive SE, and primarily non-contact SE. Women whose experiences fit into these three SE patterns differed in terms of body-related outcomes, with the poly-victimization associated with increased body shame and dysmorphic appearance concerns. Findings have implications for interventions for women who experience SE, including interventions addressing body-related outcomes among survivors.

Keywords: Sexual Exploitation; Body Image; Trauma; Latent Class Analysis; Women

Presenters: Miriam Shames Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors: Heidi Martinez, Diana Selmeczy

Title: The Role of Feedback in the Development of Value-Based Remembering

Abstract: The overwhelming influx of complex information from various sources is a hurdle that children navigate through constantly. Value-based remembering is a memory strategy that allows children to be adaptive and preferential in their treatment, encoding, and subsequent utilization of incoming information by focusing their learning on information that is deemed more valuable or important (Knowlton & Castel, 2021). Although this skill develops substantially throughout childhood and adolescence (Castel et al., 2011), when this skill first emerges and what processes support its development are largely unknown. In this study, we examine whether feedback that highlights the relevance of value scaffolds the development of value-based remembering in preschool children. Three-and-a-half to five-year-old children will study pictures varying in value (i.e., 1 or 5 stickers). Their goal will be to maximize the amount of stickers they earn by remembering the pictures. Children will then receive either item-specific feedback, where they will be told the number of stickers earned for each correctly recalled picture, or global-feedback, where they will be told the total number of stickers earned. We predict that value-based remembering will be increased for children in the item-specific condition compared to the global-feedback condition and older children will be better than younger children at utilizing this skill.

Keywords: Value-Based remembering, Feedback, Memory Strategy, Development

Presenters: Evan Smith Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors: Evan Smith

Title: Risk-aversion: Status, Cognitive ability, and Financial decision-making

Abstract: Decision making theories such as decision field theory and risk-preference theory suggest that rational people should make decisions by weighing risk against reward. The risk-preference hypothesis further states that there is a relationship between cognitive ability and risk preference wherein cognitive ability affects risk analysis and subsequently risk behavior. We measure and compare cognitive ability and risk behavior while including socioeconomic status (SES) to capture any effects that may be explained by differing status on cognitive ability and financial risk behavior. Results were taken from The National Longitudinal Study of Adolescent to Adult Health (Add Health), a longitudinal study that is representative of U.S. adults aged 33 to 43 years old. Results show that relationships were statistically significant between SES and cognitive ability, and between cognitive ability and financial risk. Our data indicates that people of higher SES tend to have higher cognitive scores and also take higher financial risks. Furthermore, those with higher SES also report less risk-aversion than those with lower SES and cognitive scores.

Keywords: risk-aversion, risk behavior, cognitive ability, cognitive health, decision-making, psychology, behavioral economics

Presenters: Alyssa Trujillo Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors: Colin Mahoney

Title: The Potential Moderating Role of Sleep Disturbances on the Association between Childhood Trauma and Substance Use

Abstract: A history of childhood trauma, including physical and sexual abuse, and current substance use are highly prevalent among college students. Sleep disturbances, including both insomnia and hypersomnia, are also relevant in this population as they are both a consequence of traumatic experiences in childhood as well as an antecedent of use for some psychoactive substances (e.g., stimulants, opioids, cannabis) to alleviate sleep-related problems. The self-medication hypothesis may provide somewhat of an explanation for these connections, suggesting that individuals engage in substance use to suppress or reduce unwanted emotions or cognitions. The current study aims to examine the conditional effect of childhood trauma and on substance use contingent upon the moderator of sleep disturbances among college students. A sample of undergraduate students will complete a battery of measures to determine childhood trauma history, posttraumatic stress disorder (PTSD) symptoms, sleep disturbances, and substance use. It is hypothesized that childhood trauma survivors with more sleep disturbances will engage in significantly more problematic substance use. Further, it is hypothesized that college students who have experienced childhood trauma will be significantly more likely to have sleep disturbances and engage in problematic substance use than those without a history of childhood trauma. Data collection to follow.

Keywords: Childhood Trauma; Substance Use; Sleep Problems; College Students

Presenters: Alyssa Trujillo Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors:

Title: Association Between Anxiety and Depression on the Ability to Cut Down or Quit the Consumption of Alcohol and Marijuana

Abstract: Mental health conditions such as anxiety and depression are commonly associated with substance use (SU). Substances such as alcohol and marijuana are commonly used together in order to enhance the effects of the other. The process of cutting down or quitting the consumption of marijuana or alcohol presents a formidable challenge, and sometimes unsuccessful outcomes. The self-medication hypothesis suggests that people with a substance use disorder engage in substances to allow for the suppression or alleviation of unwanted or undesired emotions or feelings. In this study, we examined the association between diagnoses of anxiety and depression with the number of times an individual is unable to quit alcohol and marijuana. This study aims to inform targeted interventions and therapeutic approaches to break the cycle of co-occurring mental health disorders and substance misuse, fostering a better understanding of the intricate dynamics that influence individuals struggling with anxiety and depression in their efforts to overcome alcohol and marijuana dependence. We hypothesize that the diagnoses of anxiety and depression will be associated with a higher number of times an individual is unable to quit alcohol/marijuana. A factorial ANOVA was conducted in order to examine the significance of mental health conditions and the ability to quit SU.

Keywords: Anxiety, depression, substance use, alcohol, marijuana

Presenters: Mike Villacis Undergraduate College of Letters, Psychology
Arts, & Sciences

Co-Authors:

Title: Association between depression diagnosis and socioeconomic status among males and females

Abstract: Background: Socioeconomic status affects how people perceive existing circumstances, which might increase feelings of depression. This study focuses on the examination of socioeconomic status with levels of depression among males and females.
Methods: In the National Longitudinal Study of Adolescent to Adult Health, 4,196 participants were studied from their 1994-1995 school year to the period of 2016-2019. With this study, an analysis was conducted to examine the relationship between highest level of education achieved and individual income with those diagnosed with depression, while using gender as a moderator variable.
Results: According to chi-squared tests, the relationship between individual income and a depression diagnosis between males and females was found to be statistically significant between genders, $\chi^2(2) = 33.60, p < .001$, and $\chi^2(2) = 18.08, p < .001$, respectfully. The relationship between highest level of education achieved and a depression diagnosis between males was found to be not statistically significant, $\chi^2(5) = 9.94, p = .077$, whereas between females was found to be statistically significant, $\chi^2(5) = 34.13, p < .001$.
Conclusion: Females had a higher chance of being diagnosed with depression compared to males throughout both individual income and education levels. Also, those in the lower class had a higher chance of having depression than the middle and upper class. Furthermore, males with some college and a doctorate degree had a higher percentage of having depression, whereas females with only some high school had the highest percentage of having depression compared to other education levels.

Keywords: Depression, socioeconomic status, education, income, sex, gender

Presenters: Milly M. Wathen Graduate College of Letters, Psychology
Arts, & Sciences

Co-Authors: Michael A. Kisley

Title: LAY PERCEPTIONS OF GENDER DYSPHORIA: HOW DO PEOPLE PERCEIVE THE EMOTIONS OF TRANSGENDER WOMEN?

Abstract: Perspective-taking interventions for transphobia informed by emotion research could lead to more positive outcomes, particularly if lay people perceive transgender women to experience less negative emotion in gender dysphoria-inducing situations compared to cis women. Indeed, Reiman et al. (2023) suggests that failing to consider others' internal gender experiences correlates with transphobia, a belief that leads to an aversion of transgender people. In this study, participants ($n = 48$) rated the extent to which women experiencing gender dysphoria (in vignettes) were feeling common negative emotions, which were averaged into a total emotion score (TES; sad, anxious, ashamed, jealous, embarrassed, angry), as well as happiness. They were randomly assigned to either be primed with instructions specifying that the women were transgender or with no specification. Transphobia was evaluated via the Attitudes Towards Transgender Women scale (ATTW; Billard J. T., 2018). Contrary to predictions, participants perceived transgender women ($M = 3.07, SD = 0.69$) as experiencing higher TES than unspecified women ($M = 2.49, SD = 0.59$), $t(46), p = .003$. Exploratory analysis showed that only within the trans-specified group, ATTW scores correlated positively with only happiness ($r = .47, p = .03$). Results suggest that perspective-taking interventions focused on the emotions of transgender women's gender dysphoria may not be a productive approach, as it may reinforce pre-existing beliefs about transphobia.

Keywords: emotion perspective, transgender, gender dysphoria, intervention

Social Work Presentations

Presenters: Abigail Felipe Undergraduate College of Letters, Social Work
Arts, & Sciences

Co-Authors:

Title: The Effects of Childhood Trauma in Adulthood

Abstract: Research suggests that there is an association between experiencing trauma in childhood and substance misuse later in life. This research uses a literature review methodology to better understand the connection between childhood trauma and substance misuse. The literature review was conducted by researching three scholarly databases, including Social Science Abstracts, Google Scholar and EBSCO.

The literature revealed that gender was an important factor in whether childhood trauma would contribute to later issues with substance misuse. Research suggests that societal attitudes may allow for females to more openly express their emotions associated with trauma exposure than males. Additionally, parental substance abuse was found to be a strong predictor of initial drug use, compounding the effects of trauma exposure on later outcomes.

Even looking deeper into culture, research shows a positive correlation with childhood physical abuse and lifetime substance use disorder and childhood sexual abuse. Studies have found cultural benefits with minority populations, which may include social support and religious involvement. These benefits may be an enhancement from the therapeutic relationship standpoint, which can be used as a coping strategy.

Overall, studies show that trauma predicts later substance misuse, especially among males and children exposed to parental substance abuse in their homes. To reduce these impacts, this needs to be targeted by public health policies.

Keywords: Childhood trauma, substance abuse, gender, culture, treatment

Presenters: Jasmin Panique Graduate College of Letters, Social Work
Arts, & Sciences

Co-Authors:

Title: Training in 'Rethinking Stress' influences MSW students' perceived stress, burnout, and well-being levels.

Abstract: This pilot study, conducted in the fall semester of 2023 with second-year Master of Social Work (MSW) students, aimed to assess the effectiveness of the "Rethinking Stress" training from Stanford University's Mind and Body Lab. This intervention was delivered online within the final social work internship course and was a one-hour training on acknowledging, welcoming, and using stress. The research question addressed whether integrating a stress mindset component in the MSW program would decrease perceived stress levels and enhance well-being.

Utilizing a single-group pre-, intermediate, and post-test design, the study employed the Adult Stress Mindset Measure (SMM), the Warwick-Edinburgh Mental Well-being Scale (WEMWBS), and the 10-item Perceived Stress Scale (PSS-10). Analysis, through paired-sample t-tests, revealed a statistically significant improvement in MSW students' stress mindset ($p < .05$) and perceived stress ($p < .05$) post-intervention. While the intervention positively shifted stress perceptions and reduced perceived stress, overall well-being improved but was not statistically significant.

The study supports the stress-mindset intervention in decreasing perceived stress for future social workers. Future social work curricula could incorporate teachings on stress mindset changes to promote a balanced and healthy start to the demanding social work profession.

Keywords: Rethinking Stress, Perceived Stress, Well-Being

Technical Communication and Information Design

Presenter: Haley Apricio Undergraduate College of Letters, Arts & Sciences TCID

Co-Authors: Nicholas Gervecic, Amelia Herman, Donah Schroeder, and Nicole Taclin

Title: Entering the Chat: Roles for Technical Communicators in AI Prompt Engineering

Abstract: This research evaluates how technical and professional communication (TPC) professionals are positioned to take a leading role in the field of text-based and large language model (LLM) AI prompt engineering based on their skill set and background with audience analysis, appropriate communication of technical material, and ethical considerations—all of which are relevant to the emerging field. Prompt engineering—the creation and refinement of instructional input given to generative AI models—is a critical part of utilizing AI to maximum impact in many industries. Creating the right prompt for an AI and understanding how the model will respond to it improves the efficiency and abilities of AI. TPC’s skill sets and code of conduct uniquely position its practitioners to not only assist in AI prompt development but also educate audiences on the capabilities, uses, and implications of AI. TPC is also well-suited to guide the use of AI tools across disciplines, establishing best practices and ethical standards, and ensuring the responsible use of AI. This paper synthesizes theory and practice to address how TPC professionals can inform audiences about technical concepts, apply the iterative process to prompting, and manage potential ethical concerns from new advancements in prompt engineering and large language models.

Keywords: Artificial Intelligence, Prompt Engineering, Prompting, Prompt Design, Technical and Professional Communication (TPC), Large Language Models (LLMs), Social Technology, AI Ethics

Presenter: Jennifer Kuespert Undergraduate College of Letters, Arts & Sciences TCID

Co-Authors: Haley Thomas, Joshua Ferguson, Amelia Wright

Title: Hear me, see me: The role of LLMs in accessible content development for K-12 students

Abstract: This paper will examine how technical communicators can leverage LLMs to develop accessible content for K-12 students with hearing and visual impairments within educational curriculum development. Researchers will examine and critique large language models, a subset of natural language processing technology, as proof of concept for future development of inclusivity, usability, and accessibility of academic content for all students. Researchers will identify and detail two use cases in which technical communicators could have utilized large language models to create accessible content to adapt the standard content in K-12 curricula for students with vision and hearing impairments. After detailing the use cases, researchers will offer solutions to the respective curriculum errs. By synthesizing academic field studies, identifying inaccessible areas faulted by lack of technical communicator involvement, and outlining subsequent solutions, this paper will successfully provide technical communication practitioner takeaways with ethical considerations and best practices.

Keywords: Technical Communication, Education Curricula Development, Accessibility, Large Language Models, Natural Language Processing, Artificial Intelligence, Education

Presenter: Dylan Morrison Undergraduate College of Letters, Arts & Sciences TCID

Co-Authors: Kaitlyn Adair, Teague Torrance, Amez Khidr

Title: Misinformation Miasma: The Technical Communication Professional's Role in Health Literacy on Social Media

Abstract: This paper dissects how health misinformation on Instagram perpetuates disparities in health outcomes and explains how technical communication professionals can effectively counter this issue. Within an ever-expanding digital landscape, users are increasingly likely to encounter misleading health information. As a visual-centric platform, Instagram allows users to disseminate unverified health content in an accessible medium quickly. Combined with the popularity of the platform, this further alienates marginalized communities from accurate, evidence-based health resources. This paper incorporates case studies and empirical data to demonstrate the power of collaboration between technical writers, healthcare professionals, and social media platforms to develop strategies that combat health misinformation on Instagram. It highlights technical writers' unique skills and capabilities in crafting concise, evidence-based content for diverse audiences, including those with limited health literacy. It then provides potential solutions to this problem, including creating guidelines for responsible health content dissemination and implementing effective fact-checking mechanisms.

Keywords: Social Media, Health, Social Technology, Technology, Technical Communication, Media Literacy, Health Literacy, Communication, Technical Writers, Misinformation, Disinformation

Women's & Ethnic Studies (WEST)

Presenter: Anahi Aken, Undergraduate College of Letters, WEST
Amanda Espinel, Arts & Sciences
Michelle Wilke,
Tre Wentling

Title: The Colorado Springs LGBTQ+ Oral History Project

Abstract: Lesbian, gay, bisexual, transgender, queer plus (LGBTQ+) history and activism in Colorado Springs is mostly invisible to mainstream queer history. To address this invisibility, The Colorado Springs LGBTQ+ Oral History Project was established in 2020 by Dr. Rushaan Kumar, Assistant Professor of Feminist and Gender Studies of Colorado College. Kumar immediately invited Dr. Tre Wentling, Assistant Professor of Women's and Ethnic Studies of UCCS, to be a key contributor. The Project's mission is not merely to be representative of the LGBTQ+ community in Colorado Springs, but rather amplify marginalized and invisible voices. The first goal is to document the rich LGBTQ+ history of Colorado Springs by collecting stories of long-term LGBTQ+ residents of the city, with a focus on black, indigenous, and people of color voices. The second goal is to incorporate high-impact education practices, which positions undergraduate students as co-producers of The Project. The third goal is to preserve and make accessible a digital repository for The Project. The fourth goal is to celebrate The Project in ways that bring together members of CC and UCCS as well as the broader Colorado Springs community.

Keywords: Oral History, LGBTQ+, Colorado Springs, Queer History

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. The Office of Research now sponsors and organizes this event but always with the help of many partners on campus.

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