UCCS University of Colorado Colorado Springs

OFFICE OF RESEARCH

14th Annual Mountain Lion Research Day

DECEMBER 2ND, 2022
12:00-4:00PM

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

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Welcome!

Today we gather for the 14th annual Mountain Lion Research Day! Though this is a single day that we showcase and celebrate the incredible scholarly contributions of our students and faculty, we know that research is a lifelong pursuit. Research and creative works – like many things in life – take time and take a team. We take pride in our research and creative community at UCCS and, as a presenter, judge, or audience member, your presence and engagement here today helps nurture this community.

A commitment to research and creative work is a cornerstone of the UCCS academic mission. Student engagement in research is a high impact practice in and of itself, and of course the discovery, creation, and innovation that is generated from such scholarships really does change the world. But changing the world with new knowledge requires sharing that new knowledge, and that is why we are here today. To learn together, make connections, share our passion, and celebrate the contributions of our campus' researchers.

Thank you for being a valued member of our UCCS Research Community.

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

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Land Acknowledgement

This land on which we gather collectively for this event today is the unceded land from our indigenous peoples. Here at UCCS, the land we occupy is the land of the Cheyenne and Ute Peoples. It is important that we contemplate, honor, and nurture our connection and relationship between the Indigenous community and the university community. This includes recognizing our researchers at UCCS who are adding their voice to create new knowledge that positively impacts the land, the health, and the well-being of Indigenous populations. From our faculty studying the violence – and resilience – experienced by Native youths across the nation, to our faculty studying the history of native life right here in Southern Colorado, many of our UCCS scholars are aiming to unravel the harm to indigenous elders and empower the present generation. This acknowledgement I hope inspires a commitment from all of us.

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*URA Member; **Top Scholar Finalist; *** URA Member and Top Scholar Finalist

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Anthropology Presentations

Presenters:	Jacqueline Nolly	Graduate	College of Letters, Arts & Sciences	Anthropology

Authors: Jacqueline Nolly, Tara Cepon-Robins, Theresa Gildner, Samuel Urlacher, & Angela Zhang

Title: Rural Embodiment and Community Health (REACH) Study: Sex-Specific Factors in Helicobacter pylori Infection

Abstract: Helicobacter pylori (H. pylori) is a common bacterium in human stomachs but is only pathogenic in ~20% of cases. Theoretically, sex-specific factors should impact the virulence and pathogenicity of H. pylori because estradiol, an estrogenic steroid, can be pro-inflammatory and provide membrane components to H. pylori, whereas testosterone, an androgenic steroid, has immunosuppressive effects. Therefore, we hypothesized that H. pylori infection would be more frequent and severe in females than males. If supported, this could suggest that the higher incidence of H. pylori-associated gastric cancer in males may be due to suppression of antitumor immune responses. This study examined data gathered from 90 adults (32 men, 58 women) from low-resource communities in the Mississippi Delta and southwestern Illinois as part of the REACH study. Stool samples provided H. pylori infection status and measures for fecal calprotectin (a marker of intestinal inflammation) through Enzyme-linked immunosorbent assay (ELISA). Total Immunoglobulin E (IgE), total Immunoglobulin G (IgG), and C-reactive protein obtained from ELISA with dried blood spots provided measures for adaptive immunity to microparasites and allergy; adaptive immunity to bacteria/viruses; and systemic inflammation, respectively. Contrary to our hypothesis, Fisher's Exact Tests revealed no significant difference in H. pylori infection between the sexes ($p = 0.29$). Aside from IgE, which was significantly higher in males than in females ($p = 0.02$), no immune markers varied between the sexes. This warrants further analyses to examine how H. pylori associates with IgE and downstream immune markers differently between sexes and its impact on later outcomes.

Keywords: Helicobacter pylori, sex differences, inflammation, hormones, Inflammatory markers

Presenters:	Kristi Raney	Undergraduate	College of Letters, Arts & Sciences	Anthropology

Authors: Kristi Raney

Title: Primate Conservation via Instagram

Abstract: The purpose of this study is to determine if the social media platform Instagram can be utilized to promote awareness of primate conservation. We wanted to determine which types of posts (photos/videos and caption topics) received the most views. Our predictions consisted of: (1) photos and videos would receive equal numbers of views, (2) conservation topics would be viewed most frequently, (3) media with close-up views of subjects would be preferred. We created 45 Instagram posts consisting of photos/videos during the 2022 summer/fall semesters, which received a total of 6,571 views. All posts included captions that discussed primate conservation, behavioral ecology, or folklore and similar hashtags. We analyzed posts by type (photo/video/both), caption topic, and subject position/focus in frame (centered/distant/angled position and subject/environmental focus). A Chi Square Goodness of Fit test was performed to determine if the number of views were equal or different across each type of post, caption, and subject position/focus ($p<0.05$). Proportions differed by post type; videos received more views than photos ($X2$ (1, 45)=3468, $p < 0.0001$). Proportions differed by caption topic; behavioral ecology received more views than conservation and folklore ($X2$ (2, 45)=603, $p <0.0001$). Proportions also differed for subject position/focus; angled position ($X2$ (2, 45)=998, $p <0.001$) and environmental focus ($X2$ (1, 45)=755, $p <0.0001$) received the most views. These results did not align with predictions and suggest that post type, caption topic, and subject position/focus should all be considered in promoting awareness of primate conservation via Instagram posts.

Keywords: Conservation, primatology, primates, anthropology, social media

Biofrontiers Presentations

Presenters:	River Gassen	Graduate	College of Letter, Arts, & Sciences	Biofrontiers

Authors: River Gassen

Title: Imaging of the Nervous System of Fruit Fly Larvae using a Structured Illumination Microscope

Abstract: The purpose of this experiment is to capture detailed, high-resolution images of the nervous system of fruit fly larvae. The structure illumination microscope (SIM) is a microscopy technique that has been utilized for its resolution improvements beyond the Abbe limit and beyond the diffraction limit. Improved imaging can be useful in medicine, especially when imaging the nervous system. Treatment for neurological disorders, such as Alzheimer's, epilepsy, or Glioblastoma multiforme, can be expanded with improved imaging and resolution. The nervous system of fruit fly larvae was highlighted with a green fluorescent protein (GFP), which allowed the nervous system to glow red under green light. The SIM uses a pattern of light that illuminates sections of the larvae nervous system, then later compiles images together, providing a final image with a higher resolution. Stacks of the image are also complied, focusing on various layers of the nervous system to future improve the final image.

Keywords: The nervous system, biology, physics, imaging, microscope, SIM, GFP

Biology Presentations

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

Authors: Natalie Bondarchuk, Allison Canada, Seth Jacobson, & Amy Klocko

Title: CRISPR-Cas9 Gene Editing of Apple to Create Highly Decorative Flowers

Abstract: CRISPR-Cas9 gene editing has amazing potential to specifically change genes in a wide variety of organisms. Possible uses for this approach include gene therapy to treat human disease such as muscular dystrophy, create non-allergenic peanuts, and even attempt to resurrect extinct species like the wooly mammoth. For scientists, this approach also allows for inactivation of genes of interest to study specific biological pathways. Our work is using CRISPR-Cas9 to edit the AGAMOUS (AG) genes domestic apple. Here, there are two very similar AG genes, and we are trying to determine if they have unique or overlapping functions. Alterations to the AG gene can lead to dramatic changes in flowers such as a greater abundance of floral petals. Such flowers are highly ornamental and would be of interest horticulturally. Also, these flowers would lack the ability to make pollen or seeds (but may still make apples). Our work in apple could be applied to reduce the invasiveness of species such as Callery pear, a popular but highly invasive ornamental tree. We have created 44 independent transgenic examples of our CRISPR-Cas9 apple trees. Apple trees are diploid, meaning they have two copies of each gene. Therefore, alterations can occur 1 to 4 times in a single apple tree. We are determining the exact changes to each gene and gene copy. These data will let us determine how well CRISPR-Cas9 function in trees such as apple. Future work includes characterization of overall tree form, health, and growth to see if there were any unintended changes.

Keywords: CRISPR, apple trees, gene editing

Presenters:	Peyton Brones	Undergraduate	College of Letters, Arts, & Sciences	Biology

Authors: Peyton Brones, Garrett Jenkins, & 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 being round cells to being cylindrical cells. An understood system that controls the rod shape morphology in other species of bacteria is the Mre system. The Mre system has been shown to be highly upregulated in hormogonia. Utilizing a transposon mutagenic screen, two genes, Npun_R4471 and Npun_R4472 were implicated in hormogonium development and motility. To confirm the observed phenotypes, in-frame deletions were then created in the wild-type strains for genes Npun_R4471 and Npun_R4472. Strains Δ4471 and Δ4472 displayed reduced motility and changes in cell morphology where the mutants were more spherical, and less rod shaped than wild type hormogonia. Bioinformatic analysis demonstrated that Npun_R4471 and Npun_R4472 are homologous to components of the parMRC plasmid partitioning system. Based on this observation, we hypothesize that this parMRC system regulates Mre proteins, which could influence the cell morphology of hormogonia. To test this, a bacterial two-hybrid analysis will be employed to determine if Npun_R4471 and Npun_R4472 interact with the Mre system.

Keywords: Hormogonia, Nostoc punctiforme, parMRC system, cell morphology

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

Authors: Audrey Fahland

Title: Diversity in Predation in the Environment of the Hops Azure Butterfly

Abstract: At this point in time, insects are particularly vulnerable to becoming extinct. One Colorado species approaching extinction is Celestrina humulus, or the Hops Azure Butterfly. Previous studies have observed facultative ant mutualism between the Hops Azure caterpillars and several species of ants. With a combination of pitfall traps and standard collections as well as a clay caterpillar study aimed to determine if ant/caterpillar mutualism was affecting natural predation levels.

Keywords: Endangered, predation, conservation ecology

Presenters:	Bridget Farwell	Graduate	College of Letters, Arts, & Sciences	Biology

Authors: Bridget Farwell

Title: Caper Dysfunction Results in Mitochondrial Dysfunction in the Form of Oxidative Stress

Abstract: Caper is an RNA-binding protein involved in alternative splicing within neurons. Caper dysfunction can lead to several mutant phenotypes such as defects in locomotion that worsen with age and have a sex bias. Interestingly, many neurological diseases are also age-related and demonstrate a sex bias. It is possible that changes that occur because of caper dysfunction could contribute to the manifestation of such neurological diseases. One possible mechanism in which caper dysfunction could contribute to the manifestation of such diseases is by leading to dysfunction within the mitochondria such as an increase in oxidative stress. Oxidative stress is characterized as an imbalance in reactive oxygen species produced by the mitochondria and antioxidant defenses that cope with these reactive oxygen species. This imbalance leading to oxidative stress has been linked to neurological diseases. To assess whether caper dysfunction leads to an increase in oxidative stress caper mutant flies, caper knockdown files, as well as control flies were exposed to paraquat, a chemical that is known to trigger oxidative stress. A fly that is experiencing oxidative stress prior to paraquat exposure will die faster than a fly not experiencing oxidative stress meaning, survival time serves as a maker for oxidative stress. Using this assay, it has been determined that caper dysfunction does result in an increase in oxidative stress. It is possible that this increase in oxidative stress associated with caper dysfunction could contribute to the manifestation of neurological disease and the mutant phenotypes observed when caper is not functioning properly.

Keywords: Neurodegeneration, neurological disease, mitochondria, Oxidative Stress, Drosophila, protein, gene, paraquat

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

Authors: Clinton Green & John McCoy

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 is 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. Two assays, IR size and egg hatching, have been performed with a third, fecundity, planned. 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: Drosophila arizonae, RNA transcripts, Seminal fluid, CRISPR

Presenters:	Christopher Joiner	Undergraduate	College of Letters, Arts, & Sciences	Biology

Authors: Christopher Joiner & Seth Jacobson

Title: Investigation into the possible mutation of the LEAFY gene in California poppy (Eschscholzia californica)

Abstract: Flowers with unique and unusual looks are highly sought after. Understanding the genetics behind these traits allows for plant growers and breeders to maintain and propagate these unique specimens. Our current project started with the observation of an individual California poppy (Eschscholzia californica) plant with unusual flowers. California poppy is a popular ornamental garden plant that typically has bright orange flowers. The new traits of this novel plants include ruffled sepals (the cover over the outside of the flower bud), ruffled petal edges, and larger stamens (the organs that produce pollen). To determine what may be causing these differences in the flower appearance we investigated a certain floral development gene. Many years of research in different species have identified a set of highly conserved key floral development genes. Based on the appearance of the unusual flower, we predicted that this plant may have differences in the key gene LEAFY (LFY). We decided to use gene sequencing to determine if there are genetic difference between our poppy plant with unusual flowers and poppy plants with standard flowers. We designed primers based off previously known E. californica LFY gene sequence information. Once the unusual flower DNA is sequenced, we will compare it to previously known LFY and try to determine if any significant changes in the coding for LFY exist in these uniquely different flowers. If changes are observed, these findings support the conservation of LFY function in poppy plants. Future work includes seed-based propagation and analysis of vegetative growth.

Keywords: LFY, Leafy, floral development, gene sequencing, novel flower genes, ECO, FLO, genetics, California Poppy

Presenters:	Cale Kennamer	Undergraduate	College of Letters, Arts, & Sciences	Biology

Authors: Cale Kennamer & Emily Mooney

Title: Ant Behavioral Responses to Aphids Colonizing Ligusticum porter

Abstract: Ant-aphid mutualisms, when altered, have the potential to cause cascading, multitrophic effects on local arthropod and plant communities. Flowering stalks of Ligusticum. porteri (Apiaceae) are colonized by the aphid Aphis asclepiadis, which relies on ants for protection. We examined the mediating role of phenology in the host plant L. porteri on mutualistic ant behavior in the subalpine zone of the Rocky Mountains in Colorado, USA. We utilized three tiers of observational data to infer the role of host plant phenology on ant abundance and behavior. First, we compiled six years of census data taken over June through August from 2017-2022 to determine ant abundance during all phenological stages. In 2022, we recorded focused observations of ant tending behavior, adding to previously-collected census data. Lastly, we used an ethogram to examine the effect of advanced, post-flowering phenology of aphid-colonized host plants on 26 different ant behaviors within 6 behavioral categories. Ant abundance increased during flowering stages of L. porteri. Ant tending behavior also increased during flowering stages. During post flowering stages, ants spent the highest proportion of their time communicating, exploring, and grooming. Increased time spent on non-tending behaviors such as grooming during this period suggests ants may budget less time for aphid tending as host plant phenology advances, reducing protective benefits conferred by ants at these stages. Consequently, in years where early season snowmelt leads to advanced phenology of L. porteri, aphid colonies arriving in June will encounter host plant conditions less conducive to attracting ants needed for protection.

Keywords: Ants, Aphids, Ligusticum porteri, Osha, Climate Change, Global Change, Mutualism, Rocky Mountains, Colorado

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Presenters:	Alexandra Luna	Undergraduate	College of Letters, Arts, & Sciences	Biology

Authors: Alexandra Luna

Title: Analysis of Secondary Metabolite Variation in Hops

Abstract: Humulus lupulus, otherwise known as Hops, is of ecological interest due to being a common host plant for a variety of insects, including ants. The goal of this study is to analyze the levels and presence of secondary metabolites within the collected flowers and leaves of Hops plants to determine if the bioactive compounds relate to the ways in which ants, in their various stages of development, interact with these host plants. The secondary metabolites of both the flowers and leaves of Hops plants were extracted using methanol and analyzed through high-pressure liquid chromatography (HPLC) to measure the peaks of present acids. The flower extracts were found to display high levels of alpha acids and beta acids. The concentrations found within the leaf extracts show that there are low to no alpha acids present and there is negative correlation of beta acids in comparison to the levels present in the flowers. The negative correlation of both alpha and beta acids within the leaves, when compared to the levels detected within the flower extracts, could directly relate to the differing ways in which both larvae and adult ants interact with the host Hops plants.

Keywords: Hops, secondary metabolites, acids

Presenters:	John McCoy	Undergraduate	College of Letters, Arts, & Sciences	Biology

Authors: John McCoy & Clinton Green

Title: Investigation of Seminal Fluid RNA in Drosophila arizonae

Abstract: Historically when it comes to understanding male contributions to reproductive outcomes in internally fertilizing species, the focus has been on interactions of the sperm. However, recently, there has been an increased understanding of the role that seminal fluid plays on fertility. With the discovery that RNA is found in male seminal fluid, there is increased interest in this RNA being a factor in fertilization. The presence of RNA in seminal fluid is conserved, and we have found some RNA is translated in female cells in Drosophila. We aim to investigate the gene GI26694 as it is found in both RNA and protein form in the male ejaculate. We used the CRISPR genome editing system to create a stock of D. arizonae with a knockout (KO) mutation in the gene. Following the generation of this stock, males from the knockout stock (or wild type males as a control) are mated to wildtype females. We will compare fecundity, fertilization efficiency, and the persistence of the insemination reaction between females mated to KO or wild type males. The insemination reaction is a clot like formation that appears in the female reproductive tract postmating. It is not understood what causes this reaction, but it is suspected that GI26694 is involved in its formation or persistence due to the presence of a fibrinogen domain. We predict that females mated to KO males will have smaller or faster degrading insemination reaction, a decrease in fecundity, and/or decreased fertilization efficiency compared to females mated to wild-type male.

Keywords: RNA, Fertility, CRISPR

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

Authors: Carol Michael, Evan Krohn & Eugenia Olesnicky

Title: Effects of caper dysfunction on larval and adult locomotion 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 alter or influence 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. To better characterize the role of caper in regulating locomotor behavior, additional larval and adult locomotion assays were performed. 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. Our results support a genetic interaction between caper and foraging in larval locomotion. Additionally, we find that caper dysfunction influences velocity and causes a circling behavior around a given perimeter at adult stages. Overall, our data suggest that caper is important for proper locomotion at multiple life stages and suggests that caper interacts with foraging to regulate of larval locomotion.

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

Authors: Alicia Nguyen, Savanna Mounts, & Douglas Risser

Title: Identification of two new genes involved in hormogonium polysaccharide in Nostoc punctiforme

Abstract: Nostoc punctiforme is a type of cyanobacteria that can fix nitrogen. This allows N. punctiforme to form nitrogen-fixing symbiotic relationships with eukaryotes. N. punctiforme is made of vegetative filaments which give rise to three different types of cells depending on the external environment: akinetes, heterocysts, and hormogonia. Hormogonia are motile filaments that allow the bacteria to glide on hard surfaces, so that the organism may move towards optimal light conditions or a plant partner. Motility requires the production of a polysaccharide called hormogonium polysaccharide (HPS). In order to determine what genes are responsible for N. punctiforme hormogonium development and motility, we have used transposon mutagenesis to randomly inactivate genes within the bacteria. We screened these random mutants for motility defects to find candidate genes that we then deleted in the wild type using targeted mutagenesis. Two candidates we found for involvement in hormogonia are genes Npun_F4342 and Npun_F3486. According to our bioinformatic analysis, Npun_F4342 is a glycosyltransferase and Npun_F3486 is a sugar epimerase. These mutants were observed to be completely non-motile. The bioinformatic analysis combined with the lack of motility in these mutants suggest involvement in HPS production. In the future, we intend to perform experiments which will directly measure levels of HPS production in these mutants to confirm our hypothesis.

Keywords: Hormogonium polysaccharide, cyanobacteria, motility, transposon mutagenesis

Presenters:	Gabriel Parrett	Undergraduate	College of Letters, Arts, & Sciences	Biology

Authors: Gabriel Parrett & Douglas Risser

Title: Npun_F4142: a possible new component of the cyanobacterial septal junction

Abstract: Nostoc punctiforme is a filamentous, nitrogen fixing cyanobacterium. This species can differentiate into three cell types including akinetes, heterocysts, and hormogonia. Cells within filaments are connected via septal junctions, protein complex pores that allow diffusion between cells in a similar manner to animal gap junctions or plant plasmodesmata. However, not all components of the septal junction complexes have been described. Hormogonia are the primary interest of this study and enable the organism to glide over short distances, enabling phototaxis and the formation of symbiotic relationships with terrestrial plants by supplying fixed nitrogen. Motility is facilitated by a type IV pilus gliding motor and hormogonium polysaccharide secretion (HPS). Using transposon mutagenesis, genes related to motility were identified through a partial or complete lack of motility. Afterwards, these genes of interest were deleted through targeted mutagenesis and the deletion strains characterized. One gene identified in this process was Npun_F4142, which encodes for a protein product containing five transmembrane helices with no previously described function. Colonies lacking the gene displayed decreased motility and an inability to fix nitrogen with filaments displaying a fragmented phenotype and lacking heterocysts. This trait is consistent with other deletions in genes involved with septal junction formation, thus Npun_F4142 may encode for an additional component to these complexes. Moving forward, we intend to create an Npun_F4142 GFP fusion to determine whether this protein localizes to the site of these junctions.

Keywords: Cyanobacteria, Septal Junctions

Presenters:	Abigail Schultz	Undergraduate	College of Letters, Arts, & Sciences	Biology

Authors: Abigail Schultz, Seth Jacobson, Chance Rankin, & Chris Joiner

Title: Kinematic Analysis of Maneuvering Flight in Bats

Abstract: Bats are the only true flying mammals. Previous work studying the mechanics of turning bat flight has been restricted to a single species of bat being monitored while performing one particular turning maneuver or restricted to a detailed description of a single bat performing a single turn. We constructed a flight arena to study bats more in situ and examine their turning behavior. The flight arena was constructed in Arizona over the summer of 2022. We used three cameras calibrated for 3D capture and filmed the bats as they flew around the arena. These videos were then run through a deep learning algorithm that we trained to recognize anatomical key points on the bats. The 3D trajectory of these key anatomical points were then calculated via triangulation to create a 3D computer model of the bats in flight. These 3D models were then used to study the turns of the bats based on flight kinematic parameters such as roll angle, flap angle, stroke plane angle, and wing extension/retraction. We did this for three morphologically distinct insectivorous bat species, and then compared how their flight kinematic parameters differed during turning flight. Analysis of these results is on-going; however, we expect to see species specific differences in turning abilities as well as flight kinematics. The addition of this new data will help increase our understanding of maneuvering flight for this big and important animal group, with more than 1400 species worldwide.

Keywords: Animal flight, chiroptera, bats, turning flight, biomechanics

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Presenters:	Megan Simmons	Undergraduate	College of Letters, Arts, & Sciences	Biology

Authors: Megan Simmons, Mitchel Liester, Lisa Hines, Laveen Khoshnaw & Brian Carter

Title: Since when did you start liking chicken nuggets?

Abstract: Over 2000 people undergo heart transplantation annually in the United States. Interestingly, some heart transplant recipients have reported developing personality traits that were not present prior to their transplant, and a few have claimed that these traits were present in their donor. While these reports are anecdotal, there is some supporting evidence of a biological basis for these claims. Specifically, personality changes may be the result of epigenetic factors that affect the intracardiac nervous system, which has neuroplasticity like the brain. Neuroplasticity plays a role in memory. To assess the potential connection between heart transplantation and personality changes, we are conducting a pilot study among transplant recipients throughout the US. Using a cross-sectional study design, we are recruiting all types of organ transplant recipients by reaching out to support groups via Facebook, emails, and phone calls. Study participants complete a survey regarding personality changes that they experienced following their transplants. We will discuss our preliminary results in our poster presentation.

Keywords: Organ transplant, personality changes, cross-sectional study, epigenetics

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Presenters:	Abbey Swift	Graduate	College of Letters, Arts, & Sciences	Biology

Authors: Abbey Swift

Title: The benefits of ant association to a rare butterfly species

Abstract: Insects provide important ecosystem services such as pollination, seed dispersal & soil aeration. Given the significance of these services, declining insect populations are worrying. Species interactions can sometimes be beneficial to the organisms involved. Recent studies have shown that butterfly species which form interactions with ants as caterpillars may benefit from this relationship. In this study, I determined the benefits of the ant-caterpillar association to the Hops Blue butterfly (Celastrina humulus), a local species thought to be rare. The survival rate of the caterpillars was documented in plots where ants were excluded & in plots where ants were not excluded. The presence of ants increased the survival rate of the caterpillars. The data collected from this study provides essential information for the conservation of this rare butterfly species.

Keywords: Butterfly, caterpillar, ant, species interaction, Lycaenidae

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Presenters:	Stevi Tomlinson	Graduate	College of Letters, Arts, & Sciences	Biology

Authors: Stevi Tomlinson

Title: The Effect RNA binding protein Caper Effects the Brain Size and Apoptosis

Abstract: Alternative splicing is the process by which different combinations of exons produce different mRNAs and proteins. Misregulation of alternative splicing has been shown to be linked to aging as well as neurological disorders. The RNA-binding protein Caper, which regulates alternative splicing in Drosophila, has been shown to regulate the development of mutiple cell types in the nervous system. Loss of caper function results in defects in adult locomotion, as assessed by a gravitaxis assay. Specifically, animals with a lesion in the caper locus are slower to climb as compared to controls and this phenotype is exacerbated with age. To determine if the phenotype may be due to neurodegeneration, we measured brain size and measured rates of apoptosis in the brain. Brain size was assessed by confocal micrographs of brains stained with DAPI in larval brains as well as adult brains on day 1, day 14, and day 28. There is a significant decrease in female brain size in female larval brains. To determine if apoptosis is occurring in caper mutant brains, we performed Tunel staining of dissected adult brains on days 1, 14, and 28. Our results indicate that cell death is occurring in adult brains of animals with either a genetic lesion in the caper gene or in animals with caper knocked down using RNA interference. Additionally, we assessed cell death at varying stages of development in caper deficient animals.

Keywords: Caper, Alternative Splicing, Rna Binding Protein, Apoptosis

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Chemistry and Biochemistry Presentations

Presenters:	Advita Bhatia	Undergraduate	College of Letters, Arts, & Sciences	Chemistry and Biochemistry

Authors: Advita Bhatia, Barbie Voss, & Billy Stone

Title: Analyzing the interactions of Aβ monomer with a model cell membrane in the presence and absence of curcumin.

Abstract: Alzheimer's disease (AD), a neurocognitive disorder, is the most common cause of dementia in the United States. It is caused by the development of amyloid plaques and neurofibrillary tangles in the brain. This research project focused on amyloid plaques which are formed by the aggregation of the amyloid beta (Aβ) peptide. The goal was to identify the membrane-mediated toxicity of the monomeric form of amyloid beta through a simulation tool called molecular dynamics. This tool helped us observe the motions of atoms and molecules at femtoseconds resolution. Quantitative analysis methods like deuterium order parameters and partial densities were then applied to compare the behavior of a lipid model cell membrane (DMPG) in the presence and absence of Aβ. Results revealed that the presence of monomeric Aβ reduces the order in the membrane and thus destabilizes the cell membranes. It was also revealed that Aβ caused membrane thinning. The study was extended further to explore the behavior of both the cell membrane and the Aβ peptide in the presence of a third substance, curcumin. Results revealed that curcumin leads to even more disorder in the membrane. However, when present with Aβ, curcumin lowers the amount of disorder caused by Aβ in the membrane. The partial density plots combined with qualitative analysis of the productions revealed that curcumin promotes unfolding of the peptide when it is embedded in the cell membrane. This restructuring implies a possible role of curcumin in the reduction of Aβ plaque formation.

Keywords: Neurodegenerative diseases, Alzheimer's Disease, Curcumin, Amyloid Beta, Molecular Dynamics, neurotoxicity.

Presenters:	Fabiola Estrada	Undergraduate	College of Letters, Arts, & Sciences	Chemistry and Biochemistry

Authors: Fabiola Estrada, Chris Sallaberry, & Crystal Vander Zanden

Title: Curcumin's Membrane-Mediated Protection Against Fibrillar Oligomeric Form of Amyloid Beta

Abstract: The aggregation of the protein amyloid-beta (Aβ) is the hallmark for Alzheimer's disease that results in the neurodegeneration in the brain. Aβ aggregates from intrinsically disordered monomers to intermediate fibrillary-oligomers (FOs), which have a β-sheet rich structure. The neurotoxicity of FOs is thought to arise from the protein inserting itself into the membrane and disrupting the lipid bilayer. There are no current disease-modifying drugs or treatments, but the use of natural occurring products has attracted a lot of attention, one being curcumin. Previous work in our lab showed that curcumin inserts itself into a model- membrane to provide membrane-mediated protection against FOs when given a 30-minute incubation time. To further understand curcumins membrane-mediated protection against FOs, a longer incubation time of 2-hours was tested based on previous results indicating significant improvements to curcumin's ability to inhibit monomeric Aβm accumulation at the surface when given a 2-hour incubation time. X-ray reflectivity (XR) results indicated that curcumin slowed down protein accumulation at the membrane surface. There was also a notable difference in protein electron density when looking at the two incubation times, with the 30-min incubation allowing more protein binding than the 2-hour incubation. Overall, this work with model membrane systems suggests that when no curcumin is present, there is a lot of FO accumulation at the surface which could increase neuronal cell death. By introducing curcumin there is less FO insertion at the membrane, possibly decreasing the toxicity to the cell and decreasing cell death.

Keywords: Alzheimer's disease, amyloid-beta, neurotoxicity, FOs

Presenters:	Madison Johnson	Undergraduate	College of Letters, Arts, & Sciences	Chemistry and Biochemistry

Authors: Madison Johnson, Morgan Schachterle, Luis Lowe, & Janel Owens

Title: From Air to Clothing: The Accumulation of Hazardous Flame Retardants in Dryer Lint

Abstract: Recently, there has been better understanding about the quality of indoor air in residential areas; previous assessments of dust samples have been analyzed, revealing the exposure of hazardous chemicals to human health. Considering how much time individuals spend in their homes, it is important to start asking if toxic chemicals are reaching beyond dust and latching on to our clothing. Cloth from clothing is statically charged and acts like a magnet to attract a variety of compounds. As we wear, wash, or dry our clothes tiny fabric fibers shed from the material and bundle up, creating bundles of lint. Within this accumulation of clothing fibers are hazardous flame retardants (FRs). Organophosphate esters (OPEs) are a synthetic chemical used as FRs in many commercial products. Consequently, OPEs have been found at concentrations on the part-per-million scale in indoor dust samples with the potential threat to accumulate in clothing as well. Because of this, OPEs may be a concern in lint samples, but previous studies have not explored this. This research presents a solvent-limited method for the analysis of OPEs in lint collected from residential dryers using GC/MS. With this method, 11 lint samples have been analyzed, revealing levels of OPEs that range from 22-62 mg/g of lint. Based off samples that have already been analyzed, future work includes exploring more lint samples and more FR compounds.

Keywords: Dryer lint, Flame retardants, organophosphate esters, Gas chromatography mass spectrometry, low-solvent extraction

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

Title: Understanding the Molecular Determinants Required for Epstein-Barr Virus Attachment

Abstract: Complement Receptor 2 (CR2) is the obligate human host receptor for the Epstein Barr virus (EBV). The viral surface glycoprotein 350 (gp350) is known to interact with CR2 on human immune cells, resulting in viral infection. EBV infection results in either an asymptomatic response in infant infection or a symptomatic response clinically known as infectious mono resulting from infection later in life. Regardless of when the initial infection occurs, the virus will remain latent in the body until the immune system becomes compromised. This latency has been suggested to be related to many different cancers and diseases. Currently there are no therapies or vaccines against EBV. The results we present are the first steps in understanding the molecular interactions required for the infection of immune cells by EBV. Thus far we have expressed CR2 and gp350 proteins in a mammalian cell line and purified them for use in binding assays. This is the first time these proteins have been expressed in a mammalian cell line for experimentation. The binding assays have provided Kd values for CR2 and gp350 binding. We have also collected Haddock docking data based off mutagenesis data from papers in the field. This data will be compared to in lab data and the docking parameters will be altered to obtain the best structure possible for CR2 and gp350 binding.

Keywords: Complement Receptor 2 (CR2), viral surface glycoprotein 350 (gp350), Epstein Barr virus (EBV), viral infection, mammalian cells, proteins, binding assays, Haddock docking

Presenters:	Cosme Morales	Undergraduate	College of Letters, Arts, & Sciences	Chemistry and Biochemistry

Authors: Cosme Morales & Crystal Vander Zanden

Title: Determining the structure of membrane-bound lipoxygenase

Abstract: The goal of the project is to determine the membrane bound structure of lipoxygenase using the model enzyme 8R-LOX. The project is part of a larger collaboration to elucidate the structural and functional characteristics of human 15-LOX-2. The enzyme is linked to the development of atherosclerotic plaques in the vascular system and elucidating the function of 15-LOX-2 could lead to disease reducing agents against atherosclerosis. Lipoxygenase (8R-LOX) was studied using X-ray scattering experiments from a lipid monolayer model membrane assembled in Langmuir trough. X-ray reflectivity (XR) was used to determine the presence of 8R-LOX at the lipid membrane through the electron density profile resulting from the interaction of 8R-LOX with the membrane. The experiment used calcium concentrations comparable to the physiologic calcium concentrations within a cell during signaling. The XR data were fit using a model-dependent method to discern the electron density profile of membrane-bound LOX. The results determined the LOX structure (orientation) at the membrane and showed that membrane binding was mediated through calcium ions. The protein dimensions discerned from the XR fit parameters match the dimensions of the solved crystal structure of 8R-LOX available in the PDB server. The data correlates with the predicted results from-Orientations of Proteins in Membranes computational structure prediction, and calcium mediation agrees with prior studies on LOX membrane translocation for membrane binding.

Keywords: X-ray reflectivity, lipid monolayer, electron density, lipoxygenase, membrane binding

Presenters:	Morgan Schachterle	Graduate	College of Letters, Arts, & Sciences	Chemistry and Biochemistry

Authors: Morgan Schachterle, Luis Lowe, Janel Owens

Title: Dangerous Dust: Determining Levels of Hazardous Flame Retardants in Furnace Filter Dust

Abstract: Dust acts as a sink for many semi-volatile compounds including flame retardants (FRs) that can expose people to potential health hazards in the indoor environment. FRs are added to consumer products such as furniture, plastics, and printed circuit boards to reduce flammability. Organophosphate esters (OPEs) and brominated flame retardants (BFRs) are two types of FRs that are commonly added to consumer products and subsequently, often found in indoor dust samples. Because of this, it is important to understand what concentrations of FRs people may be exposed to on a daily basis. This research presents a novel, solvent-limited approach to determine FR levels in dust sampled from residential furnace filters, a sampling technique that has not been investigated thoroughly in previous literature. Using both GC/MS and LC/MS/MS, four OPEs and two BFRs can be quantitated at the part-per-billion level while using only 1 mL of extraction solvent per sample. The dust from twenty furnace filter samples have been collected, physically processed, and are undergoing FR extraction, with the goal of gaining a better understanding of FR load in residential spaces. Preliminary data show that OPEs can be found at the part-per-million (μg/g) level in these dust samples. Future work will focus on relationships between FR load and demographics of a home to understand the health risks these contaminants may pose.

Keywords: Flame retardants, dust, furnace filters, low-solvent extraction, organophosphate esters, tetrabromobisphenol-A, gas chromatography mass spectrometry, liquid chromatography tandem mass spectrometry

Presenters:	Max Schroeder	Undergraduate	College of Letters, Arts, & Sciences	Chemistry and Biochemistry

Authors: Max Schroeder, Gavin Hoffman, & Hunter Redmon

Title: One-pot synthesis of 3-arylisoxazoles

Abstract: Abstract: 3-Arylioxazoles have been synthesized using a three-component, one-pot cycloaddition sequence combining chlorination of oximes, formation of nitrile oxides, and cycloaddition with alkynes. The isoxazoles may be unsubstituted at C-5 depending on the reaction conditions. The one-pot conditions were optimized to avoid transition metal catalysts and chromatography. Several aldehyde oximes were converted to isoxazoles through the one-pot cycloaddition method. The effect of functional groups and their substitution patterns were tested to investigate the factors that assist or hinder formation of isoxazoles using the optimized conditions.

Keywords: Heterocycles, organic chemistry, isoxazoles

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

Authors: Kyle Talley & Crystal Vander Zanden

Title: Tandem-Repeat Galectin-8 Binding to a Model Membrane

Abstract: Cell signaling pathways are essential to 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 (relating to cell growth) and to cancer. Galectin proteins contain a carbohydrate recognition domain (CRD) that drives their affinity to various carbohydrates. Due to the importance of these pathways, galectin proteins can be important targets for cancer treatment pathways and/or biomarkers for cancer detection. Due to these interests, it is important to determine how galectin proteins bind to a cell membrane and what conformations they take. Here, we used X-ray reflectivity to obtain a model of how galectin-8 is bound to a model lipid monolayer composed of combinations of dipalmitoyl phosphatidylcholine (DPPC) and GM3, or SM4. Gal-8 contains two different CRDs at the N-terminus and C-terminus, with the CRDs connected by a flexible 33-amino acid linker. Using this method, it has been found that Gal-8 bound to the model membrane. The results suggest one CRD bound more tightly to the membrane than the other, most likely the N-terminus CRD binding strongly while the C-terminus CRD remained unbound. This was evident by large (~70 Å) protein layer thicknesses in the generated electron density plots. The thickness was found to be roughly double the size of one CRD indicating that the two CRDs are in different positions relative to the membrane. These conclusions are supported by literature due to the differing affinities of tandem-repeat type galectin CRDs.

Keywords: Protein, cell-signaling, model membrane binding.

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

Authors: David Weiss, Kailene Black, Robert Wroel, Alexa Bullis, & Patrick McGuire

Title: The impact of online chemistry course mode(s) on student learning outcomes and perceptions

Abstract: The chemical education literature has recently focused on how faculty revised their General Chemistry courses to be online during the pandemic. In that work, faculty evaluated how the role of the professor changed, as well as TA interactions. There has been some national discussion that students can't be successful in learning this material if not fully in-person, and we endeavor to demonstrate that course modes and assessments can be directly related to each other and that given the right tools, students can be successful in terms of final course grade and DFW rates. We are interested in what aspects of our courses and course mode approaches are critical to student learning, their views on these course modes, and performance based on those approaches. Since the Summer of 2020, General Chemistry 2 has been taught fully online, remote synchronous, and hyflex. We wanted to know how student grades would change in these modes compared to in-person learning, and what students viewed as most important in course delivery. Results are presented on student course averages and anonymous responses to surveys used to gain student perception of the course. This is taken with respect to the change in course modes and the shift from active peer-led team learning to more individual work with group recitations.

Keywords: peer leaders; general chemistry; course modes; online; hyflex; student perception; student success; active learning

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Presenters:	Ian Wisniewski	Graduate	College of Letters, Arts, & Sciences	Chemistry and Biochemistry

Authors: Ian Wisniewski

Title: Liposomal Encapsulation of Brevinin-1EMb Derivative PTP7 as a Mechanism for Antitumoral Drug Delivery

Abstract: Antimicrobial peptides are one of the primary chemical defense mechanisms many species of amphibians use to defend themselves against foreign organisms. The gaegurins are a group of six antimicrobial peptides isolated from the frog species Glandirana emeljanovi that have demonstrated strong antimicrobial and antitumorigenic properties. A synthetic derivative of gaegurin 6 known as PTP7 exhibits these same properties while demonstrating minimal hemolytic behavior. It has not been studied whether liposomes could act as a delivery mechanism to aid PTP7 in penetrating tumor tissue. The goal of this research was to determine the IC50 values of gaegurin 6 and PTP7 and to ascertain whether PTP7 could be encapsulated in positive, negative, and neutrally charged liposomes. It was determined that the IC50 value of PTP7 against S. aureus, E. coli, and S. cerevisiae was lowest to highest in that order, indicating that PTP7 is most effective at killing gram-positive bacteria and least effective at killing eukaryotic microorganisms. Furthermore, PTP7-carrying liposomes were successfully synthesized. The results of this research will aid in advancing the potential use of PTP7 as an antitumorigenic drug in vivo.

Keywords: liposomes, drug delivery, antimicrobial peptides, cytotoxicity assay, microorganisms

Communications

Presenters:	Orion Capela	Undergraduate	College of Letters, Arts, & Sciences	Communications
Authors:	Orion Capela			
Title:	The Value of Marginalized Identities in Academia			
Abstract:	The purpose of my research is to evaluate the importance of diversity, equity, and inclusion (DEI) in academia and how this idea is presented at UCCS from the perspective of an undergraduate student. Throughout the course of my English 1308 class, I have used several methods to conduct my investigation. This includes consulting Chimamanda Adichie's TedTalk "The Danger of a Single Story," performing a quantitative analysis of the authors in the Language Acts textbook and conducting field interviews of UCCS staff. All three of these methods point to the conclusion that DEI efforts in academia are a worthy endeavor because they create space for marginalized students and lead to a holistic education for all.			
Keywords:	Diversity, Equity, Inclusion, Stories, Higher Education			

Computer Science Presentations

Presenters:	Javier Chacon	Undergraduate	College of Engineering	Computer Science

Authors: Javier Chacon & Deborah Butler
Title: Web Application Warfare: HB Gary Attack Explored

Abstract: Database security is a growing concern as more than 30,000 websites are hacked everyday with an attack occurring every 40 seconds on average on the internet. The concern for database security arises as the most common form of web attacks is SQL injection (SQLi). In our research, we explored the HBGary attack to demonstrate how devastating a SQLi attack can be. If security best practices are not followed, as in the case of HBGary, one can see how an attacker can take over a system quickly. In this paper, we present an example of a SQLi attack and the damage that comes from poor security practices and follow it up with a discussion on good security practices. This discussion delves on the importance of utilizing good password security and uncompromised hashing algorithms as well as how to secure one's database from an SQLi attack. Our research was conducted through utilizing virtual machines and penetration testing tools to recreate SQLi attacks on a contained vulnerable website. The key purpose of recreating a SQLi attack was to demonstrate the ever-growing importance of ensuring one's security to avoid a worst-case scenario as demonstrated with the HBGary hack. By having a clear understanding of how attackers can perform SQLi attacks, both business and users can help prevent breaches from the most common form of web attacks.

Keywords: The importance of Database and Web Security. Computer Security, SQL Injection, Password Cracking, Organization Policies, Password Security, Hashes

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Presenters:	Jason Cuthbert	Undergraduate	College of Engineering	Computer Science

Authors: Jason Cuthbert & Mark Wickert

Title: Complexity in Simulating Inter-Vehicular Communication

Abstract: The aim of this project is to evaluate the performance of a number of wireless propagation models for use on autonomous vehicle communications within simulated environments of varying complexity.
The topographical complexity of the space to be modeled, as well as the level of realism of the simulated environment, (e.g., number of polygons, accuracy of materials) informs which propagation model to choose to obtain a desired level of realism. Computational cost, and therefore the running-time requirement, disproportionately increases with a greater level of achieved realism; this can be an important consideration within time-critical environments such as autonomous vehicle communication.
The results of these simulations include: Path loss, Bit errors, Bandwidth achieved, Propagation paths, Receiver errors, and Delay spread. Analysis of multiple simulation outputs reveals the point at which accuracy-efficiency diminishes with computation cost.
A custom Network Simulator 3 propagation model was created and run against several rural, urban, and suburban scenarios; results are included here.

Keywords: Wireless Simulation, Autonomous Vehicles, Ray Tracing, Open Street Map

Presenters:	Ekzhin Ear	Graduate	College of Engineering	Computer Science

Authors: Ekzhin Ear & Shouhuai Xu

Title: CyberRACE: A Framework for Cyber Range Automation to support Cybersecurity Education

Abstract: The cyber range is an emerging, and perhaps the most effective, technology for training cybersecurity professionals. A cyber range mimics a real-world cyber environment, similar to (for example) how the US Army's National Training Center provides a dynamic all-domain range where military units come to train, test, and be certified for combat (i.e., the range can mimic Afghanistan, Iraq, or other regions with high fidelity to allow units to gain exposure and experience ahead of actual deployment). The state-of-the-art is that there are several quality commercial cyber ranges, which are however extremely expensive and unsustainable by higher education institutions' student training budget. This leads to the research question: How can we build quality and affordable cyber ranges for higher education purposes? This motivates us to propose a systematic framework, the Cyber Range Automation for Cybersecurity Education (CyberRACE), with accompanying innovative techniques, to guide cyber range design, development, and deployment. A salient feature of CyberRACE is that given one or multiple specific cybersecurity education objectives, it will automatically generate a corresponding cyber range environment. This feature has also been envisioned by an ongoing CU Next project. We will accomplish the project by tackling several technical challenges, including: How should we map (cybersecurity education) requirements to cyber range specifications? And, how should we automate the design, implementation, and deployment of cyber ranges?

Keywords: cyber range, cybersecurity education, training, simulation, emulation

Presenters:	Arijet Sarker	Graduate	College of Engineering	Computer Science

Authors: Arijet Sarker, Simeon Wuthier, Jinoh Kim, Jonghyun Kim, & Sang-Yoon Chang

Title: Version++: Cryptocurrency Blockchain Handshaking With Software Assurance

Abstract: Cryptocurrency software implements the cryptocurrency operations, including the distributed consensus protocol and the peer-to-peer networking. We design a software assurance scheme for cryptocurrency and advance the cryptocurrency handshaking protocol. Since we focus on Bitcoin (the most popular cryptocurrency) for implementation and integration, we call our scheme Version++, built on and advancing the current Bitcoin handshaking protocol based on the Version message. Our Version++ protocol providing software assurance is distinguishable from the previous research because it is permissionless, distributed, and lightweight to fit its cryptocurrency application. Our scheme is permissionless since it does not require a centralized trusted authority (unlike the remote software attestation techniques from trusted computing); it is distributed since the peer checks the software assurances of its own peer connections; and it is designed for efficiency/lightweight due to the dynamic nature of the peer connections and the large-scale broadcasting in cryptocurrency networking. Utilizing Merkle Tree for the efficiency of the proof verification, we implement and test Version++ on Bitcoin software and conduct experiments in an active Bitcoin node prototype connected to the Bitcoin Mainnet. Our prototype-based performance analyses demonstrate the lightweight design of Version++. The peer-specific verification grows logarithmically with the number of software files in processing time and in storage. In addition, the Version++ verification overhead is small compared to the overall handshaking process; our measured overhead of 2.22% with minimal networking latency between the virtual machines provides an upper bound in the real-world networking with greater handshaking duration, i.e., the relative Version++ overhead in the real world with physically separate machines will be smaller.

Keywords: Bitcoin, Software Assurance, Permissionless, Distributed, Merkle Tree, Bitcoin Core

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Presenters:	John-Michael Villeneuve	Undergraduate	College of Engineering	Computer Science

Authors: John-Michael Villeneuve & Marcus Lobato

Title: Ransomware: Implementation and How to Protect Against it

Abstract: Ransomware is a type of malware which threatens a victim personal data through blocking access to it unless a ransom is paid. Ransomware is implemented similarly to a Trojan where it is disguised as a legitimate file and tricks the user into downloading and/or opening the file. The Ransomware malware has been around and infecting users for over 30 years, and recently the world has been seeing an increase in the number of Ransomware malware implemented and we have seen a tremendous increase in the last five years. It is important for users to see how the Ransomware malware is implemented, what actions a Ransomware malware takes once it is on a user's computer, what corrective steps a user can take should they find themselves under attack by a Ransomware malware, and what steps a user can take to try and prevent becoming a victim so users can take the necessary preventative steps to protect themselves. We will implement a Ransomware malware on a quarantined system, show the result of an implemented Ransomware malware to the user's files on their system, and list the preventive steps for a user to take in order to defend themselves against a possible Ransomware attack.

Keywords: Ransomware Malware, Implementation, Defensive Measures, Preventative Measures

Electrical and Computer Engineering Presentations

Presenters:	David Michon	Graduate	College of Engineering	Electrical & Computer Engineering

Authors: David Michon; Emmanuel Nwaulu; Tarek Masaud

Title: Optimal Planning of University Campus Microgrid with High Penetration of Renewable Energy and Storage: UCCS Campus Case Study

Abstract: University microgrids are utilized as an energy and educational resource for today's universities. Furthermore, it reduces carbon emissions and helps organizations reach sustainability goals. To this end, this work proposes an optimization planning model for designing a campus microgrid. The proposed comprehensive model aims to determine optimal size of renewable distributed energy resources (DER), Battery storage system (BSS) as well as coordinating power curtailment and load shedding when needed. The optimization model is formulated as Mixed Integer Linear Programming (MILP) Problem and carried out using CPLEX software. Both grid-connected and islanded modes of microgrid operation are considered in the model development. University of Colorado at Colorado Springs (UCCS) is adopted as a case study. Simulation results have confirmed the effectiveness of the proposed model.

Keywords: Microgrid, Campus Microgrid, Optimal Planning

Presenters:	Kaylie Maddux	Undergraduate	College of Engineering	Electrical & Computer Engineering

Authors: Kaylie Maddux; Craig Chamber; Gregory L. Plett; M. Cott Trimboli

Title: Empirical Battery Cell Model Validation

Abstract: Lithium-ion batteries are an important reusable energy source that are used widely in consumer electronics and electric vehicles. Due to their prevalence, good management and prediction of cell behavior is required to ensure safe and efficient use of lithium-ion batteries. To attain this, accurate models of lithium-ion batteries are required. This study validated and tested an Empirical Cell Model Toolbox that was developed in MATLAB by Craig Chambers, Dr. M Scott Trimboli, and Dr. Gregory L. Plett. Tests were performed on ways to estimate the OCV, model hysteresis, and simulate dynamic cell models. Different methods to improve a base dynamic cell model were also tested, including methods that blended model parameters and increased the number of RC pairs simulated in the cell model. All simulated cell models were tested against lab data of battery cells and the RMSE between various models was compared. This toolbox will be used to simulate battery cells at various temperatures given a model that was trained for the type of behavior that a cell will experience. Further testing will be performed next on SPM models that can better predict cell behavior and aging.

Keywords: Empirical Cell Model, Lithium-Ion Battery Model

Presenters:	Sam Peters	Undergraduate	College of Engineering	Electrical & Computer Engineering
Authors:	Sam Peters; Byeong Lee			
Title:	Synthetic Malware Data Augmentation for Deep Learning Network Training			
Abstract:	Data quantity and quality are important factors in the training of deep learning networks. Having a large dataset is crucial to the performance of deep learning models and is therefore very important for attaining reliable and accurate results. With malware data, there are many obstacles to obtaining a substantial amount of reliable data. A variational autoencoder can be used in order to generate synthetic data by sampling the latent space. By adjusting parameters of the VAE, large quantities of synthetic malware data can be generated and subsequently used for testing or training models, or for data analysis. This study modified several key parameters of a VAE code, including the mean and standard deviation components of the latent space, the number of epochs used, the number of hidden layers used, and the dimensions of the sampling space in order to generate new data. The model was first tested using MNIST data, before moving on to testing with a malware dataset. The malware data that was generated could be used for future investigation into data augmentation, and into malware data analysis.			
Keywords:	Deep Learning, Malware, Variational Autoencoders, Synthetic Data			

Geography and Environmental Studies Presentations

Presenters:	Lauren Clarke	Undergraduate	College of Letters, Arts, & Sciences	Geography & Environmental Studies

Authors: Lauren Clarke

Title: Evidence of Gentrification in Colorado Springs, CO

Abstract: Gentrification is defined by Merriam-Webster as “a process in which a poor area experiences an influx of middle-class or wealthy people who renovate and rebuild homes and businesses and which often results in an increase in property values and the displacement of earlier, usually poorer residents”. In this study, we focus on understanding the spatial patterns of Hispanic population replacement within Colorado Springs, CO, in the context of neighborhood socio-economic changes over 19 years. We then examine the contributing factors to gentrification and its consequential effects on residents and businesses in the study area.

Beginning from the census tract level, we identified replacement constellations within the city urban area using multivariate clustering analysis. We then performed further quantitative and qualitative analysis at the census block level within one selected tract. These multi-scale analyses show lower-income household displacements in areas where housing prices increased, and corporate businesses moved in. In addition, the patterns indicate a dispersal of low-income and Hispanic households from the city center towards the outer tracts. We will discuss these patterns in the context of our study area and link them to the long and short-term effects of gentrification as has been observed in other US cities. Finally, an interactive web map is developed to present our project to the general public.

Keywords: Gentrification, Hispanic, displacement, socio-economics

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Presenters:	Hayden Strait	Undergraduate	College of Letters, Arts, & Sciences	Geography & Environmental Studies

Authors: Hayden Strait; David Havlick; Christine Biermann

Title: A Survey of Trout Conservationist's Perspectives

Abstract: Advancements in genetic testing have led to additional considerations in fish management, including genetic purity. Reclassified by new molecular findings, fish may now be held to account for genealogies that go well beyond recent histories of dispersal, in situ reproduction, or watershed boundaries. This research is part of a National Science Foundation-supported project examining how increasing scientific understanding of fish genetics intersects with angler preferences and agency management policies. To understand angler priorities, online surveys were distributed to Trout Unlimited chapters of Colorado and Montana. Montana was included to compare angler perspectives in a state whose trout fisheries haven’t been stocked in close to 50 years, but still supports a thriving fishing industry. Management priorities have shifted towards valuing genetic conservation and while many respondents claim to want to catch native species, they often are unable to list many historically native species and often perceive introduced, wild populations as native. Angler values around the fishing experience often outweigh concerns of genetic purity. We seek to better understand if there is a divergence between angler values and fishery management, and if so, what implications may follow.

Keywords: trout conservation, angler values, fishery management, genetic conservation

Health Sciences Presentations

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

Authors: Layla Almasri; Manuel Hernandez; Meghann Koppele-Duffy; Stacy Kirkpatrick; Carrena Boone

Title: Evaluating Pilates+4MS Program for Functional Improvements for Individuals with Mild to Severe Multiple Sclerosis

Abstract: Multiple Sclerosis (MS) is a chronic neurological condition resulting in a wide range of symptoms and functional impairments (e.g., mobility). Pilates has been demonstrated to improve these symptoms; however, studies are limited to those with mild and moderate impairment. This study incorporated a group-based online Pilates class to evaluate impact on balance, mobility, and function. We included participants with severe MS to overcome the shortcomings in previous studies. Twenty-two participants with mild (13), moderate (5), and severe (4) MS were recruited through local support groups. Participants were divided into two groups, both receiving a seated protocol of Pilates twice a week for one hour, for 12-weeks. The average age was 50.5 years. There were 16 females and 6 males, 81.5% white, 14% Latino/a, and 4.5% biracial. Participants engaged in baseline and follow-up testing including the Timed-25-Foot-Walk (T25FW) to measure speed with walking, the Timed Up and Go (TUG) to measure mobility and balance, and the BERG Balance battery. All functional measures were analyzed using two-way repeated measures ANOVA, and participants demonstrated non-significant improvement in T25FW following the intervention (mean T1=9.31, SD =9.38, mean T2= 7.50, SD= 3.69), F=1.14, p=0.30). The TUG also showed non-significant improvement (mean T1=15.80, SD =12.56, mean T2= 12.89, SD= 7.23), F=2.93, p=0.109). However, the BERG showed significant improvement (mean T1=41.44, SD =14.61, mean T2= 46.63, SD= 14.00), F=10.02, p=0.006). Overall, this pilot study demonstrated that seated Pilates is a safe and effective way to improve balance in individuals with mild, moderate, and severe MS.

Keywords: pilates, MS, multiple sclerosis, functional improvements

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

Authors: Carrena Boone; Nic Wyatt; Latashia Key; Robert Motl; Brynn Adamson

Title: Evaluating the MOVE MS Group Exercise Program for Individuals With Multiple Sclerosis: A Qualitative Exploration Of Participants Experiences

Abstract: Exercise promotion for long-term engagement of people with multiple sclerosis (MS) requires a theory-based approach accounting for the barriers faced by this population. MOVE MS is a long-term group exercise program based on Social Cognitive Theory which incorporates key components supporting long-term exercise behavior change, namely: peer instruction, foundational education in behavior change, multiple exercise modalities, and standard seated instruction. The primary scientific outcome was exercise participation and secondary outcomes were: MS symptoms and impact, disability identity, disability and exercise self-efficacy, quality of life and loneliness. Semi-structured interviews were conducted among completers and non-completers. Thematic analysis of the interviews resulted in three main themes: enjoyment of the variety of exercise modalities, need for tailoring intensity based on level of MS impairment, and participating in MOVE MS for social support regardless of class difficulty. A factor that seemed to be most impactful on the participants was camaraderie or the social connectedness they felt which impacted their enjoyment of the program. These themes reinforce the suitability of Social Cognitive Theory and the MOVE MS program for the promotion of long-term exercise behavior.

Keywords: Group Exercise Programs, Multiple Sclerosis, MS, Participants Experiences, Qualitative Research

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

Authors: Carter Gonzales; Kathy Liu

Title: Collegiate Athletes with a Previous History of an Ankle Sprain are Twice as Likely to Sustain a Subsequent Knee Injury

Abstract: Context: Ankle sprains and knee injuries are two of the most common lower extremity injuries in athletes. It is well documented that a previous history of an ankle sprain is the highest risk factor for a subsequent ankle sprain, but it is not known if it increases the risk of a subsequent knee injury. The purpose of this study was to calculate the risk of a knee injury following an ankle sprain.
Methods: The incidence of ankle and knee injuries were collected from 711 collegiate athletes. Participant limbs were placed into different groups based on the date of injury for ankle and/or knee injuries. Risk of a subsequent knee injury following an ankle sprain was calculated using an odds ratio.
Results: A total of 122 limbs sustained a knee injury after an ankle sprain. 233 limbs sustained an ankle sprain without a knee injury, 218 limbs had a knee injury without an ankle sprain, and 813 limbs did not sustain an ankle or knee injury. 36 limbs sustained an ankle injury after having a previous knee injury and was not included in the calculation. The odds ratio of sustaining a knee injury after an ankle sprain was calculated at 1.953.
Conclusion: An individual is twice as likely to sustain a knee injury if they had a previous history of an ankle sprain than someone who does not have a previous history of an ankle sprain. Understanding injury risk can help reduce the overall incidence of injuries sustained by an athlete.

Keywords: injury risk

Presenters:	Keegan Her Many Horses	Graduate	Helen & Arthur E. Johnson Beth-El College of Nursing & Health Science	Health Science

Authors: Keegan Her Many Horses; Kathy Liu

Title: A Preliminary Examination of Reactive Strength Index in Youth Athletes that Participate in Different Number of Sports

Abstract: Context: The reactive strength index (RSI) is a jumping protocol strength assessment where the individual transitions from an eccentric landing from an elevated surface to a concentric take off jump. Higher RSI numbers show better neuromuscular control and correlation to maximum strength. With sport specialization in the youth population growing, the pros and cons of sport specialization are disputed. The purpose of this study is to examine differences in RSI between single and multi-sport youth athletes.

Methods: In an ongoing cross-sectional study design, 12 youth participants were recruited (7 males, 5 females, mass=50.8±4.7kg, height=161.4±3.7cm , age=13.8±0.6 years,). Participants were instructed to drop from a 60cm dropbox, land on a force plate, then jump back into the air as quickly as possible. RSI was calculated by dividing flight time by ground contact time after three trials. A t-test was used to analyze the difference of RSI scores between single and multi-sport participants.

Results: Mean RSI: single sport athletes=0.69±0.11mm/ms, multi-sport athletes=0.77±0.12mm/ms. Peak RSI: single sport athletes=0.78±0.12mm/ms, multi-sport athletes=0.88±0.09mm/ms. No statistical significance was found with mean RSI (P=0.53) and peak RSI (P=0.29).

Conclusion: While no statistical significance of RSI scores were found between single or multi-sport youth athletes, further research should be encouraged. A better understanding of RSI values in sport specialized youth may have an impact on strength, neuromuscular control, and injury incidence.

Keywords: sport specialization, youth sport participation

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

Authors: Kate Schrock; Kathy Liu

Title: A Comparison of Ankle Musculature Strength Between Adolescent Age Groups

Abstract: Context: Muscles around a joint are the main contributor to the dynamic component of stability of the joint. Theoretically, impaired strength at the ankle increases the risk of an ankle sprain. The purpose of this study was to assess the ankle strength differences between ages in an adolescent population.
Methods: In a cross-sectional study design, 13 participants under the age of 18 years that have not had a previous ankle injury volunteered for this study. Participants were split into a pre-teen (<13 years) group and a teen (≥13 years) group. Plantar flexion, dorsiflexion, inversion, and eversion strength was assessed. A t-test was used to analyze the difference in strength between groups. Statistical significance was set at $p \leq 0.05$.
Results: There were six individuals in the pre-teen group and seven individuals in the teen group. Plantar flexion, dorsiflexion, and inversion strength was significantly greater in the teen group compared to the pre-teen group. There was no significant difference in eversion strength.
Conclusion: This current study found that, even when normalized to body mass, muscle strength of plantar flexion, dorsiflexion, and inversion increases with age in the adolescent population. As a part of an on-going research project examining injury risk in an adolescent population. Understanding the strength gains with age beyond just growth of the body can help in the future research examining the role of lower leg strength in injury risk in the adolescent population.

Keywords: injury prevention, lower leg strength

Leadership, Research, & Foundations Presentations

Presenters:	Eric Burton	Graduate	College of Education	Leadership, Research, & Foundations
Authors:	Eric Burton			

Title: The benefits of teaching empathy: An empirical study

Abstract: This study investigated the effect of an empathy-specific character education curriculum to increase empathy levels in students and to determine whether any measurable benefits were noted aside from an increase in empathy, such as improving academic performance, decreasing absenteeism, and reducing negative behaviors in schools. The data collected from this randomized controlled trial was analyzed using ordinary least squares regression and mediation models. The results showed the curriculum appeared to increase the empathy development rate among girls and decrease the empathy development rate among boys. No significant findings were found on the effect of the curriculum on race and no significant relationship between race and empathy. Higher levels of empathy were related to lower levels of negative behavior among students with no significant effect from the curriculum. Greater levels of empathy suggested higher GPAs with no significant effect from the curriculum. Neither student empathy levels nor the curriculum had a significant effect on absenteeism.

Keywords: Randomized Controlled Trial, Empathy, Middle School Students

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Presenters:	Emma Reeve-Lobaugh	Graduate	College of Education	Leadership, Research, & Foundations
Authors:	Emma Reeve-Lobaugh			

Title: Identity, Pedagogy, and Change

Abstract: Teacher identity is the basis of teacher classroom choices and guides teachers' responses to proposed change, yet identity work and reflection are frequently overlooked and misunderstood components of teacher professional development and growth. Based in dialogic self theory, this mixed-methods study used narrative case study methodology to examine teachers' perceptions of the interactions between their identities, choices, and responses to change as well as an anonymous survey to gather quantitative data and investigate the relationships between self-efficacy, a component of identity, and implementation of classroom activities. This study determined that while teachers are often aware of the ways their identities guide their choices, they are less able to acknowledge the ways their identities and choices diverge and do not see their responses to change as connected to their identities. Years of teaching experience was the variable that was the most correlated with perceptions of self-efficacy; however, student discussion and reflection did have statistically significant positive correlations with self-efficacy in instructional strategies. As a result of this study, further research into specific elements of teacher identity and encouragement of teacher doubt and reflection is needed.

Keywords: teacher identity, mixed-methods, secondary school change, self-efficacy

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Presenters:	Royla Rice	Graduate	College of Education	Leadership, Research, & Foundations
Authors:	Royla Rice			

Title: A Critical Discourse Policy Analysis & Practical Argumentation of the 2021 Guaranteed Basic Income Act

Abstract: In 2021, Congressional Progressives introduced the SUPPORT Act and the GPI Act to address the problem of poverty in the United States. Proponents cited the reduction of childhood poverty by 40% in one year by extending EITC to all Americans regardless of earnings status as evidence that poverty eradication was a policy choice, not a matter of affordability. The SUPPORT Act makes the EITC expansion permanent but is touted as a basic income, and the GPI Act adds cost-benefit factors to the Gross Domestic Product (GDP) calculation offering a more dynamic measure of economic activity and wellbeing than simply the value of goods and services produced. The acronym "SUPPORT" and the promotion of the bill as basic income program flag this legislation as a "welfare" program. The perceptions of poverty discourse has typically characterized welfare recipients as responsible for their own poverty. This narrative acts as a smokescreen to hide the economic system's contribution to causing poverty. Since both bills were pending, the Personal Responsibility and Work Opportunity Reconciliation Act (PRWORA) served as the policy for the discourse analysis. In 1996, PRWORA ended cash welfare for millions of Americans labeled by political elites as undeserving. This study integrated practical argumentation with a critical analysis of the discourse of perceptions of poverty around deservingness, welfare, and labor, and how political elites shape the public's perception of target populations and guaranteed basic income programs in the United States since the 1970s. The aim was to inform anti-poverty policy argumentation and future research.

Keywords: poverty, deservingness, welfare, basic income, intersectionality, CDA

Mathematics Presentations

Presenters:	Michael Nameika	Undergraduate	College of Letters, Arts, & Sciences	Mathematics

Authors: Michael Nameika

Title: Data Driven Approximations of Topological Insulator Systems

Abstract: Electromagnetic beam (light) propagation through a crystalline glass is a well-studied field in physics that is described by complicated equations with variable (complicated) coefficients. We use a reduced order model that converts a continuous model to a discrete model using a tight binding approximation (close together or local) that simplifies the model to constant coefficients. Using a data driven minimization/optimization approach, the coefficients of the reduced order model method are obtained by using a method known as Gauss-Newton. The method gives a reasonable prediction of the coefficients from user input data. Within this field, there are classes of systems known as topological insulators. Our goal is to apply these methods to study properties of topological insulators. Within topological insulators, there is an issue of two inputs with similar coefficients that have different topological properties. One such input allows the propagation of waves on the boundary of the crystal lattice whereas the other does not.

Our goal is to apply the methods to create a software useful for scientists working with topological insulators by giving information about the topological properties based on experimental data.

Keywords: Topological Insulators, Nonlinear regression, data minimization, approximations

Mechanical and Aerospace Engineering Presentations

Presenters:	Cecilia Knight	Undergraduate	College of Engineering	Mechanical & Aerospace Engineering
Authors:	Cecilia Knight			

Title: Development of a CubeSat Small Satellite Demonstrator

Abstract: A CubeSat is a small, lightweight satellite that is less expensive to build and launch than a conventional satellite. It is comprised of a stack of boards, each operating a subsystem, making the technology modular. The purpose of this work was to develop and build a set of small satellite demonstrators (CubeSatSims) to use as interactive learning tools in the new Aerospace Engineering program at UCCS. The CubeSatSims were built from the component level, which provided allowance to build multiple at a lower cost than purchasing them pre-assembled. With a team of students, the power distribution, battery, and payload boards were assembled and tested independently at each stage of assembly. Once all boards proved to be nominal, they were interfaced together with a microcomputer, creating the full CubeSatSim. The CubeSatSims assembled have proven to be fully functional. With the functional CubeSatSims, it's been found that it can educate students on more than what was expected. It will enable students to learn about solar power generation and storage, ultra high frequency (UHF) radio communication, sensor implementation, satellite constellations, and more. As this project continues, the current CubeSatSims will be outfitted with more functionality. Key modifications will include a magnetometer and a single axis attitude control system. In addition, two, more robust, satellites will be assembled, and will act as the payload on a high-altitude weather balloon. The current CubeSatSims and their future modifications will greatly further the education of UCCS Aerospace Engineering students to come. Not only will it provide current students with industry accurate hardware to hone their skills on, these CubeSatSims will lay the groundwork for an eventual small satellite program at UCCS.

Keywords: Cubesat, Satellite, Aerospace, Education, Solar Panels, Raspberry Pi

Presenters:	Christian Lewis	Undergraduate	College of Engineering	Mechanical & Aerospace Engineering

Authors: Christian Lewis; Lynnane George

Title: Human Crewed Interplanetary Trajectories for the Exploration of Mars and Ceres

Abstract: Companies have looked at Mars and Ceres, individually, for human space missions for years; however, it is possible to combine these planets into the same mission. To do this, Lambert's problem was used to plot the launch energy (C3) contours, with respect to the departure and arrival dates, in the form of porkchop plots. Through this, the optimal year to conduct a combined human mission to Mars and Ceres was found to be 2035. For the best balance between the time of flight and C3, two teams of astronauts will leave Earth in June 2035 and enter an orbit around Mars using aerobraking. Once established, one team will be sent to the Martian surface for research and exploration, while the other remains on the primary shuttle to make final preparations for Ceres. The second interplanetary transfer would take place in December 2035, allowing for the shortest possible time of flight to Ceres. Ceres is expected to contain resources like water, ammonia, magnesium sulfate, and silicon dioxide. Once the team arrives at Ceres, their aim will be to confirm the composition of the planet's regolith. After the mission objectives have been completed, the crew will return to Mars to pick up the first team and to help identify possible uses of Ceres' resources for In-Situ Resource Utilization (ISRU), before both teams begin the final return transfer to Earth. This mission will take roughly 4.25 years and will allow in-person research to be conducted on both planets, simultaneously.

Keywords: Aerospace, Mechanical Engineering, Space Exploration, Interplanetary travel, Mars Settlement

Physics & Energy Science Presentations

Presenters:	Yaroslav Balytskyi	Graduate	College of Letters, Arts, & Sciences	Physics & Energy Science

Authors: Yaroslav Balytskyi; Justin Bendesky; Tristan Paul; Guy Hagen; Kelly McNear

Title: Raman Spectroscopy in Open-World Learning Settings Using the Objectosphere Approach

Abstract: Raman spectroscopy, combined with machine learning techniques, holds great promise for many applications as a rapid, sensitive, and label-free identification method. Such approaches perform well when classifying spectra of chemical species that were encountered during the training phase. However, in real-world settings, there will always be substances whose spectra have not yet been taken. When typical neural networks encounter these new species during the testing, the number of false positives becomes uncontrollable, limiting the usefulness of these techniques, especially in clinical and public safety applications. To overcome these barriers, we combined the Objectosphere loss function with the ResNet architecture. To demonstrate the efficiency of this approach, we compiled a database of hyperspectral Raman images of 40 chemical species separating them into three class categorizations. The known class consisted of 20 biologically relevant species comprising amino acids, the ignored class was 10 “irrelevant” species comprising bio-related chemicals, and the never seen before class was 10 various chemical species that the neural network had not seen before. We show that this approach not only enables the network to effectively separate the unknown species while preserving high accuracy on the known ones and reducing false positives but also performs better than the current gold standards in machine learning techniques. This opens the door to using Raman spectroscopy, combined with our novel machine learning algorithm, in a variety of practical applications.

Our work is published in ACS Analytical Chemistry (Impact Factor 2021: 8.008).

Anal. Chem. 2022, 94, 44, 15297–15306,

October 24, 2022,

https://doi.org/10.1021/acs.analchem.2c02666

Keywords: Raman spectroscopy; Machine Learning; Clinical applications; Public safety.

Presenters:	Victoria Martinez	Undergraduate	College of Letters, Arts, & Sciences	Physics & Energy Science

Authors: Victoria Martinez

Title: Determination of demagnetization factors of nanomagnets

Abstract: Magnets are common materials that have both a north and south pole. Within the magnet, the demagnetizing (demag) field ensures that Maxwell equations are obeyed at its surface. This demag field is present in every size magnet, including nanomagnets, at a thousandth of a human hair width. It also gives the magnets a well-defined orientation. Taking advantage of this property, nanomagnets can be geometrically arranged to produce new materials with unique functionalities, or metamaterials, including novel computing prototypes. However, this research remains predominantly experimental, and analytical methods are required to accurately model these metamaterials. A crucial factor for an analytical model is the determination of demagnetization factors that determine the demag field. We take advantage of the natural dynamic response of magnetic materials, ferromagnetic resonance (FMR) to fit the simulated FMR and recover the demag factors by fitting. The recovered demag factors are in good agreement with analytical theory. We are currently using this method to determine the demag factors for nanomagnets of a generic size. Our aim is to obtain a qualitative function that predicts such factors without the need of more involved simulations or experimental characterization. Our results will contribute to the development of more accurate modeling methods to model metamaterials.

Keywords: Physics, Computing, Magnetism, Models

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

Authors: Kaitlin McAllister; Dmytro Bozhko

Title: Experimental observation of magnetic rogue waves

Abstract: Rogue waves are large-amplitude waves created by the constructive interference of multiple smaller waves. They were first observed in the ocean and have since been created in many systems using sound and electromagnetic waves, but magnetic rogue waves had previously only been simulated, not experimentally observed [1]. In this project, we produce magnetic rogue waves in a thin film of yttrium iron garnet. We use a near-field microwave scanning microscope, which was developed in our group, to generate magnetic rogue waves and measure their properties. The basis of the method is a broadband microwave loop antenna that scans over the surface of a sample of yttrium iron garnet using a piezo-driven platform. This antenna can transmit and receive microwave signals to and from the sample, exciting a spin wave that is recorded by four antennas positioned near the edges of the sample. The signal received by these antennas is digitized and then re-emitted in reverse, re-creating a large amplitude magnetic rogue wave, which is detected by the scanning antenna probe. Properties and features of the obtained formations will be discussed. In conclusion, magnetic rogue waves are an interesting object for fundamental studies and may have applications, for example in performing magnonic logic operations [1,2].

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[2] A. V. Chumak et al., Roadmap on Spin-Wave Computing, IEEE Trans. Magn. 58, 0800172 (2022).

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Keywords: magnetic rogue waves, near-field microwave scanning microscope, spin waves, microwave magnonics

Presenters:	Casey McGinty	Undergraduate	College of Letters, Arts, & Sciences	Physics & Energy Science

Authors: Casey McGinty

Title: Domain-wall-motion-induced modulational instability in ferromagnets with perpendicular magnetic anisotropy

Abstract: The Landau-Lifshitz-Gilbert (LLG) equations provides a suitable model for probing the behavior of ferromagnetic solids on a microscopic level as magnetic dipoles. Through the use of numerical modeling in 1D, it is possible to create magnetic domain walls, which can be shifted in space through the use of an external magnetic field. With the use of spin hydrodynamics, we interpret the magnetic poles as analogous to the flow of a wave through a fluid and the domain wall as an object in the fluid. As the domain wall moves, it creates waves that in these materials can be unstable, a phenomenon called modulational Instability [1]. We analytically determine the conditions of modulational Instability in good agreement with the numerical simulations. This effect can explain the onset of magnetic pattern formation that has been observed in 2D materials called van der Waals magnets [2].

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[2] D. Abdul-Wahab, et al., Appl. Phys. Rev. 8, 041411 (2021)

Keywords: Physics, Magnetism, Computer Simulation

Presenters:	Tristan Paul	Graduate	College of Letters, Arts, & Sciences	Physics & Energy Science

Authors: Tristan Paul

Title: Imaging Neurons Deeper Into Optically Cleared Mouse Brain Slices Using Structured Illumination Microscopy

Abstract: Structured Illumination Microscopy (SIM) is a powerful imaging technique that can provide both optical sectioning and super resolution (SR). This makes it useful for many applications including imaging neurons and live cells. However, SIM suffers from reduced resolution and signal when imaging deep into a sample, limiting its uses to thin slices. We used Maximum A Posteriori (MAP) in combination with SIM (MAP-SIM) to obtain optically sectioned, SR images up to and past the typical 50 um sample depth limit. Images were taken of a coronal GFP mouse brain slice 150 µm thick. Images with a maximum resolution of 144 nm were obtained of neurons up to 66 µm deep using a 100x/1.40 NA objective and different illumination patterns were compared to determine optimal pattern frequency. Additionally, we were able to calibrate our brain slice to a map of a mouse brain (Paxinos and Franklin) through transformation equations to identify what section of the brain each neuron is in.

Keywords: Microscopy, Neurons, Imaging

Presenters:	Alison Roxburgh	Graduate	College of Letters, Arts, & Sciences	Physics & Energy Science

Authors: Alison Roxburgh; Ezio Iacocca

Title: Manipulating the magnon dispersion relation in nano-designed magnonic crystals

Abstract: Magnonics [1] rely on the periodic patterning of magnetic materials at nanometer scales in either one dimension [2] or two dimensions [3]. The periodic patterning may induce band gaps at the collective mode, but it is challenging to induce this effect for magnons with a higher wavenumber. A new technique called thermal nano-lithography [4] can modify nanoscale magnetic material parameters, opening the possibility of nano-designed magnonic crystals. Here, we study the magnon band structure when magnetic parameters are gradually changed at the nanometer scale. We numerically [5] compute the band structure by varying magnetic parameters sinusoidally. We find band gaps and non-reciprocity, in good agreement with analytical calculations.

We aim to use our analytical method to better understand how the sharpness and accuracy of thermal nano-lithography acts on the magnon band structure. Our results intend to guide experimental efforts and propose novel magnonic devices.

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Keywords: Magnonics magnetic materials magnons

Psychology Presentations

Presenters:	Katie Agenbroad	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Katie Agenbroad; Rachel Weiskittle; Laith Al-Shawaf

Title: The Effects of Loneliness, Kinship, and Perception of Burden on Older Adult Suicidality

Abstract: Older adults (65+) die by suicide at a higher rate than any other age demographic. The transition into long-term care (LTC) poses an especially high-risk period for suicide. We are conducting two studies, one among community-living older adults and one among those in LTC, to determine predictors of depression and suicidality. Study 1 has been completed and Study 2 is in progress. Based on evolutionary reasoning, we hypothesize that distance from direct relatives, self-perception of burden, impaired health, and loneliness will emerge as significant predictors. Long-term, we hope to leverage the findings of this study to build clinical innovations that reduce older adult suicidal ideation and behavior.

Keywords: older adults, depression, suicide, loneliness, burdensomeness, distance, evolutionary, kinship

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Presenters:	Isabella Arsenault	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Isabella Arsenault; Tom Francis

Title: The Future of Work for the Next Generation of College Students: Impact, Implications, and Interventions.

Abstract: This research aims to look at what "the future of work" will be for the next generation of college students and potential college graduates entering the workforce. The study looks at existing literature and research on areas that likely will impact the future workforce including technical skills, remote work, globalization, and most recently the effects of the Covid-19 pandemic and its aftermath. The study will utilize data from current and past UCCS students and faculty to ascertain what skills and tools will be required or recommended for future workers to successfully navigate the future work landscape. The stated purpose of this research study is to examine the many factors that are currently affecting and that will impact the future of work for the next generation of college students and graduates. The goal of the study is to develop both a working model of the future of work landscape and what skills and/or tools will be required for the future worker to be fully employable.

Keywords: future of work, covid-19, college graduates, remote work, hybrid work, work from home, employability, adaptability, professionalism, and communication

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Presenters:	Grai Calabro	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Grai Calabro; Ellie McLane; Diana Selmeczy

Title: The effect of children's active study control on value-based remembering

Abstract: Value-based remembering is a learning strategy in which remembering high value information is prioritized over less valuable information (Knowlton & Castel, 2022). This is a crucial learning strategy for childhood academic success as children have limited resources to remember the extensive amount of information they encounter daily. However, there is limited knowledge on value-based remembering in children or the contexts that aid in the ability to engage in this learning strategy. The current study examined how children's (ages 6 to 7 and 9 to 10) active control of their study choices (i.e., order and duration of to be studied information) helped in their ability to engage in value-based remembering. Initial data (N=8) demonstrates that older children clearly focus on studying and remembering high compared to low value information. In contrast, younger children struggle to focus on selectively studying high value information and therefore are also less likely to recall high valued items. Overall, these results imply value-based remembering develops throughout childhood and this may be driven, in part, by differences in strategic control of their study choices.

Keywords: value-based remembering, encoding, memory, active study control, child development

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Presenters:	Marcus Chur	Graduate	College of Letters, Arts, & Sciences	Psychology

Authors: Marcus Chur; Joey Wagoner

Title: What do we value in groups: Ideological correlates of trait preferences in groups

Abstract: People belong to various groups that fulfill different psychological functions, such as the desire for intimacy, desire for achievement and success, and to provide a sense of distinctiveness and identity. A separate body of literature on social cognitive perceptions shows that people evaluate groups based on social perceptions of sociability, competence, and trustworthiness. However, it is unclear whether people's political ideology influences how they perceive groups and what they value across these groups. Political ideologies reflect people's perceptions of what is right or wrong in society. Moral foundations theory (MFT) proposes that humans evolved moral intuitions, including care, fairness, loyalty, authority, purity, and liberty. The present study aimed to integrate these distinct frameworks and bodies of literature to investigate how social and economic ideology differently relate to social perceptions and moral institutions across social and intimate groups. A sample of 209 undergraduate students at UCCS were recruited for this study. Participants reported their social and economic conservatism before reporting their identification with and perceptions of two groups: a social group (nation) and an intimacy group (family) Results showed that stronger social conservatism are related to valuing loyalty, authority, and purity across social and intimate groups. Stronger identification also related to a stronger value of loyalty and fairness across both groups, but also a value of sociability and purity in intimate groups. Results partially support our theorizing by highlighting that people's social conservatism predicts a preference for binding morality.

Keywords: social perceptions, groups, political ideology, moral foundations theory (MFT)

Presenters:	Aindreas Downing	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Aindreas Downing; Leilani Feliciano

Title: Pharmacological and Non-Pharmacological Treatments of Nightmare Disorders

Abstract: Nightmare disorder and related parasomnias are an oft-overlooked part of overall well-being. This discrepancy results in misdiagnoses and this discrepancy paired with minimal research efforts lead to unresolved health issues. This study aimed to determine the state of treatments and compare the effect of pharmacological and non-pharmacological treatments for nightmare disorder in adults. Subsequently, the comparisons and presentations of the included studies will determine the future necessity of researching nightmare disorder and what variations in methodology may be prudent. I conducted a systematic review to make these determinations. 56 research papers relating to treatments of nightmare disorder were assessed and of those 41 were excluded and 15 articles met the inclusion criteria. From the review, there was an evident lack of research and methods to manage nightmare disorders, and this shows that there is a need for this work to be completed.

Keywords: sleep disorder, nightmare disorder, sleep treatment, adults

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Presenters:	Lily Herlihy	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Lily Herlihy; Lori James; Jessica Montague

Title: Mind Over Matter: How Stress Mindset Relates to Speech Production in Older Adulthood

Abstract: This study investigated the possible relationship between stress mindsets and speech production in older adults. Findings from Baynard-Montague and James (2022) show that young adults' stress mindsets are malleable and individuals primed to adopt a stress-is-enhancing (SIE) mindset have faster speech production rates than those primed with a stress-is-debilitating (SID) mindset. Stress mindset is still a recently identified variable, and no research has investigated its possible application to older adults. We tested whether older adults who are primed with an SIE mindset performed better on a difficult speech production task than those who are primed for a SID mindset. The current study is a replication of Baynard-Montague and James (2022) with 37 older adult participants between the ages of 60-85. Participants watched one of two videos that have been used to successfully manipulate stress mindsets in past research, completed a stressor task, and then a challenging tongue twister task. Data are being scored to test whether participants made fewer speech errors, spoke more quickly, or both, in the SIE compared to the SID condition. A follow-up study will test a new sample of older adults using the same methodology, but with speech fluency measured via a 3-item picture description task in place of the tongue twister task to determine whether similar results are obtained with different speech production indices.

Keywords: Stress mindset, mindset manipulation, speech production, older adults

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Presenters:	Shantel Horne	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Shantel Horne; Colin Mahoney

Title: Associations Between Trauma-Related Shame, PTSD, and Health Risk Behaviors Among Women Interpersonal Trauma Survivors

Abstract: Interpersonal violence such as sexual assault (SA) and/or intimate partner violence (IPV) commonly occurs among college women and is associated with a greater risk of developing posttraumatic stress disorder (PTSD). PTSD is associated with engagement in health-risk behaviors or, behaviors that pose threat to one's health such as substance use, risky sexual behavior, and disordered eating behaviors (e.g., binging, purging). The self-medication hypothesis posits that individuals engage in these behaviors following trauma exposure to cope with posttraumatic distress. These behaviors can be conceptualized as impulsive, maladaptive coping strategies to deal with their symptoms. In this study, we examined if trauma-related shame is associated with engagement in health-risk behaviors among college women following exposure to SA and/or IPV. This study aims to understand the role that trauma-related shame may play in posttraumatic outcomes among college women, a population vulnerable to interpersonal violence as well as health-risk behaviors. A sample of female undergraduate participants will first complete a screening measure to determine if they have experienced interpersonal trauma. Following the screener, they will complete a battery of survey measures assessing PTSD symptoms, trauma-related shame, impulsivity, drug use, alcohol use, risky sexual behavior, and disordered eating behaviors. We hypothesize that trauma-related shame will have differential associations with health-risk behaviors and PTSD symptom severity, and will moderate these associations. We plan to utilize multiple regression and correlational analyses to examine the weight and significance of these associations between trauma-related shame, PTSD, and health risk behaviors.

Keywords: PTSD, substance use, impulsivity, trauma-related shame, risky sex, disordered eating, women

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Presenters:	Nadia Jeunelot	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Nadia Jeunelot; Heidi Martinez; Diana Selmeczy

Title: Early Development of Value-Based Remembering

Abstract: Value-based remembering is the ability to recall information that is more relevant or important than other information (Castel et al., 2011). Value-based remembering is an important strategy in learning since children receive an abundance of information to remember every day. However, previous research has not examined when this learning strategy emerges in children. The present study examines value-based remembering in preschoolers ages 3.5- to 5-years-old. Children will be given a memory task during which they will be asked to memorize images varying in value (i.e., worth one or five-star stickers). They will then be asked to recall the images and rewarded with the corresponding value for correctly recalled items. We predict that older, but not younger, preschool children will recall more high value-images compared to low value-images. Additionally, we predict that older children will improve with task experience.

Keywords: Memory, Value-based remembering, learning

Presenters:	Paige Klein	Graduate	College of Letters, Arts, & Science	Psychology

Authors: Paige Klein; Zara Keningsberg; Sophie Brickman; Steven Bistricky; Kristi Samuelson

Title: PTSD Diagnostic Status and Temporary Changes in Immediate Verbal Memory Following Trauma Trigger Exposure

Abstract: Information processing models suggest that trauma triggers elicit transient cognitive deficits in those with PTSD due to attentional interference. This study tested this premise in a sample of trauma survivors, hypothesizing that post-trauma-trigger cognitive functioning would decrease, particularly for those with PTSD. Trauma survivors (N = 45) were randomized to write a narrative of either a trauma or a non-emotional event. Logical memory, working memory, and verbal fluency subtests were administered before and after the writing task. Following up on a medium trend experimental condition-by-time-by-PTSD diagnostic status interaction effect for verbal memory, $F(1, 41) = 3.19$, $p = .08$, $\eta p2 = .07$, revealed a simple main effect of time. Unexpectedly, those without PTSD performed worse after the trigger condition than before it, $F(1, 41) = 4.53$, $p = .04$, but there were no other significant effects. Findings suggest that writing about one's trauma experience may transiently decrease ability to recall non-personally salient story details for individuals without PTSD. For some with PTSD, trauma reminders may be more frequent, less novel, and thus, less disruptive to verbal memory after one willingly recounts their trauma experience. Studies should further examine ways that diagnostic status may affect cognitive performance in trauma-exposed individuals and potential consequences.

Keywords: Immediate Verbal Memory, Trauma, PTSD

Presenters:	Kaylin Muller	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Kaylin Muller; Colin Mahoney;

Title: PTSD and Substance Use Co-Occurrence and the Effect on Psychosocial Outcomes and Healthcare Utilization

Abstract: Posttraumatic stress disorder (PTSD), is a mental disorder that occurs after an individual has directly (i.e., happened to them) or indirectly (e.g., witnessed, learned about it happening to a close friend or family member) experienced a traumatic event. Some may turn to substance misuse as a form of coping to address both PTSD symptoms and negative trauma-related emotions. The co-occurrence of PTSD and substance use can have a negative effect on physical health, symptom severity, and treatment outcomes such as adherence and relapse. Therefore, it is possible that co-occurring PTSD and problematic substance use can have a negative effect on life outcomes. In the current study, undergraduate students at the University of Colorado at Colorado Springs completed self-report measures of PTSD, substance use, psychosocial outcomes, and healthcare utilization using the Life Events Checklist for DSM-5, the Alcohol Use Disorders Identification Test, the Cannabis Use Disorder Identification Test, the Short Inventory of Problems-Revised, the Generalized Anxiety Disorder-7, the Quick Drinking Screen, the PTSD Checklist for DSM-5, Patient Health Questionnaire-9, and the Multidimensional Scale of Perceived Social Support. We hypothesize that college students with trauma histories will engage in more frequent use of alcohol and cannabis and will engage in more urgent care visits and emergency room visits in comparison to students without a trauma history. We also hypothesize that the frequency of substance use will predict negative psychosocial outcomes such as substance use consequences, anxiety symptoms, depressive symptoms, PTSD, and reduced social support.

Keywords: PTSD, substance use, healthcare, psychosocial outcomes

Presenters:	Julia Scott	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Julia Scott; Leilani Feliciano;

Title: Prevalence of Adverse Childhood Experiences in military and civilian populations

Abstract: Adverse childhood experiences (ACEs), or abuse and home-life dysfunctions during childhood, occur in much of the population and have significant correlations with later negative health outcomes (Felitti et al., 1998). ACEs include physical abuse, emotional abuse, sexual abuse, the incarceration of a family member, parental divorce/separation, living with a family member with mental illness, witnessing violent treatment of a family member by another relative, and family substance abuse. ACEs have been associated with many mental and physical outcomes including depression, anxiety, and insomnia (Brownlow et al., 2022; Wang et al., 2019; Sareen et al., 2012; Kim et al., 2021; Schnarrs et al., 202; Pool et al., 2017). Unfortunately, these conditions are all problematic among military service members. However, service members also have a higher average level of resilience than non-military populations (Sanborn et al., 2021). The current study seeks to understand if there are differences in the prevalence of ACEs in military and civilian population and/or between enlisted and commissioned service members. Using a cross-sectional survey of veterans, active-duty service members, and civilians, we will analyze the rates of ACEs, insomnia, depression, anxiety, and resilience factors in these populations using a series of one-way analysis of variances (ANOVA). If difference(s) do exist, post hoc tests will be conducted to determine which groups differ significantly. The results may help inform future screenings and treatment needs within the military.

Keywords: ACEs, Adverse Childhood Experiences, childhood trauma, military, veterans, depression, anxiety, insomnia, resilience

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Presenters:	Alisha Silkey	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Alisha Silkey; Rachel Thayer

Title: Housing Insecurity and Cost Burden

Abstract: Access to safe, stable, affordable, and adequate housing is a growing social concern with an estimated 580,000 people currently experiencing housing precarity in the United States (HUD, 2020). While individuals living in growing urban areas are more likely to experience rent burden due to increased housing demand, gentrification, and economic contraction (Seymour et al., 2020; McConnell 2017), it is likely that the economic downturn resulting from the COVID-19 pandemic will impact housing insecurity and prevalence of rent burden more broadly. This study seeks to investigate the association between cost burden and housing precarity after the onset of the global pandemic in a sample of adults living in the United States recruited online through Amazon Mechanical Turk. Cost burden, a factor of unaffordability, is operationalized as spending a third or more of monthly income on housing, with those spending more than half their income on rent classified as highly cost burdened (Newman, 2008). This study will evaluate additional factors through qualitative and quantitative data coinciding with cost burden and how facets of housing insecurity impede individuals from obtaining secure housing.

Keywords: housing insecurity, cost burden, qualitative

Presenters:	Holly Siu	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Holly Siu; Elizabeth Daniels

Title: Media Images of Male Athletes

Abstract: The proposed study uses an experimental design to assess female college students' attitudes toward media images of male sexually objectified and performance athletes. This topic is important as sexual objectification surrounds us daily, through real life encounters, experiences, and media. Generally, it seems like the media has provided a platform where viewers may consciously or unconsciously objectify an individual being portrayed. In doing so, it allows the viewers to not consider the person as a whole, but rather the person as an object. Objectified individuals in media are typically women. Viewers evaluate objectified women as less competent, less capable, less intelligent. In the present study, we tested whether objectified men would be evaluated in the same ways. Participants will be randomly assigned to view one of three possible sets of media images of male athletes. Each set will include five images and the three conditions include: sexually objectified images of male athletes (e.g., shirtless), performance images of male athletes (e.g., playing their sport), and control images (e.g., dressed casually). After viewing the images, participants will complete writing prompts to make sure they are paying attention to the images. After the writing tasks, participants will complete a survey about their attitudes about the athletes, including perceptions of competence. Completing the study will take approximately 15-20 minutes. We predict that the participants will evaluate the sexually objectified athletes as less competent than the performance athletes. This study helps us understand how sexually objectified men are perceived.

Keywords: Media, Objectification, Sexualization, athletes, attitudes

Presenters:	Alexander Stover	Graduate	College of Letters, Arts, & Sciences	Psychology

Authors: Alexander Stover; Charles Benight

Title: Exploring the Effects of Time Since Trauma on Overall Goal Importance in Those with Probable PTSD

Abstract: Motivational systems theory (MST) defines motivation as the dynamic interaction between goals, personal agency beliefs, and emotions. Identifying goals is a vital component of motivation. The Personal Goal Identification Scale (PGIS) gauges the salience of 24 goals derived from MST's goal taxonomy, rated from 0 (not at all important) to 6 (extremely important). The PGIS has shown acceptable and close fit, CLI = .92, TLI = .91, RMSEA = .038 [90% CI: .037 to .040]. Researchers may average PGIS subscale scores to obtain an overall goal importance score. Higher overall goal importance suggests a greater desire to attain some different behavioral organization. MST posits that trauma exposure may cause behavioral disorganization, prompting a shift toward new goals to achieve reorganization. With a sample of trauma survivors reporting probable PTSD, this online study tested the hypothesis that overall goal importance may differ between those with trauma exposure in the last 6 months (n = 27) and those whose event occurred over 1 year ago (n = 89). The PC-PTSD-5 identified PTSD status. Age ranged from 18 to 81 (M = 34.73). Results showed that participants exposed to trauma within the last 6 months reported more overall goal importance than those exposed to trauma over 1 year ago, t(114) = 2.67, p = .009, Cohen's d = 0.59. These findings suggest that trauma survivors with probable PTSD and more recent exposure may emphasize overall goal importance as they work to manage PTSD symptoms and achieve new behavioral organization.

Keywords: Trauma, PTSD, Goals, Motivation

Presenters:	Naila Tagoilelagi	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Naila Tagoilelagi; Nina Spitzhorn; Yanyan Ahuang; Elizabeth Daniels

Title: Sexual Harassment in STEM: Impacts on Women's Well-Being and Career Plans

Abstract: The field of science, technology, engineering, and mathematics, or STEM, is an expansive field. STEM in higher education is comprised primarily of men. Women account for 78.2% of filed sexual harassment charges (U.S. Equal Employment Opportunity Commission, 2022), suggesting women-identified individuals are commonly victims of sexual harassment and may be at risk in a male-dominated environment. The present study is investigating sexual harassment in STEM using thematic analysis (Braun & Clarke, 2006) to categorize different types of sexual harassment experiences in STEM fields, as well as responses and punishments using data from Dr. Karen Kelsky's "Sexual Harassment in the Academy Crowdsource Survey" (Kelsky, 2017). Reports from science, technology, engineering, and mathematics (STEM) fields were selected for inclusion in the present study. Analysis of 441 reports indicated that 38.2% of participants experienced sexual comments or behavior, 25.9% experienced propositioning, 21.1% encountered unwanted physical contact, and 20.7% encountered sexual assault. Recurring responses were used to establish a coding scheme for institutional responses and punishments. Examples of themes include did not report, ignored, slap on the wrist, and legitimate punishment.

Keywords: sexual harassment, STEM, women, academia, well-being

Presenters:	Giulia Wolf	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Giulia Wolf; Josh Shulkin; Mike Kisley

Title: The Relationship of Alexithymia to Depressive Symptoms Through Separate Emotion Belief and Regulation Pathways

Abstract: Alexithymia, the inability to recognize or describe one's own emotions, is associated with difficulties in emotional regulation and a higher prevalence of depressive symptoms. More specifically, Alexithymia, a personality trait, can be conceptualized with diverging mechanisms involving negative emotional beliefs, emotional regulation difficulties, and depression. To look deeper into these connections, the relationships between these variables will be analyzed. The Toronto Alexithymia Scale (TAS-20) will be used to measure Alexithymia, the Emotion Regulation Questionnaire (ERQ) will be used to assess emotion regulation, and the Emotional Beliefs Questionnaire (EBQ) will be used to assess participants' beliefs towards emotion. The Depression, Anxiety, and Stress Scale (DASS-21) will be used to measure participants' levels of depression, anxiety, and stress. A correlation between Alexithymia, deficits in emotional regulation, and beliefs of emotions being useless and uncontrollable is anticipated. Alexithymia is predicted to be correlated with depressive symptoms. The relationship between these variables will be summarized using a model that will guide statistical analyses once data have been collected.

Keywords: Alexithymia, emotional regulation, depression, emotional beliefs.

Presenters:	Aja Zamundu	Undergraduate	College of Letters, Arts, & Sciences	Psychology

Authors: Aja Zamundu; Heather Littleton; Rachael Peck; Stevie Truty

Title: Race on Campus in the Aftermath of George Floyd and Black Lives Matter

Abstract: Of the over 19 million young adults attending colleges and universities each year, nearly 50 percent of those students are racial and ethnic minorities (REMs). Attending college is a highly impactful experience in the growth and development of a young adult and experiencing racism and discrimination on campus and/or in the classroom can directly affect a student's mental and physical health, self-esteem, and academic outcomes. The murder of George Floyd and the development of the Black Lives Matter Movement brought unique challenges to REM college students. According to racial trauma theory, cumulative experiences of racism and prejudice can lead to a host of negative psychological and physiological symptoms. This can also lead to the development of heightened vigilance regarding future experiences of racism. Students experiencing racial trauma often look to their colleges and universities for active support, resources, and inclusion. This begs the question of what role colleges and universities play in the well-being of their REM students in the aftermath of George Floyd and the Black Lives Matter Movement. The current study tested a mediation model of racial trauma in a national sample of 110 REM college students recruited via social media. We hypothesized that students embedded in campuses with fewer resources for REM students would experience more racial trauma, and that racial trauma would predict heightened vigilance and psychological distress among students. Our study aims to contribute to the conversation about the ways in which academic institutions can create safe, supportive, and inclusive campus environments for all students.

Keywords: racial trauma, higher education, George Floyd, microaggressions

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Public Administration Presentations

Presenters:	Ashley Twenter	Graduate	School of Public Affairs	Public Administration

Authors: Ashley Twenter; Jessica Berrett; Kate Quintana

Title: The Impact of the Legalization of Marijuana on Nonprofits in Colorado

Abstract: With the growing number of states across the United States legalizing recreational and medical marijuana, dispensaries are thriving and want to give back to their communities. However, there is hesitation from nonprofits to accept donations from marijuana dispensaries, leaving the potential for millions of dollars on the table. Therefore, we seek to address how the legalization of marijuana impacts nonprofits. This research will apply a case study approach focusing on Colorado, as Colorado has a long history of legalization. We plan to collect survey data from nonprofit organizations and marijuana dispensaries throughout Colorado. We believe there is significant potential for this new, interdisciplinary collaboration to impact funding for nonprofits in communities, legislative decision-making regarding legalization and dispensary licensure, and views on tainted money and giving back not only for Colorado, but with implications for the broader United States.

Keywords: Marijuana, Nonprofit, Philanthropy

Social Work Presentations

Presenters:	Ana Ortiz-Mejias	Graduate	College of Letters, Arts, & Sciences	Social Work

Authors: Ana Ortiz-Mejias; Johanna Baez

Title: Exploring the Social Determinants of Health from the Voices of Unaccompanied Immigrant Minors (UMs) in the Community: Insights for Clinical Providers and Community Leaders

Abstract: Since 2012, the numbers of unaccompanied immigrant minors (UMs) seeking asylum have grown dramatically each year with 107,686 children in fiscal year 2021 released to sponsors and communities throughout the United States (U.S.). These youth are some of the most vulnerable and resilient immigrants living in the U.S., with many of these youth having unmet health needs. The purpose of this qualitative case study is to explore via an action research design the social determinants of health for UMs in their communities and in their lives. UMs, caregivers, providers, and community leaders were interviewed in Houston, Texas from April 2019 to November 2019 to provide insight into the care of UMs. The three primarily themes provide a focus for providers in supporting the health needs of UMs in the community: (1) UMs Need "Everything," (2) Legal Support Comes Before Health, and (2) Caregivers Carry Guilt: "We Want to Give Them a Better Life." The implications support providers in using best practices for UMs based on needs from their perspective, identifying legal needs as many put this before their health needs, and partnering with caregivers to support the needs of these youth in our communities.

Keywords: Unaccompanied immigrant minors, social determinants of health, providers

Teaching and Learning

Presenters:	Kristi McCann	Graduate	College of Letters, Arts, & Sciences	Teaching & Learning

Authors: Kristi McCann; Grant Clayton

Title: Initial Employment Outcomes of UCCSTeach Graduates

Abstract: There is a well-documented shortage of STEM teachers across the US. The initial employment choices and distribution of STEM teachers are poorly understood in the teacher labor market. Using de-identified, institutionally collected data from UCCSTeach, an innovative STEM educator model conceptualized at The University of Texas at Austin in 1997 and replicated in 50 sites across the US, we use linear probability models to identify factors that predict graduates entering teaching, the schools where they work, and/or accepting positions where they apprentice taught (AT) or graduated from high school. Finally, we estimate the probability of graduates leaving their initial teaching position at the end of the first year. The findings show math majors are more likely to enter teaching upon completion of apprentice teaching relative to biology majors. Contrary to prior research, we find most graduates teach at the high school level in urban settings and with higher percentages of BIPOC students. About 25% of graduates return to their home high school or accept positions from AT. The probability of a teacher switching schools is lower when their apprentice teaching grade is higher, and graduates are less likely to leave teaching or change schools and districts when employed in their AT district. This study provides a model for predicting the initial employment outcomes of STEM teachers across UTeach sites. We demonstrate the power of apprentice teaching partnerships and placement in the teacher labor market and the role university-district partnerships play in ensuring the equitable distribution of effective teachers.

Keywords: STEM, education, teacher, teacher labor market, UTeach

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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Acknowledgments

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