13th Annual Mountain Lion Research Day

December 3rd, 2021 12pm-4pm

Join us for the Closing Ceremony and award presentations at 3:15pm In Gallogly Hall

UCCS University of Colorado Colorado Springs

Contents

Welcome!

At UCCS, we take pride in the incredible research, scholarship, and creative works our community produces each year, and this year we are excited to come together once more in person to share the innovative work of our students and faculty. This last year and half has undoubtedly been challenging for our entire campus community. Yet, through it all our passionate pursuit of new knowledge has not waivered. Though we have found ourselves needing to adapt regularly to an ever-shifting landscape, we have learned a great deal about our own flexibility and ability to pivot back to what most thrills us about our work. As we know from research, engaging in mentored experiences with faculty members and contributing novel approaches and ideas to our discipline is a high impact practice that nurtures our curiosity beyond the classroom walls (or Zoom calls). We look forward to coming together again in celebration of each of you as part of our thriving research community at UCCS.

UCCS takes pride in being the only higher education institution in Southern Colorado that explicitly includes “research” as part of its mission. Your participation today, as a presenter, judge, or audience member, is essential to advance our inclusive research mission to embrace and celebrate multiple ways of knowing.

We thank you for joining us today for the 13th annual showcase of Mountain Lion Research. This day is not just about the research, it’s also about sharing the same passions and connecting with each other as we strive to enrich our culture with knowledge and understanding. Thank you for being a valued member of our UCCS Research Community.

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

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

Land Acknowledgement

This land on which we gather collectively for this event today is stolen land from our indigenous peoples. Here at UCCS, the land we occupy is on the unceded 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 Native American health disparity research in the field of nursing to our students studying outcomes of Native American children involved with child welfare systems in the field of criminal justice, many of our UCCS scholars are aiming to unravel the harm to indigenous elders and empower the present generation.

List of Presenters

Last Name	First Name	Department	Faculty Advisor:	Poster Number
Abduljaber	Jennan	Department of Psychology	Michael A. Kisley	69
Akpokiro	Victor	Department of Computer Science	Oluwatosin Oluwadare	37
Aragon	Sarah	Department of Chemistry and Biochemistry	Ronald Ruminski	20
Balytskyi	Yaroslav	Physics and Energy Science	Kelly McNear	64
Banerjee	Vijay	Department of Computer Science	Gedare Bloom	38
Bondarchuk	Natalie	Department of Biology	Amy Klocko	6
Bono	Joseph	Department of Sociology	Stephen Suh	81
Brownfield	Mallory	Department of Biology	Amy Klocko	7
Burney	Layla	Department of Geography	Brandon Vogt	49
Burrows	Jen	Department of Chemistry and Biochemistry	Amanda Morgenstern	21
Calzadilla	Annaliese	Department of Biology	Amy Klocko	8
Cegielski	Owen	Leadership, Research & Foundations	Sylvia Mendez	57
Chang	Adeline	Department of Biology	Eugenia Olesnicky	9
Chung	Esther	Department of Psychology	Mike A. Kisley	70

Church	Natalie	Department of Chemistry and Biochemistry	Wendy Haggren	22
Cooley	Katrina	Department of Psychology	Rachel Thayer	71
Daniel	Katherine	Department of Health Sciences	Joey Lee	51
Delahunt	Stephen	Department of Biology	Jeremy M. Bono	10
Dieckmann	Caitlyn	Department of Psychology	Diana Selmeczy	72
Epperson	Logan	Department of Chemistry & Biochemistry	Amanda Morgenstern	23
Foster	Brian	Department of Psychology	Tom Pyszczynski	73
Fox	Madison	Department of Chemistry and Biochemistry	James Kovacs	24
Gassen	River	Biophysics	Kathrin Spendier	5
Gibson	Andrew	Mechanical and Aerospace Engineering	Michael Calvisi	62
Gould	Brendan	Department of Computer Science	Phillip Brown	39
Grant	Jeremy	Health Sciences	Paige Whitney	52
Graybill	Alayne	Department of Biochemistry	Dr. Andrew Klocko	25
Griffith	Christopher X.	Department of Psychology	Leilani Feliciano	74
Hanson	Emily	Department of Chemistry/Biochemistry	Janel Owens	26
Harrell	Sabrina	Department of Chemistry and Biochemistry	James Kovacs	27

Hovis	Sophia	Helen and Arthur E. Johnson Beth-El College of Nursing and Health Sciences	Jennifer Zohn	53
Hubbard	Ike	Department of Educational Leadership, Research, and Policy	Sylvia Mendez	58
Johnson	Shannon	SPA		80
Kelso	Kevyn	Department of Electrical and Computer Engineering	Byeong Lee	46
Këpuska	Krenar	Department of Computer Science	Jugal Kalita	40
Khammash	Hadeel	Department of Biology	Amy Klocko	11
Kulakowski	Emily	Department of Education	Sylvia Mendez	59
Lee	Tristan	Department of Electrical and Computer Engineering	Byeong Lee	47
Lehman	Emma Lynn	Department of Art History	Kristen Galvin	3
Lu	Dongliang	Department of Electrical and Computer Engineering	Gregory Plett	48
Lundberg	Tiffany	Department of Biochemistry	Andrew Klocko	28
Manglona	Kaylani	Department of Biology	Lisa Hines	12
Manthey-Pierce	Courtney	Department of Anthropology		1
McAllister	Kaitlin	Department of Physics and Energy Science	Dmytro Bozhko	65
McCann	Kristi	Leadership, Research, and Foundations	Robert Mitchell	60

Mofidi	Farhad	Department of Computer Science	Shouhuai Xu	41
Muchow	Eric	Department of Psychology	Steven Bistricky	75
Paul	Tristan	Department of Physics and Energy Science	Kelly McNear	66
Peaux	Anya	Department of Chemistry and Biochemistry	Thomas Wolkow	29
Peng	Jim	Department of Computer Science	Gedare Bloom	42
Peroor	Renju	Department of Physics and Energy Science	Dr. Dmytro A. Bozhko	67
Pierce	Brian	College of Business	Dr. James Van Scotter II	19
Pirillo	Emma	Department of Anthropology	Tara Cepon-Robins	2
Premovich	Alyssa	Department of Psychology	Daniel Segal	76
Rayburn	Alexis	Department of Biology	Emily Mooney	13
Remillard	Alexandria (Alex)	Criminal Justice	Gia Barboza	45
Rice	Royla	Leadership, Research, and Foundations	Sylvia Mendez	61
Rosemond	Katrina	Department of Computer Science	Gedare Bloom	43
Roy	Shreeya	Mechanical and Aerospace Engineering	Michael Calvisi	63
Santos	Brianna	Department of Geography and Environmental Studies	Brandon Vogt	50
Schaff	Branden	Department of Psychology	Rachel Weiskittle	77

Silkey	Alisha J.	Department of Psychology	Rachel E. Thayer PhD	78
Simmons	Madison	Department of Biology	Aaron Corcoran	14
Sollenberger	Alaric	Interdisciplinary Studies: Cognitive Archaeology	Karin Larkin	55
Sollenberger	Alaric	Interdisciplinary Studies	Michele Okun	56
Soto	Daniel	Department of Chemistry and Biochemistry	Crystal Vander Zanden	30
Super	Meg	Department of Biology	Eugenia Olesnicky	15
Swenor	Abigail	Department of Computer Science	Jugal Kalita	44
Tagoilelagi	Naila	Department of Psychology	Elizabeth Daniels	79
Talley	Kyle	Department of Chemistry and Biochemistry	Wendy Haggren	31
Taylor	Loren	Department of Chemistry and Biochemistry	Allen Schoffstall	32
Tixtha	Erika	Department of Biology	Eugenia Olesnicky Killian	16
Tolson	Robert	Department of Biology	Thomas Wolkow	17
Tomlinson	Stevi	Department of Biology	Eugenia Olesnicky Killian	18
Troutman	Bailee	Department of Chemistry and Biochemistry	Wendy Haggren	33
Vair	Ally	Department of Art History	Kristen Galvin	4
Visscher	Lindsey	Health Sciences	Jessica Kirby	54

Voss	Barbie	Department of Chemistry and Biochemistry	Crystal Vander Zanden	34
Watson	Mark	Department of Physics and Energy Science	Paul Romatchke	68
Webb	Chandler	Department of Chemistry and Biochemistry	Wendy Haggren	35
Windebank	Brent	Department of Chemistry and Biochemistry	Wendy Haggren	36

Abstracts in alphabetical order by department

Anthropology Presentations

Presenters:	Courtney Manthey-Pierce	Faculty	College of Letters, Arts & Sciences	Anthropology

Authors: Courtney Manthey-Pierce & Tara Cepon-Robins

Title: Polycystic ovarian syndrome (PCOS) hyperandrogenism and bone mineral density: Preliminary evidence suggests female hyperandrogenism may act as a protective agent for female CrossFit athletes

Abstract: Polycystic ovarian syndrome (PCOS) is argued to be an evolutionary mismatch disorder, where a trait evolving in one environment becomes maladaptive in another. One prominent hypothesis states that PCOS-related hyperandrogenism may have been beneficial to ancestral populations experiencing sporadic nutritional distress by increasing bone mineral density (BMD), however research on this is conflicting. Here, we test the hypothesis that PCOS-related hyperandrogenism has a protective effect on BMD during maternal reproductive stress (i.e., pregnancy, childbirth, breastfeeding) and leads to decreased fracture occurrence. CrossFit athletes were recruited due to their intensive fitness routines that are often linked to increased fracture risk and altered nutritional status compared to the general population. 56 adult women were surveyed and categorized as follows: CrossFit athletes with PCOS (35.7%), CrossFit athletes without PCOS (30.3%), and non-athletes with PCOS (33.9%). CrossFit athletes without PCOS-related hyperandrogenism presented the highest percentage of fracture occurrence (47.1%) compared to CrossFit athletes with PCOS (20%) and non-athletes with PCOS (10.5%; $p = 0.338$). Chi-square tests indicated no significant relationships between pregnancy, childbirth, breastfeeding and fracture occurrence in any test groups. CrossFit athletes without PCOS possessed significant relationships between bone fractures and diet at the time of injury ($p = 0.009$). These results suggest the bone health of females with PCOS is less likely to be impacted by nutritional hardships compared to females without PCOS. This research also supports the argument that PCOS-related hyperandrogenism may have had a protective effect on preserving BMD in times of sporadic nutritional distress in ancestral populations.

Keywords: Evolutionary mismatch, polycystic ovarian syndrome, CrossFit, bone mineral density, reproduction.

Presenters:	Emma Pirillo	Undergraduate	College of Letters, Arts & Sciences	Anthropology

Authors: Emma Pirillo, Romello Valentine, Courtney Manthey-Pierce, Theresa Gildner, & Tara Cepon-Robins

Title: Potential embodied effects of resource access and disease exposure on intestinal health in adults from Colorado Springs and St. Louis

Abstract: Elevated intestinal inflammation is often overlooked among low-resource populations with limited access to medical care even despite being indicative of more serious health complications (e.g., gastrointestinal cancers, Inflammatory Bowel Disease, etc.). Many low-income and marginalized populations are also more likely to be exposed to certain pathogens, including SARS-CoV2/COVID-19. Embodiment Theory describes how external environments and lived experiences (e.g., reduced resource access, increased environmental pathogen exposure) shape internal physiology and health. Here we test how embodied sociodemographic factors like household income, race/ethnicity, and disease exposure affect intestinal health in a random sample of healthy adults from Colorado Springs, CO and St. Louis, MO. 56 adults (ages 18 to 83) participated in online surveys to assess sociodemographic factors and provided stool samples to measure fecal calprotectin (FC; measured using BUHLMANN Laboratories Quantum Blue reader) and lactoferrin (LF; measured using TECHLAB rapid tests), both biomarkers of intestinal inflammation. No associations were found between intestinal inflammation (FC > 49), age (p = 0.582), sex (p = 0.401), and self-reported race/ethnicity (p = 0.939). Income level was significantly associated with FC level (p = 0.038), with 64.7% of lower-income earners (< $50,000/year) exhibiting elevated FC levels. 12.5% of participants had elevated LF levels. Fischer's exact test indicates individuals who reported having had SARS-CoV2/COVID-19 were more likely to have elevated LF levels (p = 0.030). These findings suggest that embodied sociodemographic factors and environmental pathogen exposure may affect intestinal health, with important implications during an ongoing pandemic like the present.

Keywords: Embodiment, intestinal health, intestinal inflammation, resource access, sociodemographic, COVID-19

Art History Presentations

Presenters:	Emma Lynn Lehman	Undergraduate Student	College of Letters, Arts & Sciences	Art History

Authors: Emma Lynn Lehman

Title: The Music Behind Kandinsky

Abstract: Kandinsky is one of the most well-known abstract artists of the 20th century. His pieces have wild and crazy compositions that keep the eye entangled, trying to find one ounce of meaning behind the piece. It may just be full of circles and lines, but his pieces have more meaning behind them than what meets the eye. Circles in a Circle (1923) is one of the more well-known pieces from Kandinsky. This piece looks exactly as the name suggests it would - its full of circles within one larger circle. And while that may seem sort of boring, we will be taking a deep dive into what Kandinsky was really trying to portray in this piece. Formally analyzing this piece makes it seem as if there is not much to it. There is cyclical and diagonal movement within the piece, and the eyes seem to be glued to the painting, with no way to escape. But when one reads the theories that Kandinsky wrote himself on art, it creates a whole new meaning behind the piece. Kandinsky is rumored to have synesthesia - a neurological phenomenon where two senses are triggered at the same time. This rumor is based off of the theories that the artist wrote. If one looks at the qualifications for synesthesia, it is evident that Kandinsky has it. By taking a scientific approach towards this piece and combining that with his fanciful compositions he creates, it becomes evident that Kandinsky aims to create a musical composition with Circles in a Circle. In Kandinsky's theories, he talks about the spiritual in art and aims to explain why his pieces seem to have more behind them than what someone would expect.

Keywords: abstract art, synesthesia, Kandinsky

Presenters:	Ally Vair	Undergraduate Student	College of Letters, Arts & Sciences	Art History

Authors: Ally Vair

Title: Whimsical Tales of Darkness: Julie Buffalohead's Visual Storybook of Animals and Trauma

Abstract: Trauma can invade every part of our being; it is in our very cells. The challenges of grasping the complexity of trauma can be brought to the surface by artworks that address painful themes. Through an iconography of personified animals and an illustrative style filled with whimsy, the contemporary female Native American artist Julie Buffalohead creates visual stories about trauma. To further examine her body of work, I bisect it into two categories: historical and contemporary trauma. Contemporary trauma includes works regarding sexual assault, human trafficking, violence against women, and modern challenges of Native American reservations. Historical trauma, and the prevailing remnants of such, include the continued suffering inflicted upon Native Americans because of industrialization, commercialization, and colonialization. Theoretically, Buffalohead's works provide a link between post-colonialism and ecofeminism to highlight the subject of trauma for Indigenous communities, and more specifically, the horrors faced by Indigenous women. A problem of many contemporary artworks that involve trauma is the potential for secondary traumatization or re-traumatization faced by viewers of particularly graphic works. My research identifies the success of Buffalohead's work as located in her ability to craft dark stories about trauma without unsettling the viewer, which is a challenging feat to gracefully accomplish. The deeper viewers immerse themselves into Buffalohead's work, the more awareness is sparked, and the more they may be able to understand, empathize, and honor those whose suffering has long been silenced.

Keywords: contemporary art, trauma, visual art, Indigenous artists, violence against women, post-colonialism, ecofeminism

---

Biophysics Presentations

Presenters:	River Gassen	Graduate Student	College of Letters, Arts & Sciences	Biophysics
Authors:	River Gassen			

Title: Magnetic Nanoparticle Clusters Delivering Antibiotics to E Coli. Through High Viscous Non-Newtonian Fluid using a Magnetic Field

Abstract: The purpose of this experiment is to expand the biomedical applications of magnetic particles and antibiotics through the oscillating of magnetic particle clusters through high viscous fluids. This research could help develop medical treatments for ailments such as asthma or cystic fibrosis. In prior research, it was discovered that magnetic particle clusters can get through high viscosity fluids when oscillated by a magnetic field. In the presented experiments, Hec-Gel, a Non-Newtonian fluid, is similar in viscosity and structure to mucus and agarose gel, also a Non-Newtonian fluid was used as testing fluids. These high viscous gels were layered on top of E. Coli, strain k-12. Clusters of barium hexaferrite ($BaFe_{12}O_{19}$) nanoparticles and iron oxide (Fe_3O_4) nanoparticles were placed on top of the gels and oscillated using a magnetic field of 60 Hz, 7 mT. The temperature of the gels was kept constant at 37 C throughout the experiment.

Keywords: Biomaterials, nanotech, nanoparticles, nanotechnology, bacteria, mucus, viscosity, drug delivery, biophysics, magnetism

Biology Presentations

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

Authors: Natalie Bondarchuk, Allison Canada, Anh Nguyen, Tim Artlip, & Amy Klocko

Title: CRISPR-mediated Gene Editing of Two AGAMOUS-like Genes in Domestic Apple

Abstract: Plants have differences in numbers, identities, and arrangements of floral organs which are thought to be due to variations in core floral development genes. Many non-model plant species have duplications of key floral genes, which may represent either functional redundancy or specialization. One example is Malus domestica (apple). Apple trees have two closely related copies of AGAMOUS (AG), a key gene specifying anther and stigma organ identity and floral meristem determinacy. Initial work demonstrated that suppression of these genes by RNA interference (RNAi) leads to a near-complete conversion of anthers and stigmas to petals, and reductions in bisexual fertility. To better understand the function and degree of functional redundancy, this current study is targeting these two AG genes using CRISPR-Cas9-based gene editing. This approach leads to genetic changes at specific DNA sequences. The advantage to the newer CRISPR-Cas9- based approach over the classical RNAi method is targeting specificity, allowing each gene to be targeted individually. As apple trees are diploid, it will be possible to isolate individuals with one to four alterations in the two target AG genes. Currently, 4 CRISPR constructs have been transformed into domestic apple and 44 independent transgenic lines obtained. Ongoing work includes analysis of individual alleles of targeted genes, analysis of targeting efficiency, mutation type characterization, and quantification of mutation rates. Our work to date shows successful gene editing of target alleles, with 0-2 altered alleles per analyzed plant. Future work includes a field trial for analysis of floral form, fertility, and vegetative traits.

Keywords: CRISPR, Gene Editing, Floral Development

Presenters:	Mallory Brownfield	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Mallory Brownfield, Haley Klemp, Annaliese Calzadilla, Ahn Nguyen, & David Doran

Title: Analysis of Perfluorinated Compound Presence and Impacts on Tree Growth in the Fountain Creek Watershed

Abstract: Perfluorinated compounds (PFCs) are a group of chemicals that are used to create hydrophobic and heat resistant coatings, such as waterproof fabrics and non-stick cookware. PFCs are manufactured, persistent compounds that bioaccumulate in the environment and the presence of PFCs in drinking water is linked to negative impacts on human health. In October 2016, 150,000 gallons of water containing PFC fire suppressant foam was spilled into the Fountain Creek watershed. The possible ecological impact of the spill is yet to be determined. We are analyzing the existence and impact of PFCs on three species of trees at two test sites, totaling in 18 trees in our sample population. Locations are based on previous analysis of PFC levels found in water, soil, and stream sediment. Fountain Creek is the site of acute contamination. Monument Creek is a tributary to Fountain Creek and represents the background levels of PFCs. Samples of leaves were collected from each tree and chemically analyzed to quantify the amount of PFCs absorbed by the trees. Leaves are measured for leaf length, leaf shape, leaf area, leaf density, and petiole dimensions to observe growth and stress. Wood cores from cottonwood trees at both sites were utilized to quantity annual tree growth before and after the 2016 spill.

Keywords: PFCs, Tree growth, ecology

Presenters:	Annaliese Calzadilla	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Annaliese Calzadilla

Title: The Better Side of Herbicide; Developing a Rapid Method to Identify Transformed Wisconsin Fast Plants

Abstract: Everyday 25,000 people die from hunger-related causes. A fruitful option to obtaining healthier crops is to genetically modify plants with the ability to be more nutritious and resistant to herbicides. A reliable and quick transformation is important for Brassica rapa, aka Wisconsin fast plants, as it increases its usefulness as a model plant and teaching subject. Current procedures allow 1 in 1000 seeds to be transformed. Finding transformants is limited to screening for physical changes that may show in seedlings. Identification of the transformed seedlings could be sped up with a robust herbicide selectable marker. This study intends to make a streamlined methodology that allows students to follow. We use Agrobacterium tumefaciens for transformation via a floral dip procedure. We will be inserting a gene to allow the plants to express Green Fluorescent Protein (GFP) along with resistance to the herbicide. The purpose of GFP is two-fold, causing an interesting reaction to captivate students and adding another visual marker for identifying transformed plants as they are grown on media-infused herbicide for selection. Currently, we have determined a sterilization procedure to be used on the seeds and herbicides that are effective. We also performed two experimental rounds to develop transformed Brassica rapa. Overall, we collected 4777 seeds. Of these, 447 seeds were plated and believe 161 to be transformed, an overall efficiency of 36%. Future plans include growing potential transformants for genotype testing, evaluating remaining seeds, and having students test the floral dip procedure as part of a lab class.

Keywords: Brassica Rapa, Agrobacterium transformation, herbicide, plant transformation, plant selection

Presenters:	Adeline Chang	Graduate Student	College of Letters, Arts and Sciences	Biology

Authors: Adeline Chang

Title: The Roles of the Conserved Splicing Factor Caper in the Nervous System

Abstract: The global aging population is predicted to surge dramatically in the next few decades. As such, it is becoming increasingly important to study the aging process and age-associated diseases such as neurodegeneration. The Olesnicky lab has identified an evolutionarily conserved splicing factor, Caper, as a significant player in aging and neurodevelopment in the model organism Drosophila melanogaster. Notably, caper dysfunction phenotypes exhibit age- and sex-biases, which are common characteristics of neurodegenerative diseases. This indicates that the regulation of caper may be multilayered and complex. Biochemical tests were performed to delineate caper regulation in D. melanogaster at the mRNA and protein levels. Western blots reveal that in males, Caper protein levels decrease in neural tissue as a function of age. Additionally, PCR analyses suggest that caper poison exons, whose inclusion trigger degradation of mRNA transcripts, are utilized more in neural tissue compared to muscle. Moreover, a modifier screen indicates that caper interacts with genes involved in the development and maintenance of the nervous system, such as Nmnat, CRMP, and Dab, to modify locomotor behavior. Investigating the regulation of the evolutionarily conserved caper in the Drosophila nervous system may prove to be valuable in enriching our understanding of the mechanisms behind age-associated neurological diseases in humans and so provide avenues for the development of novel therapeutic strategies.

Keywords: RNA binding proteins, nervous system, gene regulation, alternative splicing

---

Presenters:	Stephen Delahunt	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Stephen Delahunt & Jeremy Bono

Title: RNA Transfer Through Male Drosophila Ejaculate

Abstract: Male ejaculate carries much more than the sperm required for sexual reproduction. RNA has been shown to be one of many components of male ejaculate, but it is unclear what it does once it enters the female. Recent evidence gathered in our lab indicates that, in Drosophila arizonae, some of it is translated into proteins by the female. This finding suggests that it could play an important functional role in reproduction. We will test this hypothesis using CRISPR/ CAS-9 to knockout one of the genes in Drosophila arizonae males. After screening for mutations, the mutant flies will be tested against wild type flies in egg laying and egg hatching experiments to see if the mutation has influenced the fertility of the flies. These experiments could impact our understanding human physiology as humans have also been shown to transfer RNA in their seminal fluid.

Keywords: Drosophila, CRISPR/CAS-9, RNA, sexual reproduction

Presenters:	Hadeel Khammash	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Hadeel Khammash & Amy Klocko

Title: Analysis of Efficacy and Efficiency of CRISPR Gene Editing in Fission Yeast

Abstract: CRISPR gene editing has the potential to make precise genome changes. However, the efficacy of this approach can vary. A goal of our work is to evaluate CRISPR targeting one gene in fission yeast. Yeast with changes to the AVT5 gene should gain the ability to grow on salt, a condition that normally kills the cells. Data from a lab experiment with unexpected results was used as a basis for this study. Yeast had been transformed with a CRISPR construct targeting the AVT5 gene and were being tested with salt plates to identify salt-tolerant yeast. Oddly, all yeast grew on the salt, even yeast that did not receive the CRISPR construct. Sequencing the AVT5 gene showed that there was no genetic changes, which mean the amount of salt was too low and that the targeting did not work. Therefore, we decided to identify a lethal dose of salt and to repeat the yeast transformation to gain more colonies for testing. In brief, competent yeast are transformed with the CRISPR plasmid and grown for colonies before testing on salt. Salt-tolerant colonies are isolated, DNA purified, and sent out for genetic analysis. Experimental yeast samples are compared to WT DNA, and success is indicated by genetic changes in the AVT5 gene. Success with such experiments can be seen in large scale medical experiments on diseases like muscular dystrophy and the work that is being done to aid in advance the research done to potentially treat diseases like this in the future.

Keywords: Yeast, gene sequencing, salt tolerance, CRISPR

Presenters:	Kaylani Manglona	Graduate Student	College of Letters, Arts and Sciences	Biology

Authors: Kaylani Manglona

Title: Human Evolution in the Mariana Islands through CHamoru Medicine

Abstract: Health in the Mariana islands were historically supported by Indigenous CHamoru healers known as makana, who were described by the colonial Spanish as suruhanu/a. Despite close geographic location, each island within the Mariana Archipelago maintains differences in microenvironments which may have affected the availability of medicinal botanica and relate to disease prevalence found on excavated skeletons. Stemming from the lack of epidemiological data from the Commonwealth of the Northern Mariana Islands (CNMI), this study aims to understand current perspectives and usage of CHamoru traditional medicine and Western biomedicine as they relate to health on Rota Island, CNMI. 33 individuals located across Songsong and Sinapalo villages were formally interviewed regarding their healthcare experiences as well as opinions on overall public health in the CNMI. Study results indicate that though contemporary suruhana continue to struggle with microenvironmental issues regarding plant availability, health and disease prevalence are perceived to be critically attached to regional economic instability (76%), changes in indigenous lifestyle (82%) and consequences of remote healthcare (73%). Participants express preference for traditional medicine to solve every-day acute ailments, but preferred biomedicine for chronic ailments. Their preferences suggest that chronic diseases stemming from post-colonial consequences are best treated by biomedicine. Specific individuals also suggest that medical choices are actively becoming indicators of class status amongst younger generations that further impact the instability of indigenous medicine. Emergent questions regarding CNMI cultural and environmental preservation, the possibility of complementary medicinal practices, and the current state of CHamoru Indigenous preservation are discussed.

Keywords: Biological Anthropology, Medical Anthropology, Traditional Medicine, CAM, Alternative Medicine, Postcolonialism, Disease Prevalence, Epidemiology, Indigenous Studies, Micronesia, Asian Studies, Ethnography

---

Presenters:	Alexis Rayburn	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Alexis Rayburn & Emily Mooney

Title: A Decline in Lipid Storage by Miller Moths (Euxoa Auxiliaris) at Pennsylvania Mountain, CO

Abstract: Global change and vegetation loss has proven detrimental to many insect types. The purpose of this resampling study was to examine how lipid storage by miller moths at high elevation has changed over the last 40 years. To obtain our moth samples from Pennsylvania Mountain, CO, we used the same methods from the original study published in 1981. We trapped moths using a black light along an elevation gradient over 5 weeks in June-July. In the lab, the miller moths were sorted out by male and female. Their abdomens dissected, and a lipid extraction using chloroform was performed. Our findings indicate a decline in the lipid storage of the miller moths in the past four decades. The moths 40 years ago were able to build lipid storage over the summer to prepare for reproduction, where the moths this year lost a percentage of their lipid storage by the end of summer. Future work will examine how changes in lipid storage correlate with declines in alpine floral abundance.

Keywords: Lipid Storage, Extraction, Euxoa Auxiliaris, Resampling

---

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

Authors: Madison Simmons, Seta Aghababian, & Aaron Corcoran

Title: Determining the Cause of Bat Fatalities at Wind Turbines using 3D Thermal Videography

Abstract: Each year, hundreds of thousands of migratory bats are killed at wind turbines in the United States alone. Previous studies have indicated that bats may be attracted to the structures, but there is no consensus as to why. In a collaboration with Bat Conservation International, we are studying bats at two turbines at a wind farm in Iowa during peak migration season (July-October) of this year. Each turbine is being recorded with two calibrated thermal cameras to document three-dimensional (3D) flight trajectories of bats. The 3D data will provide spatiotemporal information of the bats in relation to the turbines as well as bat flight characteristics. We are processing the videos using custom Matlab software to automatically detect bats and re-construct flight paths. Currently, we have 694 hours of processed videos. We also spot-check videos manually by reviewing 15 second paired video clips every quarter hour to confirm the accuracy of the automated detections. Finally, we are in the process of manually reviewing 3-D flight tracks to eliminate false detections and categorize flight behavior. Preliminary observations show bats exhibiting a range of behaviors, including inspecting the turbines, flying in loops, and changing direction as they pass through the plane of the spinning turbine blades. The objective of this study is to understand bat behavior at wind turbines, determine risk factors, and help develop curtailment systems to reduce bat fatalities.

Keywords: Bat fatalities, bat behavior, wind turbines, 3D thermal videography

---

Presenters:	Meg Super	Graduate Student	College of Letters, Arts and Sciences	Biology

Authors: Meg Super

Title: Identifying genetic pathways that the RNA-binding protein Caper interacts in to regulate neurological behavior in Drosophila.

Abstract: Neurological disease is one of society's greatest public health challenges. Neurological disorders are prevalent, costly, and their underlying causes are poorly understood. RNA-binding proteins have been increasingly implicated in neurological diseases such as Amyotrophic Lateral Sclerosis, Fragile X Syndrome, and Epilepsy. Using the model organism Drosophila melanogaster, we are studying the role of the highly conserved RNA-binding protein Caper in the regulating neurological phenotypes. We have shown that Caper is involved in both the development and maintenance of the nervous system and interacts with the RNA-binding protein involved in Fragile X Syndrome, FMR1. Caper dysfunction results in behavioral phenotypes reminiscent of those seen in neurological disease, such as locomotor dysfunction, shortened life-span, and seizure-like behavior. Seizure-like behavior is also seen in flies with FMR1 dysfunction. The genetic pathway in which Caper functions to regulate seizure-like behavior remains unknown. We are conducting a modifier screen to identify other genes that Caper interacts with by observing enhancement or suppression of this phenotype. Based on immunoprecipitation, the Caper protein was also found to physically interact with the RNA-binding protein Imp. Imp may genetically interact with Caper to control the seizure-like behavior and brain size. Understanding these interactions and their behavioral and phenotypic outcomes is integral to understanding and mitigating neurological disease.

Keywords: neurobiology, neurological disease, seizures, molecular genetics, neurological behavior, Drosophila melanogaster, Fragile X Syndrome

---

Presenters:	Erika Tixtha	Graduate Student	College of Letters, Arts and Sciences	Biology

Authors: Erika Tixtha

Title: Exploring Fertility as an Aging Phenotype Impacted by Caper Dysfunction

Abstract: Declining fertility is a well-known characteristic of aging, and therefore it can be used to assess accelerated senescence in mutants of various genes. One such gene whose dysfunction causes aging-related phenotypes is caper, which encodes an RNA-binding protein involved in alternative splicing. Previously, the Olesnicky lab has shown that in Drosophila, caper limits reproductive output in females; however, these studies were limited to the first ten days of life at reproductive maturity. Subsequent work examining lifetime reproductive output has confirmed this trend in both caper mutant and knockdown animals, and additionally has shown that caper knockdown females have a steeper drop in embryo production with age than their control counterparts. Future studies will contextualize these findings further by exploring differences in mating behaviors between caper mutants and their controls. Together, these experiments will afford a greater understanding of caper function, particularly in the fertility aging phenotype.

Keywords: Fertility, Caper, Aging

Presenters:	Robert Tolson	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Robert Tolson

Title: Detection of Diastatic Strains and Genomic Instability

Abstract: The brewing industry in Colorado employs more than 22,000 residents and has a $3.3 billion dollar impact on the economy. Colorado is home to over 400 breweries, which is the fourth most breweries per capita in the United States. To produce reliable, consistent results the breweries need to be able to quickly detect any type of contaminants. If not, this can lead to the loss of tens of thousands of dollars in ingredients and customer loyalty. Diastaticus yeast strains as well as genomically unstable yeast are two common contaminants. Diastatic strains cause secondary fermentations leading to off-flavors, over-carbonation, and in some cases exploding bottles, while genomic instability affects yeast fermentation efficiency and flavor. Here, I employed a combination of polymerase chain reaction strategies and a microbiological plating assay to detect the presence of these contaminants. Using primers specific for the extracellular STA1-encoded glucoamylase together with Lin's Cupric Sulfate Medium, I was able to detect diastaticus at a 1:108 dilution. Experiments to determine if primers specific to a brewing yeast transposon can provide a readout of genomic instability are currently underway.

Keywords: Brewing, Diastatic strain, Polymerase chain reaction

---

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

Authors: Stevi Tomlinson & Bridget Farwell

Title: Identifying genes that interact with caper in the nervous system of Drosophila melanogaster

Abstract: Caper is an RNA binding protein that is especially important in post-transcriptional gene regulation including alternative splicing. Mutations in the caper gene have been found to cause myriad neurological phenotypes in Drosophila melanogaster. Caper is highly conserved and the human ortholog, RNA binding protein RBM 39, is expressed in human neural tissue. Nonetheless, little is known, apart from our own work, about the function of caper in neurogenesis and neurodegeneration. A key step in discerning caper function is identifying other genes that interact with caper to begin to place caper within a genetic pathway. To identify genetic interactors of Caper we are performing a screen that looks for genes that can modify a shortened lifespan phenotype in caper mutant animals. Here we report the results of our ongoing study, where we have identified multiple enhancers of the lifespan phenotype and a single suppressor. Establishing which genes caper interacts with will help to illuminate the molecular pathways caper functions in, as well as, illuminating how caper dysfunction contributes to the manifestation of neurological disorders.

Keywords: Caper, Interacting genes, Genetic Screen, Drosophila,

---

Business Management Presentations

Presenters:	Brian Pierce	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Brian Pierce, Riley McGarth, Xiaoyin Li

Title: Strategic Information Management

Abstract: Strategic Information Management Dr. James Van Scotter II Xiaoyin Li, Riley McGrath, Brian Pierce Current trends in information technology, the internet of things, and artificial intelligence are prompting a change in the way companies and managers must address data in the workplace. Managers are taught how to manage people but often not taught effective ways to manage the way employees interact with data. This study is comprised of a meta-analysis of existing management literature with an emphasis on information security. This literature review was used to build an information security climate survey that has been adapted from reviewed and established safety, climate, and medical surveys. We are hoping to identify personality traits and behaviors associated with the most effective information security management practices and develop a framework to guide further research.

Keywords: Business, cybersecurity, leadership, management, information security

Chemistry and Biochemistry Presentations

Presenters:	Sarah Aragon	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Sarah Aragon & Ronald Ruminski

Title: Synthesis and Characterization of a New Rhodium Complex, [Rh(dpop')(3,6-bis(2'-pyridyl)pyridazine)Cl](PF6)2.

Abstract: The molecule, [Rh(dpop')(3,6-bis(2'-pyridyl)pyridazine)Cl](PF6)2, was synthesized and characterized by UV-Vis electronic absorption spectroscopy, electrochemical analysis, and NMR spectroscopy. The UV-Vis spectra confirmed the presence of the two ligands bonded to Rhodium due to the observed p(π)->p(π *) intraligand transition peak shift compared to the un-complexed ligands. The electrochemical analysis further supported the presence of the synthesized molecule. 1H and 2D -COSY NMR spectra are also consistent with 2 possible product isomers.

Keywords: Inorganic Chemistry, Synthesis, Photodynamic therapy

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

Authors: Jen Burrows & Amanda Morgenstern

Title: In Search of Better Medicine: Computational Analysis of Drug Candidates for Human African Trypanosomiasis

Abstract: Human African Trypanosomiasis (HAT), also known as African Sleeping Sickness, is a disease that affects sub-Saharan Africa's rural populations and is carried by the parasite Trypanosoma brucei (T. brucei). HAT causes severe physiological and neurological symptoms and is typically fatal if treatment is not pursued. Inhibition of T. brucei's glycogen synthase kinase-3 (GSK3) enzyme, which is essential for cell growth, results in parasitic death. This project uses computational methods to understand ligand binding within the GSK3 enzyme for the purpose of proposing novel inhibitors. Indirubin derivatives were docked in GSK3 using HADDOCK. Key residues within GSK3's active site were determined, and the active site systems were imported into Amsterdam Density Functional (ADF) to analyze ligand interactions using density functional theory (DFT). Current work with DFT modeling involves evaluating the docked systems with quantum theory of atoms in molecules (QTAIM) and energy decomposition analysis (EDA) to understand the details of binding within GSK3's active site. Specific properties undergoing investigation include binding energies of ligands, ring and cage critical points, and types of bonding interactions between similar ligands. These properties are used to identify important interactions between potential drugs and specific active site residues, which can be used to guide design of novel drugs for further experimentation.

Keywords: parasite, computational, drug, kinase

Presenters:	Natalie Church	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Natalie Church

Title: Using CRISPR to Modify the Yeast Genome

Abstract: Typically, the wine, beer, and bread yeast, Saccharomyces cerevisiae, does not digest starch. We are investigating the use of CRISPR to aid target-specific integration of the DNA for mouse alpha-amylase into the yeast genome. While the cloning protocols on which we have embarked have been daunting, this research has expanded our approach to cloning and opened new conversations on how to utilize biochemical techniques for cloning. Successfully integrating this gene into the yeast genome would enable the yeast cell to secrete the enzyme amylase which breaks down starch to glucose and maltose. These small molecules diffuse into the yeast cell where glucose is fermented, generating ethanol. Relying on the yeast cell to "do all the work" would decrease cost and increase efficiency for breweries. Furthermore, depending on the starch source, this process could be used as a sustainable source of energy.

Keywords: CRISPR, cloning, α-amylase, biofuels, Homologous recombination

---

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

Title: Computational Predictions of Electric Field Effects on HCN Reaction Rates

Abstract: One model for a chemical bond draws on the attracting and repelling forces between nuclei and electrons in molecules. Electric fields can be used to describe these forces. One theory for the catalytic power of enzymes suggests a reorganizing electrostatic field in the active site is the determining factor increasing the rate of reactions. It has also been shown that an applied external electric field (EEF) may be used to alter reactivity by controlling the exchange of electrons and charge transfer within a reaction. Both experimental and computational studies have demonstrated how an applied EEF can alter reaction favorability or increase product selectivity for certain reactions. An EEF is an appealing experimental alternative to traditional solvents and catalysts considering the possible lower cost and reduced environmental impact. A better fundamental understanding of how electric fields rearrange electron charge density and change activation barriers is first necessary before electric fields can be presented as a feasible experimental method. Towards this end, the presented work explores the isomerization of HCN in the presence of an EEF using density functional theory (DFT). Reaction rates are calculated with positive and negative EEFs applied along each bond in HCN as well as with no EEF. Changes in the charge density in response to the EEF are analyzed using the Quantum Theory of Atoms in Molecules (QTAIM), which provides a full representation of the charge density of the system. Computational results are then compared to experimentally observed reaction rates for the HCN isomerization.

Keywords: HCN isomerization, electric field, reactivity, electron charge density, computational chemistry, reaction rates

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

Title: Bioengineering of a Haloalkane Dehalogenase for the Bioremediation of Perfluorinated Compounds

Abstract: High levels of toxic contamination of perfluorinated compounds, PFCs, found in the Southern Colorado Springs Metro Area have been measured in drinking water and degraded in organisms found originating at Peterson Air Force Base, one of approximately 2,000 Department of Defense known chemical spill sites. They have been known to cause significant health effects such as affecting fetal growth and development, cancer, and injury to vital organs in exposed populations. PFCs are both long-lived and toxic, and limited governmental resources for impact investigation make the proposed work both urgent and of inherently high impact to the citizenry of southern Colorado. Methods such as filtration and carbon sorption are ineffective and expensive, so alternative methods are needed to remove them. Here we propose a method of bioremediation to defluorinate PFCs using enzymes bioengineered to degrade per-fluorinated compounds. This method is a better alternative than the previously proposed methods since the enzyme works to remove the fluorine atoms, as fluoride ions, from the compound. This makes degradation more efficient and better for the environment rather than re-locating the toxic compound to another site, which would thus increase the total amount of PFC contamination. A haloalkane dehalogenase protein from a marine Rhodobacteracea was expressed using standard bacteriological protein expression. The enzyme was then purified using affinity chromatography, purity was monitored using FPLC and SDS-Page gels. We are currently modifying known dehalogenation assays to measure the inherent de-fluorination of our enzyme before testing optimized enzymes. Our next steps begin by modeling the active site to drive the bioengineering of the enzyme by locating and identifying important amino acids for mutagenesis.

Keywords: PFCs, bioengineering, protein synthesis, biochemistry, EPIC

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

Authors: Alayne Graybill & Ashley Ward

Title: Assessing changes in the genomic organization of Neurospora crassa upon altering epigenetic marks

Abstract: Eukaryotic DNA is comprised of two general forms of chromatin: active euchromatin and silent heterochromatin, each of which possess epigenetic marks involved in regulating gene expression. These chromatin forms are then further organized into active and silent "compartments" where DNA loops facilitate long-range interactions (1-4). The mechanisms underlying this organization are not fully understood and it is unknown whether changing levels of epigenetic modifications would impact long-range interactions. This work explores how variations in epigenetic marks alter genome organization by using the filamentous fungus, Neurospora crassa, which has similar DNA compaction to humans, but a smaller genome which is amenable to high-throughput chromosome conformation capture sequencing (Hi-C) methods. Genome organization was characterized in multiple Neurospora strains containing deletions of genes encoding proteins found within silencing complexes, specifically the histone deacetylase complex (HCHC). In Neurospora, the HCHC removes active acetyl groups from histones thereby silencing chromatin. Deletion of HCHC genes results in increased histone acetylation as well as changes in DNA methylation within heterochromatic regions in a sized-dependent manner. Genome organization of mutant strains lacking the HCHC members CDP-2 and CHAP were assessed. Here, we present the findings of these mutant strains where the loss of HCHC members caused genome wide organizational changes and detail additional research of a double mutant strain lacking CDP-2 and the DNA methyltransferase DIM-2 to elucidate if these genome changes are a result in the altered histone acetylation or DNA methylation. All told, this research suggests that epigenetic marks play a role in organizing the genome of eukaryotic organisms.

Keywords: Neurospora crassa, fungi, DNA, epigenetics, genomic organization

Presenters:	Emily Hanson	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Emily Hanson, Luis Lowe, Amy Klocko, & Janel Owens

Title: Assessing Levels of Perfluorinated Compounds in the Fountain Creek Watershed: The Case of the Missing PFOA

Abstract: Perfluorinated chemical (PFC) contamination in drinking water, surface water, ground water, and soil in southern Colorado Springs metro area has been on significant national, regional, and local research interest since initial reports of contamination were disclosed in 2016. Previous work in our laboratory focused on determining levels of nine individual PFCs in surface water, soil, and sediment samples collected at eight locations in the Fountain Creek Watershed. It was found that the total PFC concentration in water was over 1.5 times higher than the EPA health advisory limit of 70 ng/L (which is for PFOS and PFOA only). It was also previously found that the soil samples collected from near creek beds had mainly absorbed the higher chain PFC compounds (PFOS, PFOA, and PFHxS) with generally good agreement between predicted and determined concentrations, especially for PFOS. In the case of PFOA, however, we found much less of the compound in the soil compartment than expected. The questions asked: Where is the missing PFOA? Are trees bioaccumulating this PFC? And can we find other PFC contaminants in tree samples? In this present study, funded by the Undergraduate Research Academy (URA) and LAS Dean's Research Initiative, PFC concentrations in tree leaf samples were determined via solid phase extraction (SPE) and liquid chromatography tandem mass spectrometry (LC/MS/MS). PFC contamination was determined to be present in three differing tree leaf samples: cottonwood, Russian olive, and willow trees in both Fountain Creek watershed and at Monument Creek, with mean levels of PFOA found up to 0.7 ng/g (parts per billion). Other significant PFCs found in tree leaf samples from both locations included PFBS and PFHxA.

Keywords: Perfluorinated alkyl substances, Liquid chromatography mass spectrometry, Solid phase extraction, Watershed contamination

---

Presenters:	Sabrina Harrell	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Sabrina Harrell & James Kovacs

Title: Annexin A2 interactions with Factor H protein and 3C6 antibodies

Abstract: The complement system plays a role in aiding the innate immune system and is classified by three different activation pathways: classical, lectin, and alternative. The alternative pathway focuses on clearing out pathogens through the use of regulatory proteins, which activates the pathway on host cells, making it easier to identify the pathogens that enter the body. Factor H has been shown to suppress the alternative pathway; therefore, any mutations in the factor H protein may lead to spontaneous activation of the pathway. In addition, annexin A2 binding to factor H can lead to spontaneous activation of the alternative pathway. When annexin A2 interacts with factor H, it inhibits factor H from binding to the alternative pathway thus leading to activation of the pathway when not needed. Binding certain antibodies to annexin A2 has been found to be useful to stop the interaction with factor H. The goal of this study is to determine the binding affinity of antibodies, 3C6 and 3C6-Crry, to annexin A2 compared to the binding affinity of annexin A2 to factor H in both humans and mice proteins.

Keywords: Annexin A2, mouse fH, human fH, 3C6-crry, 3C6, alternative pathway, protein interactions, binding affinities

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

Authors: Tiffany Lundberg & Alekzandyr Schaff

Title: Evolution of Fungal Genome Organization

Abstract: The information in eukaryotic DNA is stored as genes – units of transcription that encode proteins necessary for the proper cell function. DNA is packaged in eukaryotic nuclei as chromatin – an association of DNA and protein controlling DNA regulation. Chromatin can either be expressed (euchromatin) or silenced (heterochromatin). One of the mechanisms controlling gene expression is how chromatin is organized in the nucleus. Macroscopically, heterochromatin associates, yet is segregated from euchromatin. However, it is unknown if genome organization influences fungal gene expression microscopically, or if genome organization changes as fungi evolve and speciate. To this end, we are comparing genome topology in four species of the fungal Ogataea clade. To explore genome organization, we use chromosome conformation capture coupled with high-throughput sequencing (Hi-C). The well-known Ogataea polymorpha is used for industrial protein production, and it is our control species to compare evolutionary changes in genome topology in other Ogataea species. Contact matrices, showing genomic organization for O. polymorpha, as well as the closely related species O. parapolymorpha and O. haglerorum show chromosome-wide euchromatin compaction and independent clustering of either centromeres or telomeres. To examine the underlying chromatin in O. polymorpha, we performed Chromatin Immunoprecipitation-sequencing to assess the enrichment of activating post-translational acetylation and tri-methylation on histone tails across the O. polymorpha genome, with the future goal of assessing if changes in epigenetic mark placement could drive altered genome topology. Here we present our analysis of the evolution of genome organization and epigenetics in closely related Ogataea species.

Keywords: Evolution, Genome, fungi, organization, epigenetics, chromatin,

Presenters:	Anya Peaux	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Anya Peaux, Megan Royal & Luis Lower

Title: Determine if Isomerized Alpha Acid Concentrations at Early Brewing Stages Can Accurately Predict Finished Product IBU.

Abstract: This study evaluated the relationship between the wort stage of beer brewing and the finished beer that can be contributed to the isomerized α-acids (IAAs) from the hops plant, Humulus Lupulus. The concentration of IAAs imparts a bitterness flavor to the beer that is measured as an International Bitterness Unit or IBU. Hazy beer samples were collected from the Goat Patch Brewery in Colorado Springs. These samples were extracted using isooctane, then evaluated with a UV-Vis spectrophotometer and high-performance liquid chromatography (HPLC). An International Calibration Extract (ICE-3) was used as a standard for HPLC data evaluation. HPLC data indicated that the IAAs (cohumulone, adhumulone, and humulone) decreased during fermentation. The IBU also decreased from the wort stage (average 156, standard deviation ±56) to the finished beer (average 59, standard deviation ±9), indicating that the wort IBU had a greater IBU range than the finished beer IBU range.

Keywords: beer brewing, IBU, IAAs, HPLC, UV-Vis spec, hops

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

Authors: Daniel Soto, Chad Sallaberry & Crystal Vander Zanden

Title: Monomeric Amyloid β Induces Membrane Disruption in in vitro DMPG Monolayer

Abstract: Alzheimer's disease is the 6th leading cause of death in the US, affecting more than 6 million Americans over the age of 65 years old. Monomeric amyloid β (Aβm) protein aggregation has been proposed to induce membrane-mediated toxicity in Alzheimer's disease by disrupting lipid packing and nucleating fibrillation. Amyloid formation is hypothesized to occur through the aggregation of intrinsically disordered monomeric species, forming larger, more stable aggregates with increasing β-sheet composition. In this study we propose an *in vitro* model of intrinsically disordered Aβm interacting with negatively charged DMPG lipid monolayer. Protein-lipid interaction was assessed via Langmuir trough assays by observing changes in membrane surface pressure (π). Experiments were conducted at a surface pressure of 25 mN/m to resemble biological membrane dynamics. 500 nM Aβ was injected into a water subphase beneath a DMPG monolayer to measure protein insertion. Aβ inserted into the membrane after a three-hour lag phase, reaching a maximum π of ~27 mN/m. This result diverges from previously collected measurements demonstrating a one-hour lag phase and π of ~30 mN/m. Deposition of 35 µL DMPG and 80 µL Aβm (1.0 µM) exhibited an increase in max π (~30 mN/m) and decrease in lag phase (2 hours). Using a different protein stock demonstrated similar lag phase results. Overall, increased lipid deposition and protein concentration resulted in a shorter lag phase and higher maximum π, respectively. However, this correlation changed when different Aβm protein stock was used, suggesting monomeric species may have aggregated into oligomeric structures in solution.

Keywords: Alzheimer's disease, Langmuir Trough, Amyloid beta, membrane

---

Presenters:	Kyle Talley	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Kyle Talley & Wendy Haggren

Title: Identifying Genetically Modified Food Products Using PCR

Abstract: A large portion of the soybeans, cotton, and corn grown in the United States are genetically modified by the addition of foreign genes, the products of which protect crop plants from herbicides or insects. Investigating this phenomenon is a great way to teach PCR technology in high school and undergraduate level laboratories as evidenced by peer-reviewed literature and available kits. We propose to enhance the student laboratory experience at the University of Colorado Colorado Springs and deepen student experiential learning by updating published protocols to those methods currently used in our research lab, including identifying the specific genes cloned into plants, e.g., the "Round-up Ready gene (EPSPS) or the Bacillus thuringiensis toxin gene (Cry1Ab).

Keywords: PCR, Genetically Modified Plants (food crops)

Presenters:	Loren Taylor	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Loren Taylor

Title: Approaches to the Synthesis of Ditriazoles

Abstract: The syntheses of four *o*-xylyl ditriazoles were performed using uncatalyzed (Huisgen), copper catalyzed (Sharpless), and coppercarbene-catalyzed, solventless methods. α,α-Diazido-*o*-xylene was prepared from the *o*-xylyl dibromide for use in each of the three synthetic approaches. Each method provided satisfactory yields of products upon reaction with common terminal alkyne reactants. For reactions of internal alkynes, only the uncatalyzed method was used with microwave heating. Product isolation and purification proceeded readily as many of the ditriazole products crystallized during workup. The copper catalyzed (Sharpless) method was preferred, as the solventless method requires enough of one reagent be liquid and the uncatalyzed reaction requires a chromatographic purification step.

Keywords: ditriazoles, synthesis, cycloaddition, CuACC

Presenters:	Bailee Troutman	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Bailee Troutman, Noah Thompson & Ian Wisniewski

Title: A visible chromoprotein as a model for bacterial expression of an antimicrobial protein

Abstract: The color of sea anemones is produced by expression of chromoproteins. Our lab has engineered one of these chromoproteins to act as a reporter for non-native protein expression in E. coli cells, a system we will use as a model for expression of an antimicrobial peptide. In addition to seeing a bright pink color under various growth conditions, cells have been cracked open and this chromoprotein identified from among other cellular proteins. In our laboratory, we have determined that wildtype MG1655 E. coli cells were efficient at expressing this pink chromoprotein. Precise cellular localization of the protein, in the cytoplasm, periplasm, or extracellular environment has not yet been determined. The purpose of these studies is to gain an understanding of how to manipulate E. coli to fully or partially secrete a functional antimicrobial peptide that has been shown to selectively kill mammalian tumor cells.

Keywords: chromoprotein, protein expression, antimicrobial peptides

---

Presenters:	Barbie Voss	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Barbie Voss, William Stone & Crystal Vander Zanden

Title: Membrane-mediated protection against the toxic peptide associated with Alzheimer's disease by green tea and turmeric-derived compounds, epigallocatechin-3-gallate (EGCG) and curcumin

Abstract: Alzheimer's Disease (AD) is a neurodegenerative disease that affects 5.8 million Americans 65 years and older. Amyloid beta (Aβ), the primary component in AD plaques, is hypothesized to be toxic to cellular membranes where it interacts and nucleates fibril formation from its monomeric, fibrillar oligomer (FO), and non-fibrillar oligomer (NFO) peptide forms. Epigallocatechin-3-gallate (EGCG) is a water-soluble compound from green tea and has been identified to inhibit Aβ beta sheet formation by redirecting protein assembly pathways. Curcumin is a polyphenolic compound found in turmeric that has demonstrated neuroprotective by membrane interactions that block Aβ binding. The interactions between Aβ, a model cellular membrane, and EGCG were examined using a Langmuir trough. Preliminary results indicate that when Aβm is pre-mixed with EGCG there is no change in Aβm insertion into the monolayer. Molecular dynamic simulations were performed on a model cell membrane that contain Aβ+curcumin or FO+curcumin. Membrane thickness was analyzed, and it was determined that the addition of curcumin decreased the thickness in the region. The frequency of interactions between curcumin and Aβ was compared to the probability of random interaction based on the composition of amino acids in Aβ-40. Results indicate that curcumin has a preferential binding to non-polar and cationic residues. These initial results are preliminary data to investigate the efficacy of curcumin and EGCG as potential therapeutics for AD, but more analysis needs to be done.

Keywords: Alzheimer's disease, neurodegenerative disease, molecular dynamics, lipid monolayer, curcumin, EGCG, Amyloid-beta

---

Presenters:	Chandler Webb	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Chandler Webb, Wendy Haggren & James Kovacs

Title: Expression of α-amylase from two in-frame ATG start translation codons

Abstract: Studies of the expression of the mouse α-amylase gene, carried on extra-chromosomal plasmids, have shown that in the yeast Saccharomyces cerevisiae, the mammalian enzyme is synthesized, secreted, and functional. Yeast expression vectors selected for the study were expected to show graduated—low to high—amounts of amylase production because the plasmid vectors varied in copy number and strength of the yeast-regulated promoter. Results in biological systems differed from predicted. Examination of the DNA sequence revealed that the α-amylase gene-fragment contained two in-frame ATG or "start translation" codons, a phenomenon thought to enhance regulation by the cell. The goal of this experiment was to establish the level of α-amylase expression by yeast when only the ATG codon closest to the coding sequence for α-amylase was present

Keywords: Yeast Gene Expression, ATG Codons, Translation Regulation

---

Presenters:	Brent Windebank	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Brent Windebank, Rachel Kvaal, Wendy Haggren & Andy Klocko

Title: Examining Microbial Community Composition in the Fountain Creek Watershed following Exposure to Perfluorinated Compounds

Abstract: Perfluorinated compounds (PFCs) historically have been used in products such as Teflon® and fire retardants but have recently undergone scrutiny for negatively impacting human health and the environment. Extensive use of PFCs at military installations surrounding Colorado Springs have led to accidental release of these potentially detrimental compounds in our water resources, soil, wildlife, and vegetation. PFCs have been detected in the Fountain Creek watershed of southern Colorado Springs and surrounding rivers. Our goal is to determine the impact of PFCs on the composition and diversity of microbial communities, identifying microorganisms that can survive on and potentially catabolize PFCs. To this end, we applied a well-established method to specifically identify fungal and bacterial species by isolating DNA from PFC-contaminated and control soil samples, amplifying the variable regions of ribosomal genes by Polymerase Chain Reaction (PCR), and subjecting rDNA amplicons to Next-Generation High-Throughput Sequencing. As workflow proof of principle, we 1) correctly identified laboratory strains of microbes following the cloning and Sanger sequencing of ribosomal DNA amplicons; and 2) identified several species from cloned ribosomal DNA amplicons from soil samples. Our initial high-throughput sequencing results show a vastly different array of bacterial and fungal species in PFC-contaminated soil including thousands of uncharacterized species. Several bacterial phyla stand out, including Proteobacteria (genus *Rhodobacter*), Bacteroidetes (genus *Flavobacteria*), and Acidobacteria. This methodology will characterize the soil microbial communities from the PCF-contaminated soil of the Fountain Creek River in Colorado Springs, possibly revealing microbial species selectively adapted for PFC resistance for future purposes of bioremediation.

Keywords: Perfluorinated Compounds (PFCs), Earth Microbiome Project (EMP), Watershed, Soil, QIIME, Next-Generation Sequencing (NGS)

Computer Science Presentations

Presenters:	Victor Akpokiro	Graduate Student	College of Engineering	Computer Science

Authors: Victor Akpokiro, Oluwatosin Oluwadare, & Jugal Kalita

Title: DeepSplicer: An Improved Method of Splice Sites

Abstract: Post-transcriptional splicing of ribonucleic acid (mRNA) entails removing regions of RNA sequences (Introns) that do not include information for protein synthesis. Thus, accurate splicing site detection is integral for understanding gene structure and, as a result, protein synthesis for biological and medicinal applications. However, the necessity to develop an advanced computational algorithm arises because existing splice site (SS) prediction methods are either computationally inefficient or expensive. Considering this, we present DeepSplicer– a deep learning-based Convolutional Neural Network (CNN) model for locating splice sites. In this work, we compared the ability of the existing SS prediction algorithms model to identify SS in organisms– Homo sapiens, Oryza sativa japonica, Arabidopsis thaliana, Drosophila melanogaster, and Caenorhabditis elegans– to ours. Using a 5-fold cross-validation test, DeepSplicer achieves an accuracy of 96.65% for the acceptor homo sapiens dataset and 94.75% for the donor homo sapiens dataset. The datasets used and models generated are available at our GitHub repository here: https://github.com/OluwadareLab/DeepSplicer.

Keywords: Deep Learning, Spice Site, Convolutional Neural Network, Ribonucleic Acid, Genome

---

Presenters:	Vijay Banerjee	Graduate Student	College of Engineering	Computer Science

Authors: Vijay Banerjee & Gedare Bloom

Title: Secure Boot in Restart-based Cyber-Physical Systems

Abstract: Cyber-Physical Systems (CPS) often use Commercial off-the-shelf (COTS) components to gain performance improvement with a shorter development timeline. To account for the possible security vulnerabilities in the COTS component, the CPS systems use the Simplex architecture that combines the high-performance controller with a safety controller to maintain system availability. In case of an attack, some systems restart the complex controller and transfer the control to the simple and reliable component. However, if the attacker manipulates the Operating System (OS) image, the system can still execute the malicious code injected by the attacker. To address this, we're proposing a secure boot mechanism for the restart-based CPS to check the system integrity on every restart.

Keywords: Secure Boot, Cyber-Physical Systems

Presenters:	Brendan Gould	Undergraduate Student	College of Engineering	Computer Science

Authors: Brendan Gould & Phillip Brown

Title: On Partial Adoption of Vehicle-to-Vehicle Communication: When Should Cars Warn Each Other of Hazards?

Abstract: The emerging technology of Vehicle-to-Vehicle (V2V) communication over vehicular ad hoc networks promises to improve road safety by allowing vehicles to autonomously warn each other of impending road hazards. However, research on other transportation information systems has shown that informing only a subset of drivers of road conditions may have a perverse effect of increasing congestion. In the context of a simple (yet novel) model of V2V hazard information sharing, we ask whether partial adoption of this technology can similarly lead to undesirable outcomes. In our model, drivers individually choose how recklessly to behave as a function of information received from other V2V-enabled cars, and the resulting aggregate behavior influences the likelihood of accidents (and thus the information propagated by the vehicular network). We fully characterize the game-theoretic equilibria of this model. Our model indicates that for a wide range of our parameter space, V2V information sharing surprisingly increases the equilibrium frequency of accidents relative to no V2V information sharing, and that it may increase equilibrium social cost as well.

Keywords: Game Theory; Distributed Control; Road Safety Optimization

---

Presenters:	Krenar Këpuska	Graduate Student	College of Engineering	Computer Science

Authors: Krenar Këpuska & Jugal Kalita

Title: A survey of Cybersecurity Issues in Higher Education Institutions

Abstract: Data breaches in academic institutions are becoming prevalent, especially in the post-Covid era. Universities, colleges and academic institutions in western Balkan countries have a significant lack of cybersecurity culture and integrated governance. In this paper, we present a survey of data theft and attacks concerning universities and colleges, followed by a discussion of vulnerabilities in e-learning platforms. We especially investigate cybersecurity vulnerabilities for universities, located in western Balkan countries. Our analysis was conducted using penetration test methodology and manual inspections. The main purpose of the survey is to review cybersecurity challenges in higher education, especially vulnerabilities that exist in learning management systems used in western Balkan higher education institutions. For future work, in order to improve cybersecurity protections for specific HEIs, a lightweight framework with proactive controls we emphasize the need for developing, is urgently needed.

Keywords: CyberSecurity, Higher Education Institutions, Vulnerabilities, Frameworks, Cybersecurity Culture, Western Balkan

---

Presenters:	Farhad Mofidi	Graduate Student	College of Engineering	Computer Science

Authors: Farhad Mofidi, Erik Guy, & Juan Hernandez

Title: An Exploration on Leveraging Amazon Web Services to Re-design UCCS Network

Abstract: UCCS network is complex and securing it is a daunting challenge. As a scientific exploration project, we ask the following question: If we are tasked to re-design the UCCS network from scratch and we are permitted to leverage Amazon Web Services (AWS), how would we do it and what security assurance would be obtained? In this study, we describe our design objectives, the corresponding system model and threat model, and our security architecture for achieving the security objectives against the threats in the threat model. We discuss how to instantiate the security architecture with specific cryptographic and other defense mechanisms. We analyze the security properties of the resulting system and report the performance of some prototype implementations. We draw insights into the lessons we learned, such as why it is so challenging to securing real-world complex networks.

Keywords: AWS, cryptography, network design

Presenters:	Jim Peng	Graduate Student	College of Engineering	Computer Science

Authors: Jim Peng, Gedare Bloom, & Shouhuai Xu

Title: Comprehensive Analysis of Vulnerabilities Exploited by Ransomware

Abstract: In legacy literature, the taxonomy for ransomware tend to enumerate 1) Locker, 2) Crypto Locker, 3) Scareware, and even other subcategories under Malware. However, in the modern taxonomy, CISA define ransomware as only the prominent crypto lockers: Ransomware are ``a form of malware designed to encrypt files on a device, rendering any files and the systems that rely on them unusable. Malicious actors then demand ransom in exchange for decryption.'' Unfortunately, under current CVEs- and CVSS- based vulnerability management frameworks, CVEs exploited by malware have high false positive and false negative rate, let alone by ransomware. Only 2.2% of CVEs in the database were finally weaponized. As ransomware have grown to be the major threat in the cyber space—20 billions USD ``business'' by the end of 2021—it is important to perform a comprehensive analysis on ransomware. We have researched ransomware based on 1) Ransomware-focused Surveys and SoKs, 2) Architecture Vulnerability Analysis, 3) MITRE ATT&CK Enterprise and Mobile, 4) CVE and CVSS frameworks, 5) Commercial Reports, 6) Notable Ransomware Research on a) Detection, b) Prevention, c) Recovery of Files, d) Recovery of Key Vault, e) Cryptocurrency or E-Money Tracing. We hope our work to be the first cornerstone of Ransomware Vulnerability Management.

Keywords: Vulnerability management, ransomware, computer architecture, reverse engineering

---

Presenters:	Katrina Rosemond	Graduate Student	College of Engineering	Computer Science

Authors: Katrina Rosemond

Title: Facilitating Automotive Research: Building a CAN IDS Hardware Research Platform

Abstract: The average modern vehicle can be thought of as a network on wheels executing millions of lines of code, as shown in Chart 1. Embedded microcontrollers, also known as electronic control units (ECUs), execute this code in order to control functionality within a vehicle from infotainment to safety-critical components like braking. One network used for ECU communication is the controller area network (CAN). CAN was originally created to be an internal-only network and therefore was designed without security in mind. However, with emerging automotive technologies like autonomy and Internet of Things (IoT) device connectivity, the number of attack surfaces within an automobile continues to increase and expose vulnerabilities within CAN bus. Attackers can use these vulnerabilities to access the network and gain control over ECUs. Therefore, the CAN needs to be hardened to prevent attacks against safety-critical features. While previous work has shown that intrusion detection systems (IDSs) can help harden the CAN bus, these works are often difficult to reproduce and validate due to challenges including limited access to intellectual property (IP) and implementation expenses. Thus, the objective of this research is to enable valid and reproducible CAN IDS research by creating a platform for experimentation and validation.

Keywords: Controller Area Networks, Automotive Security, Field Programmable Gate Arrays (FPGAs)

Presenters:	Abigail Swenor	Undergraduate Student	College of Engineering	Computer Science

Authors: Abigail Swenor & Jugal Kalita

Title: Using Random Perturbations to Mitigate Adversarial Attacks on Sentiment Analysis Models

Abstract: Attacks to deep learning models are often difficult to identify and therefore are difficult to protect against. This problem is exacerbated by the use of public datasets that typically are not manually inspected before use. In this paper, we offer a solution to this vulnerability by using, during testing, random perturbations such as spelling correction if necessary, substitution by random synonym, or simply dropping the word. These perturbations are applied to random words in random sentences to defend NLP models against adversarial attacks. Our Random Perturbations Defense and Increased Randomness Defense methods are successful in returning attacked models to similar accuracy of models before attacks. The original accuracy of the model used in this work is 80% for sentiment classification. After undergoing attacks, the accuracy drops to an accuracy between 0% and 44%. After applying our defense methods, the accuracy of the model is returned to the original accuracy within statistical significance.

Keywords: Machine Learning, Natural Language Processing, Adversarial Attacks, Sentiment Analysis

---

Criminal Justice Presentations

Presenters:	Alex Remillard	Graduate Student	School of Public Affairs	Criminal Justice

Authors: Alex Remillard & Gia Barboza

Title: The impact of LGBT+ status, future orientation, and PTS on the relationship between ACEs and delinquency: a moderated mediation analysis

Abstract: Decades of research has documented the deleterious effects of cumulative and co-occurring adverse child experiences (ACEs) particularly among youth with a history of child welfare involvement. Less understood is the association between early child adversity and delinquent behavior among older youth who are aging out of foster care. The current longitudinal study employs a sample of 1,245 foster youth to examine the effect of ACE exposure on future delinquent behavior. We used structural equation modeling to test whether higher ACE exposure predicts future juvenile delinquent behavior (i.e., Time 2) and whether symptoms of post-traumatic stress mediate the ACE-delinquency relationship. We further explored the moderating role of sexual minority status and protective factors, operationalized as positive future orientation, on the association between ACEs, PTS and delinquency. Results indicate ACEs exposure predicts juvenile delinquency, and further that youth with more ACEs have higher levels of PTS which translates into a higher risk of delinquent behavior. Sexual minority status and future orientation moderated the effect of ACEs on PTS but not delinquent behavior. Implications for youth involved in the child welfare system are discussed in context.

Keywords: LBGT+, ACEs, trauma, delinquency, foster care, resilience, future orientation, moderated mediation

Electrical and Computer Engineering Presentations

Presenters:	Kevyn Kelso	Undergraduate Student	College of Engineering	Electrical and Computer Engineering

Authors: Kevyn Kelso & Byeong Lee

Title: Accordion AutoEncoders (A2E) for Generative Classification with Low Complexity Network

Abstract: Deep learning technologies are popularly used in many areas including recognition, identification, anomaly detection, classification, etc. Large network complexities requiring more computational resources and response time are a popular challenge. Generative models used in modern applications have lower dimensional latent spaces which can be manipulated to change features of the output. Recently, autoencoders have been used in dimension reduction, data reconstruction, etc. One of the disadvantages is the network size in which the architecture of the autoencoder has a double workload due to the encoding and decoding processes. In this paper, we explore a scheme to reduce the network complexity of the autoencoder. The motivation behind exploring different autoencoder architectures lies in their practical uses for the applications such as anomaly detection, classification, and their usages in generative models. Additionally, deeply understanding the mechanism to improve dimensionality reduction may lead to a better understanding of how the human brain finds meanings in data. We come up with an Accordion Autoencoders (A2E) architecture, as an effective performing solution to anomaly detection and classification problems, which is not necessarily a solution to dimensionality reduction, but rather a performance improvement for the problems using several sets of lower-dimensional space to generate more meaningful features of the data. Based on our experiments, the proposed solution provides the network size reduction (85.1%~94.5%) with maintaining the accuracy (4.9%~13.6% accuracy drop) in fraud detection and MNIST classification.

Keywords: autoencoders, deep learning, classification, anomaly detection, performance improvement, network reduction

Presenters:	Tristan Lee	Undergraduate Student	College of Engineering	Electrical and Computer Engineering
Authors:	Tristan Lee			

Title: Splatter: An Efficient Sparse Image Convolution Technique for Deep Neural Networks

Abstract: Deep neural network (DNN) based approaches, such as deep convolutional neural network (CNN), have achieved highly accurate results in many fields (e.g., computer vision, etc.) at the cost of a huge number of parameters and high computational workloads. The parameters require high memory capacity and memory access time which cause a migration problem to embedded devices. Pruning techniques can reduce the DNN complexity, but it brings sparsity in the matrix which causes computational inefficiency and performance loss. The reasons for the inefficiency include reduced data reuse opportunities, waste of memory bandwidth, and computational irregularity. Applying sparse matrix formats can help to improve inefficiency with a regular computational pattern of the sparse matrix (e.g., CSR), but it has a limitation to improve efficient data reuse and memory bandwidth. In this paper, we proposed the Splatter which is an efficient sparse image convolution technique for DNN. In the convolution sweep, non-zero input data will be multiplied by each kernel element and the outcomes will be accumulated into an output. Based on our observation, the proposed approach can reduce memory access by reusing the input data. We also use the proposed technique with a CSR (compressed sparse row) format. Our experimental results with sparsity 50%~90% show the Spatter can improve the execution time of sparse image convolution by 25%~81% with conventional matrix format, and 49%~90% with a CSR matrix format. Also, the number of input data accesses is reduced by 88~96% with the proposed convolution method.

Keywords: deep neural networks, performance improvement, sparse image convolution, sparse matrix, convolutional neural networks

Presenters:	Dongliang Lu	Graduate Student	College of Engineering	Electrical and Computer Engineering

Authors: Dongliang Lu, Gregory Plett, & Scott Trimboli

Title: Physics-Based Reduced-Order Lithium-Ion Battery Aging Model and Validation

Abstract: The modern lithium-ion battery controls must continuously effect a tradeoff between the power that the cell can deliver to its load and any additional degradation that may be experienced by the cell in so doing. The best available controls depend on accurate mathematical models (sets of equations) that describe both how the battery will respond in the short term to different power demands as well as how these demands will cause the cells to age. These models can be empirical, but the most promising models are based on knowledge of the internal physics of the cells, in which several particle-differential equations (PDEs) are coupled to describe the dynamics. While the PDEs are not ideal for solving in real-time, we have developed reduced-order forms that retain the fidelity from PDEs but are also applicable in real-time systems. Other than describing the cell dynamics, the cell internal properties are predicted by the model parameters. However, finding all parameter values is complicated in general, and traditional destructive experiments can be very expensive to perform. To account for degradation, such a method requires calibrating internal mechanisms periodically when the cell is being used, which is generally infeasible. Our work is mainly dedicated to developing non-destructive experiments and isolate model parameter values. The processes should be simply replicated by the onboard battery management system (BMS) during the lifetime of cells. Practically speaking, the final model is computationally efficient and having parameter values that adjust over time to account for accumulated aging experienced by the cell.

Keywords: Lithium-ion battery, physics-based model, non-destructive experiment design, system identification, cell degradation, model validation

---

Geography and Environmental Studies Presentations

Presenters:	Layla Burney	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Authors: Layla Burney & Brianna Santos

Title: A Survey and Environmental Assessment of Two Rock Glaciers in the San Juan Mountains of Southwest Colorado with an Emphasis of Hydrological Impact

Abstract: Rock glaciers are a curious commodity of this earth and possibly of other planets. This summer I was able to be a part of a research team funded by the Undergraduate Research Academy which was led by faculty advisor Brandon Vogt and graduate student Austin Routt investigating two rock glaciers in Colorado. The Arapaho Rock Glacier in Colorado is the most extensively studied rock glacier in the state and it is an anomaly in comparison to the rest of the world as the research seems to indicate it does not appear to be increasing in speed. Our project examined two rock glaciers, the first being that of Yankee Boy Rock Glacier and the other being Engineer Mountain Rock Glacier, to continue the research into rock glaciers in Colorado and further investigation into other rock glacier's speed and why they may be different from those located around the world. My presentation covers how the survey was conducted, roadblocks of fieldwork, an overview of the data collected, a preliminary conclusion from the project, and how hydrology is related and important to rock glaciers.

Keywords: Rock glacier, survey, hydrology, fieldwork, total station,

---

Presenters:	Brianna Santos	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Authors: Brianna Santos & Layla Burney

Title: The Pitfalls of Understanding Vegetation Density and Dependency Among Rock Glaciers

Abstract: In the summer of 2021, an Applied Geography graduate student directed two Undergraduate Research Academy students in a field survey that investigated the movement of two rock glaciers: Yankee Boy Basin and Engineer Peak in the San Juan Mountains of Colorado. A side project attempted to understand rock glacier hydrology at these sites and hydrology's connection to vegetation density to emphasize their ecological importance and help define areas of rapid rock glacier movement. Tools such as NDVI and Google Earth were used for imagery analysis but included insufficient spatial resolution and missing or faulty information. The goal of this presentation is to address the technological obstacles and physical limitations in measuring vegetation density near the rock glaciers to better prepare others interested in a similar question to avoid these issues.

Keywords: rock glacier, San Juan Mountains, NDVI, Google Earth, vegetation density, hydrology, lichen

Health Sciences Presentations

Presenters:	Katherine Daniel	Graduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Katherine Daniel, Greg Welk & Joey A. Lee

Title: Association between Family and Community Engagement in School Wellness Initiatives and Youth Physical Activity

Abstract: **Introduction**: Family and community engagement in school wellness programming has been recognized as an important component of school wellness. Yet, little is known if community engagement truly influences youth health behaviors. This study examined the influence of schools' efforts to engage families and communities in school wellness initiatives on youth physical activity (PA). **Methods:** A cross-sectional study comprising twenty-one Midwestern elementary and middle schools was conducted. Schools reported family and community engagement practices via an online survey. Fourth and fifth-grade students reported their school, home, and total PA behaviors via the Youth Activity Profile survey. Linear regression models were used to examine the association between family and community engagement in school wellness programming and youth PA. Separate one-way ANOVAs were used to examine differences between youth PA by low, mid, and high levels of family and community engagement in schools. **Results**: Multiple linear regression models demonstrated that family and community engagement was not associated with youth school, home, or total PA (all $p>.05$). Results of the separate one-way ANOVAs revealed that there was no association between family and community engagement and youth PA at school or home (both $p>.05$). **Conclusions**: Contrary to common assumptions in school health frameworks, our findings suggest that family and community engagement in school wellness initiatives is not associated with higher levels of youth PA at school or home. Further research is warranted to better understand how family and community engagement with school wellness benefits youth health outcomes.

Keywords: family community engagement school wellness youth physical activity

Presenters:	Jeremy Grant	Graduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Jeremy Grant & Jon Brown

Title: An Interprofessional Approach to Lifestyle Medicine

Abstract: Lifestyle medicine has been identified as an approach to address chronic disease. Interprofessional collaboration is also critical to improving individual and population health outcomes. However, there has been little research published showing the impact of an 8-week lifestyle medicine program presented through an interprofessional lens. The purpose of this collaboration highlights the interprofessional collaboration between UCCS and Centura Health Care Network. The core component of the 8-week program was a weekly 90-minute group meeting. Additionally, participants were offered a personal session with the registered dietitian, and weekly meetings with their assigned health coach. The mixed-methods program evaluation allowed the team to explore the impact of an interprofessional 8-week lifestyle medicine program and showed the impact the program has had on participant health and health behavior. In 8-weeks, weight, BMI, and systolic blood pressure were found to significantly decrease, and those participants that engaged in health coaching showed a higher attendance rate than those that did not. Utilizing hope theory, participants were able to build agency and pathways to reach their health and wellness goals. This collaborative interprofessional 8-week program supported lifestyle behavior change and goal achievement to participating members and should be considered when building lifestyle medicine programs and teams.

Keywords: Interprofessional collaboration, lifestyle medicine, hope theory

Presenters:	Sophia Hovis	Undergraduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Sophia Hovis

Title: COVID-19 and its Impact: The Pandemic's Effect on Suicide Risk Factors, Awareness and Prevention

Abstract: Suicide is the 10th leading cause of death in the United States. Worldwide, more than 700,000 people die by suicide each year. For every suicide, there are many other people who think about, plan, or attempt suicide. Known risk factors for suicide include depression, anxiety, stress, substance abuse, social isolation, fear, trauma, financial instability, and prior suicide attempts. The global COVID-19 pandemic has presented significant societal and health concerns that relate to known suicide risk factors and do not exclude any patient population. A literature review was conducted to analyze the effect of the COVID-19 pandemic on known risk factors for suicide across different populations. This literature review was completed using CINAHL, PUBMED, PsycINFO, Scopus, and Trip databases. The available data suggests an increase in the prevalence of known risk factors for suicide related to the pandemic. Although evidence continues to emerge, more research is needed including quantitative multi-site studies and randomized controlled trials (RCTs) to further understand the impact of COVID-19 upon suicide risk. Understanding the signs and symptoms of suicide risk, utilizing suicide screening questions, and implementing prevention strategies such as crisis intervention and gatekeeper training are vital tools in the fight to increase suicide awareness and prevent suicide. The anticipated impacts of this research include raising awareness around suicide, understanding the effect of the global pandemic on mental health, and identifying suicide prevention strategies. The interventions and resources identified in this research can be utilized by both health care providers and the general population to prevent suicide.

Keywords: COVID-19, suicide prevention, suicide risk, risk factors, long-term risk, depression, anxiety, substance use, trauma, stress

Presenters:	Lindsey Visscher	Graduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Lindsey Visscher, Emily Kulakowski, Ryland Townsend, Jessica Kirby & Keston Lindsay

Title: Mountain Lions on the Move: A mixed methods case study of psychological well-being and basic psychological needs satisfaction in university students participating in a peer-led physical activity program before and during the COVID-19 pandemic.

Abstract: Currently, only 50% of college students meet minimum physical activity recommendations, and a majority report feeling lonely, exhausted and overwhelmed. However, college students have the capacity to learn and adopt behaviors such as consistently engaging in physical activity, and creating and maintaining quality social relationships, that can lead to flourishing in adulthood with optimal health and well-being. The UCCS Fitness Buddies program is a free campus recreation program that aims to foster peer-based social connections between undergraduate students in a physical activity context. The Fitness Buddies program was intentionally developed (e.g., marketing, peer leader selection, training processes, etc.) to be a welcoming and inclusive program where students who typically would not utilize campus recreation facilities can feel safe and supported to engage in weekly physical activity. We will present initial results of this mixed methods case study that examined the basic psychological needs satisfaction (autonomy, competence, relatedness) within physical activity-based peer relationships, motivation to participate in the Fitness Buddies program, the impact of participation on perceived psychological well-being and situational affect, and student reflections on program participation. The impacts on the program and on student outcomes pre- and post-COVID will also be discussed. This research is funded by the NIRSA Foundation.

Keywords: physical activity, psychological well-being, motivation, COVID-19, student health, wellness

---

Interdisciplinary Studies Presentations

Presenters: Alaric Sollenberger Undergraduate Student College of Letters, Arts & Sciences Interdisciplinary Studies

Authors: Alaric Sollenberger & Karin Larkin

Title: Fatty's Place: Early Tourism in Garden of the Gods

Abstract: This paper explores the commercialization of romantic ideas of the "Wild West" in Garden of the Gods park during the late 1800s and early 1900s through historical archaeology. The cities of Manitou Springs, Colorado Springs, and Colorado City relied heavily on tourism for their development. Tourism here centered on the natural beauty of places like Garden of the Gods as well as romantic ideas of the Native American past. Data presented here is from an archaeological field school that excavated Edwin "Fatty" Rice's curio shop at the eastern entrance of the Garden of the Gods. Artefacts recovered illustrate how the Rice family's curio shop crystalized the romance of the "Wild West", of the "Noble Indian", and of untamed beauty in the area through selling trinkets and novelties to the new tourist seeking to connect with this cultural background and imagery. This research offers insight into how tourism fed the romantic views of the famed "Wild West" that are still carried into today's tourism industry.

Keywords: cultural tourism, historical archaeology, tourism, Garden of the Gods, western history

Presenters: Alaric Sollenberger Undergraduate Student College of Letters, Arts & Sciences Interdisciplinary Studies

Authors: Alaric Sollenberger, Jordyn Blide, Foram Raval, Leilani Feliciano, & Michele Okun

Title: Indices of Psychological and Physiological Stress in Students: Implications for Health

Abstract: Stress is ubiquitous among college students due to myriad new experiences, such as relationships, living situations, pressure to perform academically, financial obligations, and post-graduation planning. A consequence of stress is an increase in depressive symptoms, anxiety symptoms, and disrupted sleep. Psychological stress, has a direct, negative effect on various biological markers, including cortisol and urine specific gravity levels (USG) (i.e., dehydration). The current study examined associations between indices of psychological and biological markers of stress. Students completed online questionnaires on demographics, stress (PSS), depression (IDS), anxiety (DASS-21), and sleep quality (PSQI) followed by home collection of saliva (8 samples for 2 days) and urine (first catch). Preliminary data include psychological and biological information collected from N =23 students. Students were 24.1 (7.9) years of age, and all but one was female. On average, stress was high (range 7 – 44, M = 26.5 (9.6)), depression was low (range 1-18, M = 10.4 (4.9)), anxiety was moderate (range 8-27, M = 12.9 (5.6)), and sleep quality was poor (range 1-18, M = 6.5 (4.0)). High stress (scores > 26) was observed in 47.6% of the students. Severe depression in 17.4%, moderate depression in 21.7%, and mild depression in 43.5% of students. Extreme severe anxiety in 13%, severe anxiety in 17.4%, moderate in 34.8% and mild in 34.8% of students. USG measures were average to slightly elevated (M = 1.02 (.008)) indicating average levels of hydration to mildly dehydrated. Three students had USG < 1.010 which suggests that they are drinking too many fluids or may have a chronic health condition such as diabetes. None of the psychological measures was associated with USG levels. Cortisol assays are underway. In this preliminary examination of psychological stress in college students, we observed much higher rates of severe stress, depression, and anxiety compared to other studies of college students, whereas rates of poor sleep quality were like other reports (although still high). While none was associated with dehydration levels, we anticipate cortisol will be significantly associated with psychological stress indices. Acknowledging the stress that college students endure is necessary for developing and incorporating programs to mitigate serious mental and physical health issues.

Keywords: Stress, hydration, sleep, college students, mental health

Leadership, Research, & Foundations Presentations

Presenters:	Owen Cegielski	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Owen Cegielski, Kristi Maida, & Danny Morales

Title: Enhancing the Learning Environment: Secondary Teachers' Perceptions of Culturally Relevant Education

Abstract: American school populations have become increasingly diverse; culturally relevant education (CRE) provides educators with a means to promote social justice, create more equitable and inclusive learning environments, and encourage critical reflection and discourse of power. Using a descriptive phenomenological research design, this study explores 20 secondary teachers' perceptions of the environmental outcomes of incorporating CRE within their pedagogies and curriculum. Four themes emerged through the data analysis process: CRE facilitates a safe environment, creates a classroom community focused on critical consciousness, builds bridges between students of diverse backgrounds, and fosters a pedagogical shift in traditional teacher-centered roles. Our findings suggest that CRE allows students to culturally connect with academic skills and concepts, become more engaged with curricula, allows less hesitant educators to use discourse with students to critique existing power structures, develop cultural competence, and affirm their cultural identities. The implications of this study suggest that secondary teachers are not receiving the supports needed to effectively implement CRE practices, necessitating more targeted professional development opportunities.

Keywords: Critical cultural consciousness, culturally relevant education, phenomenology, constructivism

Presenters:	Ike Hubbard	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Ike Hubbard, Rich Sinclair, & Sylvia Mendez

Title: Student Receptivity to Social-Emotional Learning Opportunities: Viewpoints of Secondary Educators

Abstract: This study explores secondary educators' viewpoints on student receptivity to social-emotional learning (SEL) opportunities through an instrumental case study research design (Stake, 1995). SEL is the process through which students acquire and apply knowledge, skills, and attitudes to develop healthy identities, manage emotions, achieve personal and collective goals, feel and show empathy for self and others, establish and maintain supportive relationships, and make responsible and caring decisions (The Collaborative for Academic, Social, and Emotional Learning [CASEL], 2021). CASEL's model of SEL is used as the conceptual framework for the study. The model highlights the inter-relationship of communities, families and caregivers, schools, and classrooms in ensuring students develop self-awareness, self-management, social awareness, relationship skills, and responsible decision-making competencies. Two themes emerged relative to the viewpoints of secondary educators on student receptivity to social-emotional learning (SEL) opportunities: (1) A genuine commitment and fidelity to SEL practices are key; and (2) Receptivity varies based on perceived authenticity of SEL delivery. These findings reveal the significance of the leader in the classroom and in the school concerning student receptivity to social-emotional learning.

Keywords: social-emotional learning, secondary education; The Collaborative for Academic, Social, and Emotional Learning (CASEL)

Presenters:	Emily Kulakowski	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Emily Kulakowski & Elizabeth Peterson

Title: Female Student STEM Identity: The Role of Engineering Faculty

Abstract: Abstract: Broadening participation in STEM, particularly in the engineering discipline, is of paramount importance to the scientific and educational communities as it is imperative that all individuals contribute their diverse talents and creativity to the nation's technological base. As such, the purpose of this phenomenological research was to assess engineering faculty perceptions of STEM identity and if/how they foster STEM identity in the classroom with their students, particularly their female students. Engineering faculty at R2 institutions engaged in semi-structured interviews to offer their teaching philosophies and perceptions of engineering education. From these interviews, several themes emerged including awareness of STEM identity and promotion of STEM identity. Additionally discussed are suggestions for fostering STEM identity in higher education such as mentorship and at what age intervention is most effective.

Keywords: STEM identity, higher education, engineering education

Presenters:	Kristi McCann	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Kristi McCann

Title: A Discourse-Historical Approach to Understanding National, State, and Local Discourse Surrounding Equity and Access to High-Quality STEM Education

Abstract: This exploratory study investigates the national-, state-, and local district-level (re)production of STEM education policy discourse to determine what messages are communicated regarding underserved students and their access to a quality STEM education. Using a Critical Discourse lens, a Discourse-Historical Approach was used to analyze legislation, reports, and related STEM education agency websites to determine what main discourse topics were present, what discursive strategies were employed, and how this changed over time from 2007 to present. National and State-level discourse topics were similar with maintaining global competitiveness the justification for improving STEM education and broadening participation of underserved students in STEM. Discursive strategies included nomination to construct and categorize students who are underserved in STEM education, and argumentation to justify the use of underserved students to solve the issue of the STEM workforce shortage. Local districts in Colorado were varied compared to national and state STEM education discourse with suburban and urban districts reproducing messages and no reproduction of messages in rural districts. This study suggests the national goal of high-quality STEM education for all students in all geographic locations may not be realized for rural students.

Keywords: STEM education, underrepresented students, social equity, access to education, STEM discourse

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

Authors: Royla Rice

Title: A Critical Race Theory Case Study of the Effect of Gerrymandering on Political Representation in El Paso County Colorado

Abstract: In 2020, Black Lives Matter protests following the murder of George Floyd in Minneapolis spread across the United States and around the world demanding an end to police brutality against Black people and for Whites to recognize that racism persists because they allow it to. Dr. Martin Luther King, Jr. recognized the right to vote as foundational to equality in a democracy. Gerrymandering creates a winner-take-all game that appears partisan but results in racially inequitable outcomes due in part to housing segregation policies in the 1930s that concentrated Black Americans into specific neighborhoods. This article presents a case study of a gerrymandered congressional district in Colorado that is 83% White and 7% Black, using Critical Race Theory to examine the effect on representation. The congressional seat and seven of the eight state house district seats are White occupied. Despite constitutional term limits, the seven house seats maintain a gerrymandered 60% voter turnout for a single party while the single state house seat held by a Black Representative has about 50% voter turnout for either party.

Keywords: Black voter dilution; proportionality; residential segregation; voting rights; winner-take-all.

Mechanical and Aerospace Engineering Presentations

Presenters:	Andrew Gibson	Graduate Student	College of Engineering	Department of Mechanical and Aerospace Engineering

Authors: Andrew Gibson, Xin (Cindy) Yee, & Michael Calvisi

Title: Application of Koopman theory to the control of nonlinear bubble dynamics

Abstract: Koopman operator theory has gained interest in the past decade as a framework for rigorously transforming nonlinear dynamics on the state space into linear dynamics on Koopman-invariant subspaces. These Koopman-invariant subspaces can be approximated purely through data-driven methodologies, which then enables future state prediction and the application of classical linear control for strongly nonlinear systems. Here we use a Koopman linear quadratic regulator (LQR) to control nonlinear bubble dynamics, as described by the well-known Rayleigh-Plesset equation, with two novel objectives: 1) stabilization of the bubble at a nonequilibrium radius, and 2) simple harmonic oscillation at amplitudes large enough to incite nonlinearities. Control is implemented through a single-frequency transducer whose amplitude is modulated by the Koopman LQR controller. We then repeat these results with a Koopman MPC controller, which allows for the implementation of constraints. This work is a step towards controlling nonspherical shape modes of encapsulated microbubbles, which has applications in biomedicine for ultrasound imaging and intravenous drug delivery.

Keywords: Koopman theory, control theory, data science, machine learning, bubble dynamics, drug delivery, biomedicine, acoustics

---

Presenters:	Shreeya Roy	Undergraduate Student	College of Engineering	Electrical and Computer Engineering

Authors: Shreeya Roy

Title: A literature review of the risk factors related to aneurysm growth and rupture

Abstract: An aneurysm is a localized enlargement of an artery that develops over time and, in some cases, can rupture and cause serious health problems or death. The most common locations of aneurysm formation are in the circle of Willis at the base of the brain and in the abdominal aorta. In the U.S, there are over 200,000 cases of aneurysms per year. The development of an aneurysm is dependent upon several risk factors that may include age, gender, smoking habits, cholesterol and hypothyroidism. The purpose of this study is to conduct a thorough literature review to identify these risk factors and understand their correlation with aneurysm growth and rupture. An understanding of the risk factors related to aneurysms can help identify high-risk patients so that aneurysms can be better diagnosed and appropriately monitored.

Keywords: Aneurysm, risk factor, lifestyle, age, gender, smoking, cranial, abdominal aortic artery

---

Physics Presentations

Presenters:	Yaroslav Balytskyi	Graduate Student	College of Letters, Arts, & Sciences	Department of Physics and Energy Science
Authors:	Yaroslav Balytskyi			

Title: Interdisciplinary Applications of Physics and Machine Learning

Abstract: I do interdisciplinary research at the intersection of Physics, Machine Learning and Cryptography.
Firstly, the new data obtained with increasingly high precision at the Large Hadron Collider and other experiments provide an opportunity to search for New Physics from a small mismatch between the Standard Model theoretical predictions and experimental measurements. With the usage of numerical algebra tools, the NNLO soft function is obtained which is an essential part of these theoretical predictions.
Our paper is already published in Physical Review: "NNLO soft function for threshold single inclusive jet production", PHYSICAL REVIEW D 104, 054032 (2021), Yaroslav Balytskyi, Jianbo Gao. https://journals.aps.org/prd/abstract/10.1103/PhysRevD.104.054032
Secondly, to realize the computational advantages provided by quantum mechanics, one must be able to efficiently perform the Quantum State Tomography (QST). We developed a novel quantum algorithm for the Bayesian parameter estimation using the novel PT-symmetric quantum mechanics and showed its advantages. Our paper "PT-Enhanced Bayesian Parameter Estimation", Yaroslav Balytskyi, Manohar Raavi, and Sang-Yoon Chang, is accepted to IEEE International Conference on Quantum Computing and Engineering (QCE 21).
https://qce.quantum.ieee.org/technical-papers-program/
Thirdly, we build a machine-learning-based algorithm and show its effectiveness for distinguishing between AI-generated and human generated texts.
Our paper is accepted to 11th Workshop on Socio Technical Aspects in Security (STAST 2021): "Position Paper: Towards Detection of AI-Generated Texts and Misinformation" Ahmad Najee-Ullah, Luis Landeros, Yaroslav Balytskyi, and Sang-Yoon Chang
https://stast.uni.lu/index.html
Finally, our Team won the CRDF Global Cybersecurity Research Competition in July this Summer.

Keywords: Machine Learning; Quantum Computations; Cryptography; Biological and Medical Applications;

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

Authors: Kaitlin McAllister, Renju Peroor, & Dmytro Bozhko

Title: Near-field microwave scanning microscope for magnonics applications

Abstract: Modern magnonics requires tools for the investigation of spin-wave dynamics in frequency, time, and space domains. One of the most critical features nowadays is the ability to probe spin waves in out-of-plane magnetized materials. We report the design and performance verification of a near-field microwave scanning microscope capable of providing all these features. It uses a broadband microwave loop antenna as a probe, which can be positioned over a sample surface with down-to-nanometer resolution using a piezo-driven platform. The microwave signal is recorded by a fast oscilloscope. As an example of the system performance, we will show the dynamics of spin waves in a Yttrium Iron Garnet ring. Research using the microscope is ongoing and will continue to aid the study of new magnetic materials, with applications in data processing and computing.

Keywords: near-field microwave scanning microscope, spin-wave dynamics, magnonics

---

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

Authors: Tristan Paul, Anatoliy Pinchuk, & Kelly McNear

Title: Optimization of Laser Deposited Silver Nanoparticle Substrates for Surface-Enhanced Raman Spectroscopy

Abstract: The detection of chemicals in low concentration is important in many settings, including finding contaminants in agriculture or identifying bacterial and fungal infections in healthcare. Raman spectroscopy is a useful method to identify such chemicals by using a laser to excite vibrations in molecules and measure how those vibrations affect the light scattered off the sample. The scattering is weak which leads to a low signal, but can be significantly increased through Surface-Enhanced Raman Spectroscopy (SERS) by the introduction of noble metal nanoparticles. However, SERS substrates are hindered by low reproducibility and unstable signals. We investigated different morphologies of our unique laser-deposited silver nanoparticles devices to determine what parameters lead to consistent substrates with high signal intensities.

Keywords: Raman Spectroscopy, Nanoparticles, Laser Deposition, SERS

Presenters:	Renju Peroor	Graduate Student	College of Letters, Arts, & Sciences	Department of Physics and Energy Science
Authors:	Renju Peroor & Dmytro Bozhko			

Title: Heralded parametric single magnon source

Abstract: The creation and detection of single-magnon states constitute an interesting and intriguing challenge for quantum magnonics. In this work, we present an all-magnon way to construct a single magnon source. In our experiment we use single-crystal Yttrium Iron Garnet film and apply a uniform rf pumping field parallel to the magnetization direction of a ferromagnet. It results in the creation of a pair of magnons at half of the pumping frequency. At room temperature, an open dielectric resonator is used to enhance the pumping efficiency and it generates magnons with opposite wavevectors, propagated towards two detection antennas. We calculated the cross correlation between those two signals confirming their creation by the same parametric down conversion process. In the quantum limit, such a device can serve as a single magnon source if one of the outputs will be used for heralding the generated magnon number.

Keywords: Single magon source, Cross correlation, Parametric down conversion

---

Presenters:	Mark Watson	Graduate Student	College of Letters, Arts, & Sciences	Department of Physics and Energy Science
Authors:	Mark Watson			

Title: Turbulent Hydrodynamic Flow of an Electronic Dirac Fluid in a 2D Solid

Abstract: In the present numerical study, we explore the possibility of a turbulent flow in the electric transport of a two dimensional solid, with particular focus on graphene. We use a relativistic hydrodynamic simulation to analyze the flow of the massless charge carriers in a solid with impurities. We find evidence of the possibility of a chaotic and perhaps pre-turbulent flow. Experimental consequences are discussed.

Keywords: turbulence, graphene, relativistic hydrodynamics, lattice Boltzmann method

---

Psychology Presentations

Presenters:	Jennan Abduljaber	Graduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Jennan Abduljaber and Michael A. Kisley, Ph.D.

Title: The Effect of Social Identity on Emotion in Social Situations

Abstract: Years of research have shown that social identity plays a role in human social interaction. Much of what is known contributes to in-group and out-group theories, such that people value their social identity in-groups higher than others who are not part of that group. This study aims to test the effect of social identity, particularly gender, on emotion in social situations. A two-by-two factorial design was implemented in which participants were randomly assigned to read one of four vignette pairs of a social situation (embarrassment or jealousy) with different gender interactions (MM, MF, FM, FF) and rate the emotion they think the protagonist is feeling. The expectation was that participants would rate the protagonist to feel more emotion when the other character is of the same gender and less emotion if they are of a different gender. Data collection is currently in progress and results will be presented. This research is intended to provide insight into how bias is expressed among different social identity groups.

Keywords: Keywords: social identity, emotion, gender, bias

Presenters:	Esther Chung	Graduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Esther Chung & Michael A. Kisley, Ph.D.

Title: Individual Differences and Emotion Beliefs

Abstract: "All emotions are useful to me." Whether or not you believe that to be true, we all have some type of opinion on emotions. Emotional belief is defined as how humans think, believe, and feel about emotions. These beliefs are important since they can help people focus on what is important, influence emotion regulation, and shape our emotional responses. However, how might meta-emotional beliefs differ based on a person's individual identity and cultural background (such as sexual orientation, first generation status, or even birth order)? These variables characterize everyone's identity, yet due to meta-emotional studies being a fairly new subject, there still much to learn about the relationship between an individual's everyday experience with their beliefs on emotion. Utilizing Qualtrics, we created a survey utilizing several different meta-emotional scales (ie., Individual Beliefs about Emotion (IBAE), Help vs Hinder Theories about Emotion (HHTEM), and Leahy's Emotional Schema Scale) in order to first determine a participant's belief on emotion; followed up with questions relating to demographics. Since each of these scales focus on a different aspect on emotion beliefs, multiple scales were used in order to understand multiple perspectives on beliefs about emotions rather than just focusing on a single view. We hypothesize that there is a correlation between emotion beliefs and a person's background demographics; more specifically we believe that a person's first-generation student status as well as birth order will be more strongly related to beliefs on emotions compared to other variables.

Keywords: Meta-emotion, emotion belief, psychology

Presenters:	Katrina Cooley	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Katrina Cooley & Rachel E. Thayer, Ph.D.

Title: A Bad High or Something Worse? The Effect of Cannabis Use on Psychosis

Abstract: With the legalization of cannabis in many parts of the country and the globe, the question arises as to whether there is a negative impact on one's health, particularly mental health. Furthermore, with an increase of the potency of many cannabis products the question is, could the cannabis be harmful more than originally thought. A meta-analysis of research effects of cannabis use on the risk of psychosis was conducted using case control studies. Studies were selected if they included individuals who have experienced psychosis, who either had or had not used cannabis prior to the onset. Only six studies were identified for inclusion in the current analysis with sample sizes ranging from N=25 to N=4573 and ages 15 to 64. Four of the studies measured symptoms of psychosis, while two measured symptoms of schizophrenia. Overall, there was a medium relationship (r=.34) between using cannabis and an increased risk of having a psychotic episode. Furthermore, the r-value amongst adolescents and younger adults was higher, suggesting that they are at a higher risk of schizophrenia. This could be due to the prefrontal cortex still developing and the impact of schizophrenia or psychosis on that development.

Keywords: cannabis use, psychosis

Presenters:	Caitlyn Dieckmann	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Caitlyn Dieckmann, Michelle Shields, & Diana Selmeczy, Ph.D.

Title: Development of children's help-seeking behaviors during learning

Abstract: Children often encounter situations where they can seek help to improve their learning, such as asking a teacher for a useful hint or looking up the answer from their textbook. Previous research demonstrates improvements in help-seeking behaviors throughout childhood during problem-solving tasks (e.g., Nelson-Le Gall, 1987). However, the impact of help-seeking on memory and learning has not been assessed. The current study examined children's (ages 8 to 13, N=26) help-seeking behaviors during a novel animal fact-learning task. Results showed that children tended to seek help in the form of a hint as opposed to the full answer, suggesting that children seek help that is considered more adaptive for further learning. Furthermore, all children appropriately asked for help more frequently when they experienced low confidence in their answer, but older children were more efficient in this process. Overall, these results suggest adaptive help-seeking abilities during learning are well established by middle-childhood.

Keywords: help-seeking, memory, meta-memory, children

Presenters:	Brian Foster	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Brian Foster, Tom Pyszczynski, Ph.D. & Joey Wagoner

Title: Exploring the Epistemic Mechanisms of Threat- A Comparison of Mortality Salience and Incongruity on Cognitive Performance.

Abstract: Terror management theory posits that the awareness of one's mortality triggers distinctive defensive processes. The present study investigated how exposing people to tasks that triggered incongruent or death-related cognitions would affect performance on a logic test that is sensitive to political bias. 468 participants were randomly assigned to one of four tasks containing one of the following stimuli: death word pairs, congruent word pairs, incongruent words pairs, and a death-related short answer question. Data analyses are currently being conducted, and preliminary analyses found political bias but no effects of the threat manipulations.

Keywords: existential threat, biased cognitions, logical syllogism, task performance

---

Presenters:	Christopher X. Griffith	Graduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Christopher X. Griffith

Title: Treatment Outcomes of Behavioral Activation for Adults with Comorbid Depression and Type 2 Diabetes

Abstract: A depressive disorder, commonly referred to as depression, is a common class of mental health conditions that are highly comorbid with other mental and physical health conditions including type 2 diabetes mellitus (T2DM). Depression is known to negatively impact self-care behaviors and thus is an important target to treat alongside T2DM. Behavioral activation (BA) is a therapeutic intervention often shown to be effective in the treatment of moderate to severe depression, including when comorbid illnesses are present. The current study furthers this literature by examining the relationship between depression symptomology and brief BA treatment (once a week for 5 weeks) with two follow-ups over the course of six months within different age groups (younger adults aged 18-39, middle-aged adults aged 40-54, and older adults aged 55+). A sample of 60 adults (8 younger adults, 31 middle-aged adults, and 21 older adults) participated in an in-home diabetes management program with BA to treat depression. Depression was measured using both the World Health Organization's 5-Item Well-Being Index (WHO-5) and the Nine-Item Patient Health Questionnaire (PHQ-9). A one-way analysis of variance (3 x 2 ANOVA) will be used to determine if there is a significant difference between age groups in how they respond to BA. If such differences are present, post hoc tests will be used to determine which groups differed. The findings may have implications for which age groups respond favorably to BA and which age groups require further research into the treatment of depression with comorbid diabetes.

Keywords: Depression, Diabetes, Aging, Comorbidity, Behavioral Activation

---

Presenters: Eric Muchow | Graduate Student | College of Letters, Arts and Sciences | Psychology

Authors: Eric Muchow, Sophie Brickman, & Abby Fink

Title: Bedtime Procrastination and Self-Control: The Moderating Role of Cell-Phone Activity Interference

Abstract: Background: Bedtime procrastination (BP) is the tendency to go to bed later than intended in the absence of external factors leading to the delay (Kroese et al., 2014). BP has been linked to insufficient sleep, negative mental health outcomes, and is at times attributed to increased media use (e.g., television and smartphones) before bed (Chung et al., 2020; Exelmans & Van den Bulck, 2021). Additionally, self-control (SC) has been negatively associated with BP and compulsive cell-phone use. The current study investigated the potential moderating role of a singular component of compulsive cell-phone use, cell-phone activity interference (CAI), on the relationship between SC and BP. Methods: Undergraduate and graduate students (N = 95) completed the Bedtime Procrastination Scale, the Brief Self-Control Scale, and provided data on CAI (Murdock et al., 2017; 2019). Results: SC and CAI showed opposite correlations with BP (r = -.27, p < .01 and r = .30, p < .01, respectively). SPSS PROCESS moderation analysis revealed a significant SC-CAI interaction, indicating that CAI moderated the relationship between SC and BP. For those with medium or low CAI, higher SC was associated with lower BP, but for those high in CAI there was no significant relationship between SC and BP (t(94) = 3.07, p < .01). Conclusions: Self-control may not impact BP for those high in CAI. It may be beneficial for BP interventions to target improving self-control for individuals lower in CAI, and initially decreasing CAI for those higher in CAI.

Keywords: Bedtime Procrastination, Self-Control, Cell Phone, Well-being

Presenters:	Alyssa Premovich	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Alyssa Premovich, Lisa Stone, & Daniel Segal, Ph.D.

Title: The Alternative Model of Personality Disorders: Gender Differences among Older Adults

Abstract: Introduction: Previous research suggests notable gender differences among younger adults on the Alternative Model of Personality Disorders' (AMPD) two constructs of personality functioning and pathological personality traits. This study examined gender differences on these two constructs of personality pathology among older adults. Method: Older adults (N = 222; 50% women) completed the Personality Inventory for DSM-5 (PID-5) to measure the AMPD's pathological personality traits and the Level of Personality Functioning Scale-Self Report (LPFFS-SR) and Severity Indices of Personality Problems-Short Form (SIPP-SF) to measure the AMPD's personality functioning. Results: Independent samples t-tests were conducted, comparing men and women on personality functioning and pathological personality trait domains. All t-tests were significant ($p < .01$), with men indicating higher levels of personality pathology than women across all three measures. Effect sizes for both personality functioning and pathological personality traits were small-medium, with Cohen's d ranging from |.35| to |.50|. Discussion: Significant gender differences were exhibited between men and women within this sample of older adults, with older men scoring higher in personality pathology when compared to the older women. These findings are consistent with previous research among younger adult populations. It is possible that the AMPD measures may exhibit a gender bias, as there is no theoretical reason for men scoring higher than women on the aforementioned measures. Combined with previous research that suggests the AMPD lacks age neutrality, older men may be at particular risk for being over-diagnosed with PD pathology under the AMPD.

Keywords: Older adults, Alternative Model of Personality Disorders, AMPD, Personality Pathology, Gender Differences, Personality Functioning, Personality Traits.

Presenters:	Branden Schaff	Graduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Branden Schaff & Rachel Weiskittle, Ph.D.

Title: Feasibility Study of a Teletherapy Group Intervention for Rural Older Adult Isolation

Abstract: In March 2020, a virtual group treatment manual was rapidly developed in response to older adult isolation and worry brought upon by the COVID-19 pandemic. Preliminary evidence via facilitator feedback study indicated high acceptability and feasibility beyond the early pandemic period. Rates of loneliness remain high in the older adult population and are exacerbated by factors such as rurality. The present study will conduct a randomized waitlist controlled trial to assess the efficacy of an updated, evergreen manual by implementing its eight-week treatment program with rural older adult participants. Levels of anxiety, depression, and loneliness will be assessed before (Pre-1) and after (Post-1) treatment conditions as well as in a one-month follow-up (FU). There will also be a baseline assessment (Pre-2) in the waitlist control group. Participants' internet access and technology proficiency will be considered; participants will be provided tablets with data plans as needed. Results are hypothesized to indicate that this is a viable treatment method for addressing social isolation in older adults with high acceptability and feasibility. Future research building from this work will address the barriers and facilitators yielded in these preliminary results.

Keywords: Rural, aging, older adult, loneliness, telehealth, group therapy, anxiety

Presenters:	Alisha J. Silkey	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Alisha J. Silkey & Rachel E. Thayer, Ph.D.

Title: Housing Insecurity and Cognitive and Mental Health

Abstract: Examining associations among stigma, cognitive functioning, and health history offers an opportunity to better understand potential barriers to accessing resources in housing insecurities. This pilot study assesses the impact of stigma associated with low socioeconomic status and impact on cognitive health through a single session of cognitive testing. Presently very little research examining stigma and cognitive health exists, and one study has found experience of stigma directly and negatively influenced cognitive performance among individuals living with HIV (Lam et al., 2019). It is likely the experience of stigma interacts with cognitive and mental health among other marginalized individuals. This project has been directly impacted by the COVID-19 pandemic and is working to continue recruiting participants who report experiencing homelessness or unstable and inconsistent housing. Identifying individual health factors that contribute to housing insecurity could provide guidance for presentation and intervention programs at the local level.

Keywords: Housing insecurity, homelessness, cognitive health, stigma, mental health

---

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

Authors: Naila Tagoilelagi & Nina Spitzhorn

Title: Sexual Harassment: Understanding the Impact on Women in STEM

Abstract: Background. In October 2017, the exposure of the widespread sexual-abuse allegations against Harvey Weinstein caused the #MeToo movement to spread virally as a hashtag on social media. Later in the same year, Dr. Karen Kelsky started an anonymous “Sexual Harassment in the Academy” crowdsource survey, dubbed the #MeTooPhD hashtag, to provide a place for women in academia to share their experiences with sexual harassment without fear of censorship or judgment (Kelsky, 2017). The number of responses was overwhelming with over 5,000 contributions. In the present study, we examined sexual harassment experiences that were reported by individuals in STEM fields specifically. Given that these fields are typically male-dominated field, women-identified individuals may be at greater risk for sexual harassment. This study investigates this issue by analyzing the responses in the Kelsky dataset. Responses are coded through the use of thematic analysis (Braun & Clarke, 2008). This work aims to capture the content of victims’ experiences through qualitative rather than quantitative research, potentially uncovering a range of issues that have yet to be explored. Method and Findings. The dataset was filtered to participants in STEM fields. Responses were reviewed to identify recurring concepts. Recurring concepts were used to establish a coding scheme of 13 themes. Preliminary analyses of 100 responses found that 28% of participants reported experiencing sexualized comments; 19% reported sexual assault; 19% reported unwanted physical contact; and 19% reported being propositioned. Other experiences included appearance comments (14%), sexualized environments (12%), stalking (7%), invasion of personal space (4%), and ogling (3%).

Keywords: sexual harassment, STEM, women

Social Work Presentations

Presenters:	Shannon Johnson	Faculty	School of Public Affairs	Social Work

Authors: Shannon Johnson & Nicole Flemate

Title: Disenfranchised grief among mothers of a child with cancer

Abstract: A narrative methodology was used to explore experiences of grief and among a sample of mothers of a child with cancer. At the start of the study, all participants completed an initial interview focusing on their personal narratives of grief (N=7). Three months later, five of the original seven participants completed a memory box elicitation interview focused on their reactions to a memory box they had created between the two interviews. Participants also provided access to their social media feeds and submitted three journal entries, completed between their interviews, that were focused on their experiences of grief. Thematic analysis was used to conduct analyses with a focus on the narrative aspects of the data. Data ultimately organized into six themes: 1) Grief over what my child has lost; 2) Grief over my own losses; 3) Unable to process and grieve; 4) Sense of isolation; 5) Feeling emotionally unsupported; and 6) Silver linings. Findings reflect a meta-story of maternal grief during childhood cancer that can be used to deepen insight into the needs and experience of mothers of a child with cancer and to improve the services that are available to families.

Keywords: grief, trauma, childhood cancer, oncology, healthcare social work

Sociology Presentations

Presenters:	Joseph Bono	Graduate Student	College of Letters, Arts and Sciences	Sociology

Authors: Joseph Bono

Title: Trans-Locality via the Arts: Mobility and Transnationalism through Musical Avenues

Abstract: The hardcore scene is a subcultural community that consists of social bonds rooted in similar style in terms of music, other forms of art like fashion, and socio-ideological opposition to hegemony. Hardcore is made up of local scenes that are connected to other local scenes via global networks, which presents the concepts of transnational and trans-local hardcore scenes. This essay explores content and discourses of the hardcore scene that capture the transnationalism and trans-locality of the subculture's stakeholders, subcultural art, and oppositional value systems. The content and discourse analyzed are six video recordings of live performances (content) and four videos of interviews with bands (discourse). Examining these elements of the scene provides an understanding of how musical, subcultural, transnational and trans-local identities are interconnected. The results of this research find that the interrelation of musicality, trans-locality and transnationality in the hardcore scene uncovers lifestyle mobilities (Cohen et al., 2015) among musicians and other stakeholders. Such an interrelation simultaneously reveals contemporary ways the people of the scene are becoming increasingly connected in global contexts via flows (Appadurai, 1996) of subcultural art and resistant value systems.

Keywords: Flows, Hardcore scene(s), trans-locality, transnationality, and lifestyle mobilities

The History of Mountain Lion Research Day

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

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

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

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

Acknowledgements

We extend our deep felt thanks to Jennifer Poe of the Center for Student Research and Lindsay Coppa of the Office of Research for their leadership in organizing the event this year. We also thank Amanda Harvey of the Office of Sponsored Programs for their dedication and assistance. We also thank the Research Faculty Advisory Board for their service as judges for the Top Scholar Awards and thank our Interim Provost, Kelli Klebe, for being our research champion. The Office of Research is led by Associate Vice Chancellor for Research, Jessi L. Smith.

Main Hall 312 - OOR@uccs.edu - Instagram @UCCS_OOR #UCCSResearch