Mountain Lion Research Week

Virtual November 16th – 20th 2020

University of Colorado Colorado Springs

Office of Research

JOIN US FOR THE CLOSING CEREMONY AND AWARD PRESENTATIONS AT 9AM NOVEMBER 20TH IN TEAMS

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Welcome!

At UCCS, we take pride in the incredible research, scholarship, and creative works our community produces each year, and this year we've turned our traditional one-day celebration into a one-week virtual event. This year has undoubtedly been challenging and stressful for our entire campus community. Yet, through the struggles of a global pandemic, months of social unrest, and uncertainty about what our futures hold, our students and faculty have demonstrated profound resiliency and found creative and innovative ways to persevere. Indeed, we know that research is a high impact practice that helps feed our souls and minds as we contribute new knowledge to the world. And though this year has forced us to go remote, we can all find some connection and much needed distraction in an event like this. Whether we are near or socially distanced, UCCS is committed to ensuring a thriving research community for our entire campus.

In 2019, UCCS was classified as a "High Research Activity" university by the Carnegie Foundation. 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 this week for the 12th annual showcase of Mountain Lion Research. We invite you to watch, comment, and engage. This week 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

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Land Acknowledgement

We wish to acknowledge that this land on which we sit at our computers to gather collectively for Mountain Lion Research Week is stolen land from our indigenous peoples. Here in Colorado Springs, the land we occupy is on the unceded land of the Ute Peoples. It is our obligation to unravel the harm to their elders and empower the present generation. This includes recognizing the valuable contributions of indigenous peoples right here at UCCS. We want to celebrate and remember Dr. Janice Gould (1949-2019) who was a Koyangk'auwi Maidu writer and musician, associate professor of Women and Ethnic Studies at UCCS, the Pikes Peak Poet Laureate for 2014-2016, and an award-winning and published author in over 60 journals, reviews, and anthologies. Dr. Gould's research and creative works are vital pieces that help us to discover more about the human condition and our place within the global community. Her contributions to literature and her work with students served to bring a voice to indigenous peoples, specifically those of her ancestry in the tribes of Northern California, and to make present in the mind of the colonizer that indigenous peoples are still here. The themes of much of her writing included longing for connection, family, history, and place – core values for all people, though made so much more difficult to attain for indigenous people displaced through colonialism. It is our hope that this acknowledgement and the creative contributions of Dr. Janice Gould inspire commitment from others to not let indigenous voices go unheard.

"Still, we have poetry, music, and amazing visual expressions that attempt to interpret the awesomeness of connecting (or longing to connect) with something larger than ourselves."

-Janice Gould

List of Presenters

Last Name	First Name	Department	Faculty Mentor
Anderson	Lynn	Computer Science	Adham Atyabi
Arsenault	Luke	Chemistry & Biochemistry	Wendy Haggren
Balytskyi	Yaroslav	Physics and Energy Science	Anatoliy Pinchuk
Bergh	Heather	History	Paul Harvey
Bridgewater	Cody	Biology	Thomas Wolkow
Browne	Danielle	Chemistry and Biochemistry	Crystal Vander Zanden
Burrows	Jennifer	Chemistry and Biochemistry	Amanda Morgenstern
Calzadilla	Annaliese	Biology	Dr. Amy Klocko
Catarino	Daniela	Psychology	Fred Coolidge
Craig	Ashton	Mechanical and Aerospace Engineering	Jena McCollum
Dangal	Prajjwal	Computer Science	Dr. Gedare Bloom
Dias	Jeanette	Leadership, Research, and Foundations	Patty Witkowsky
Disbrow	Bradey	Counseling	Joe Wehrman
Doran	David	Biology	Amy Klocko
Emery	Shawn	Computer Science	Edward Chow
Epperson	Logan	Chemistry and Biochemistry	Amanda Morgenstern
Fields	Charles	Biology	Lisa Hines
Foster	Brian	Psychology	Thomas Pyszczynski
Fox	Madison	Chemistry and Biochemistry	James Kovacs
Gassen	River	Biophysics	Kathrin Spendier
Gibson	Andrew	Mechanical and Aerospace Engineering	Dr. Michael Calvisi
Greve	Kinsey	Biology	Emily Mooney
Hale	Tanrei	Psychology	Charles Benight

Hansel	Jamie	Psychology	Andrew Lac
Henning	Emilie	Mechanical and Aerospace Engineering Department	Todd Bredbenner
Henson	Colin	Computer Science	Sudhanshu Semwal
Herring	Whitney	Chemistry and Biochemistry	James Kovacs
Hill	Brittini	Biology	Jeremy Bono
Hilliard	Julia	Biology	Meghan Lybecker
Hood	Jonathan	Leadership, Research, and Foundations	Andrea Bingham
Knight	Autumn	Electrical and Computer Engineering	Byeong Lee
Korobchuk	Alexander	Computer Science	Terrance Boult
Li	Zexin	Chemistry and Biochemistry	Ronald Ruminski
Llop Girones	Adria	Computer Science	Adham Atyabi
Lockett	McKenzie	Psychology	Tom Pyszczynski
McCann	Kristi	Leadership, Research, and Foundations	Phillip Morris
Mehew	Spenser	Geography & Environmental Studies	Eric Billmeyer
Middleton	Michael	Computer Science	Adham Atyabi
Miller	Lukas	Computer Science	Adham Atyabi
Neeley	Kayla	Psychology	Andrew Lac
Odell	Nicole E.	Health Sciences	Joey A. Lee
Pablo	Erinn	Geography and Environmental Studies	Cerian Gibbes
Peng	James	Computer Science	Gedare Bloom
Peroor	Renju	Physics and Energy Science	Dr. Dmytro Bozhko
Raavi	Manohar	Computer Science	Sang-Yoon Chang
Reinicke	Trenton	Biology	Petter Bjornstad
Rivera	Ericka	Chemistry and Biochemistry	Janel Owens

Rodriguez	Sara	Chemistry and Biochemistry	Andrew Klocko
Saldana Baque	Pau	Mechanical and Aerospace Engineering	Jena McCollum
Sallaberry	Chad	Chemistry and Biochemistry	Crystal Vander Zanden
Sarker	Arijet	Computer Science	Sang-Yoon Chang
Sawh	Nita	Nursing	Dr. Helen L. Graham
Sharp	Jakob	Engineering	Sudhanshu Semwal
Shtanko	Yulia	Chemistry and Biochemistry	Andrew Klocko
Shulkin	Joshua	Psychology	Michael Kisley
Smart	Kyle	Engineering	Sudhanshu
Smith	Amanda	Leadership, Research, and Foundations	Dr. Leslie Grant
Sorency	Riley	Mechanical and Aerospace Engineering	Jena McCollum
Starkey	Kathryn	Leadership, Research, & Foundations	Dr. Patty Witkowsky
Stone	William	Chemistry and Biochemistry	Crystal Vander Zanden
Strutton	Jared	Mechanical and Aerospace Engineering	Jena McCollum
Swift	Abbey	Biology	Emily Mooney
Titus	M. Brandon	Biology	Eugenia Olesnicky Killian
Tixtha	Erika	Biology	Eugenia Olesnicky-Killian
Trujillo	Dustin	Computer Science/Engineering	Edward Chow
Vaszary	Mark	Computer Science	Sang-Yoon Chang
Voss	Barbie	Chemistry and Biochemistry	Crystal VanderZanden
Weber	Christopher	Electrical and Computer Engineering	Omid Semiari
Wheeler	Michael	Chemistry and Biochemistry	James Kovacs
White	Laura	Chemistry and Biochemistry	Amanda Morgenstern
Wisniewski	Ian	Chemistry and Biochemistry	Wendy Haggren

Abstracts in alphabetical order by department

Biophysics Presentations

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

Title: Magnetic Particle Motion Through High Viscous Fluids Influenced by a Magnetic Field

Abstract: The purpose of this experiment is to study the movement of magnetic particles in fluids of different viscosity, at different magnetic fields, and at different drive frequencies. The investigations have practical applications to the medical field, specifically drug delivery through high viscosity fluids like mucus. Prior results from this project found that magnetic barium hexaferrite ($BaFe_{12}O_{19}$) and iron oxide (Fe_3O_4) particles suspended in glycerol and various concentrations of glycerol and water were able to be oscillated or rotated when influenced by a magnetic field. The mixtures had a concentration of 2.50mg/ml for the $BaFe_{12}O_{19}$ and 1.00mg/ml for Fe_3O_4. In current experiments, the same concentrations of $BaFe_{12}O_{19}$ and Fe_3O_4 are being tested in various concentrations of hec-gel, a mucus like fluid, as well as glycerol, to study their movement when influenced by a magnetic field, at different driving frequencies. Time-varying magnetic fields in a frequency range of 10 Hz to 150 Hz are created by pairs of home-made wire coils that insert into the microscope. Magnetic field amplitudes were varied from 5, 8 and 10 mT. Particle movement was imaged and analyzed using image-j software, and compared to an existing theoretical model.

Keywords: Hec-gel, magnetic particles, particle clusters, viscosity, magnetic field, bio-medical, drug delivery, glycerol

Biology Presentations

Presenters:	Cody Bridgewater	Graduate Student	College of Letters, Arts and Sciences	Biology

Authors: Cody Bridgewater

Title: Function of the Conserved Fission Yeast rad26(ATRIP) and rad3(ATR) Tetramer

Abstract: The DNA damage response (DDR) ensures cellular survival by coordinating DNA repair processes within the cell cycle to prevent accumulation of DNA damage. Improper function of the DDR can lead to multiple human diseases such as infertility, neurodegeneration, and cancer. In humans, the phosphatidyl inositol kinase-related kinase (PIKK) Ataxia-telangiectasia mutated (ATM) responds to double stranded DNA breaks during G2, while the PIKK ATM and RAD3-related (ATR), responds to S-phase damage that stalls DNA replication. ATR interacting protein (ATRIP) is the regulating subunit of ATR, providing both stability and function to ATR. ATR and ATRIP form a tetramer that responds to stalled replication forks by recognition of replicative protein A (RPA), which binds exposed single stranded DNA, which accumulates when forks stall. Following recognition of RPA by the ATR/ATRIP tetramer, ATR autophosphorylates in trans, becomes catalytically active, and initiates a signaling cascade activating the protein kinase Chk1. In turn, Chk1 helps stabilize replication forks and inhibits mitotic cyclin dependent kinase activity. This process helps ensure damaged DNA is repaired before segregating into daughter cells. We use the model system Schizosaccharmoyces pombe to study the DDR response, in which Rad3ATR and Rad26ATRIP respond to both stalled replication as well as double stranded DNA breaks (DSBs) throughout the cell cycle. Following DNA damage, the Rad3ATR/Rad26ATRIP tetramer recognizes ssDNA coated with Rad22RPA, autophosphorylates in trans activates downstream effector protein kinases Chk1CHK2 and Cds1CHK2. While the structural significance of the tetramer is not currently known, it is understood that HEAT (Huntington, elongation factor 3 (EF3) 1, protein phosphatase 2A (PP2A) 2, and the yeast PI3-kinase TOR1) repeats of ATRIP and Rad26ATRIP are required for tetramer formation with ATR and Rad3ATR, respectively. Previous evidence suggests specific residues in the HEAT repeats are necessary for robust checkpoint signaling and upon mutation checkpoint signaling becomes perturbed or unable to operate completely. Here, we report that partial removal of the HEAT repeat contained in Rad26ATRIP causes constitutive checkpoint signaling. Our data suggest that the tetramer formed by Rad26ATRIP and Rad3ATR is autoinhibitory to Rad3ATR activity, and possibly, allows Rad3ATR to activate its downstream effectors more easily, causing chronic checkpoint signaling.

Keywords: Cell Cycle; S. pombe; fission yeast; human disease; ATRIP; ATR.

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: Every day 25,000 people die from hunger-related causes. A fruitful option to obtaining healthier crops is to genetically modify plants to be more nutritious and resistant to insects or herbicides. The efficient production of safe plants is vital in accomplishing this goal. We are focusing on creating a more effective transformation technique for Brassica Rapa, known as Wisconsin Fast Plants®, a cousin to broccoli. These plants quickly reproduce in about 40 days, allowing for faster results and higher potential as a teaching subject. Current methods transform one in every thousand seeds. Intensive labor and in-depth analysis are required to discover which seedling is transformed, as inserted traits may not be visible to the naked eye. A literature review and experimental plan have been completed due to the gracious LAS Student Summer Research/Creative Works Stipend award I received over summer 2020. I have perfected the seed cleaning procedure needed to eliminate mold, which commonly comes on the seeds' coats. We finished evaluating kanamycin's and hygromycin's herbicide efficacy and are looking into BASTA, a commercial herbicide. We will soon begin genetically modifying the plants with the desired trait and herbicide resistance to finish developing our method.

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

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Presenters:	David Doran	Graduate Student	College of Letters, Arts and Sciences	Biology

Authors: David Doran, Anh Nguyen, Annaliese Calzadilla, Phillip Welser, & Tim Artlip

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

Abstract: Genetic engineering is a viable option for containing gene flow of invasive plant species. Previously, the process of RNA interface (RNAi) was used to simultaneously reduce fertility and suppress two AG-like genes in apple trees (Malus domestica) to produce trees with "double flowers". However, there was also suppression of non-target genes. Compared to RNAi, CRISPR-Cas9 is a more efficient and precise process that alters genotypes to give loss of function mutations. CRISPR-Cas9 is a method that uses a nuclease, Cas-9, to cut target DNA sequences determined by a guide RNA with complementary bases; The damaged portion of the DNA sequence is repaired which can introduce mutation(s). Malus domestica is known to contain two AG genes but their degree of functional overlap has yet to be determined. The CRISPR method will be used to determine the effects that altering regions of the AG genes will have on floral form and development. Four CRISPR constructs designed to target various portions of the AG genes were used to produce 44 transgenic sequences for each of the two apple cultivars of interest. The transgenic lines obtained are currently being sequenced and analyzed to determine the effects of CRISPR on the target genes.

Keywords: CRISPR, biotechnology, genetic containment, apple, flowers

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Presenters:	Charles Fields	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Charles Fields & Lisa Hines

Title: Determining the Significant Predictors of COVID-19 Prevalence and Mortality in Colorado: A Multivariate Analysis

Abstract: The 2019 novel coronavirus responsible for the COVID-19 global pandemic has been detected in nearly every country around the world. As of November 6, 2020, an estimated 9.4 million cases and more than 230,000 deaths have been reported in the United States; making it the most severe epicenter for the virus. Within each state, the prevalence and mortality of COVID-19 varies greatly; states like Texas, California, and Florida represent nearly 30% of the total reported cases in the country. Colorado has reported 121,000 cases and 2,353 deaths as of November, 6 2020; recent news articles have indicated that the burden of COVID-19 has been disproportionately affecting Colorado residents of lower socioeconomic status and people of color. We generated a multivariate model to assess significant predictors of incidence and mortality in Colorado using publicly available data from the CDPHE's COVID-19 open data portal and CDPHE's Colorado public health indicators dataset. Our findings were then compared and contrasted with the nation as a whole.

Keywords: COVID-19, Colorado, Statistics

Presenters:	Kinsey Greve	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Kinsey Greve

Title: Effects of Elk Browse on Quaking Aspen in Colorado

Abstract: Aspen trees serve as important habitat for many different species of the Rocky Mountains. During winter, elk strip the bark and browse the twigs of aspen, which may make aspen more vulnerable to disease as well as inhibiting regeneration of stands by suckers. This study investigated the effects of elk browse on the structure and health of aspen stands along the eastern slope of the Rocky Mountains in Colorado. For each aspen stand sampled in a stratified random sample with blocking by watershed, trees were tallied by life and size status and measured by diameter at breast height. Ungulate pellet piles and browse marks were tallied, and Leaf Area Index was measured as an indicator of stand health and density. Across the aspen stands sampled, there was an average of 0.5 browse marks per tree and an average LAI value of 0.744, ranging from 0.30 to 1.18. Stand composition ranged from being 0.00-80.77% made up of saplings and 0.00-50.00% made up of deceased trees.

Keywords: biology, ecology, herbivory, aspen, elk, browse, aspen recruitment

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Presenters:	Brittini Hill	Graduate Student	College of Letters, Arts and Sciences	Biology

Authors: Brittini Hill, Jeremy Bono, & Denise Herzing

Title: Immigrant Dolphins: A Shifting Home Range in Atlantic Spotted Dolphins (Stenella frontalis) in the Bahamas

Abstract: The home range of a species is a basic unit of ecology, defined as the area utilized by the individual for gathering food resources, mating, and caring for offspring. Although species home ranges are not static, fluctuating over time to remain within favorable environmental conditions, Earth's species are being redistributed at accelerating rates due to climate change and anthropogenic causes. We are analyzing the home range of Atlantic spotted dolphins (Stenella frontalis) in the Bahamas before and after an unprecedented mass emigration event, which followed a decrease in sea surface temperature and chlorophyll a concentration. In 2013, when dolphins from Little Bahama Bank moved to Great Bahama Bank, they not only acquired a new habitat, but also encountered resident communities of dolphins. The unique underwater nature of this study allows for comparison of not only the size, but also the use and function of the immigrant dolphins' new home range to both their previous home range on Little Bahama Bank and the home range of resident Great Bahama Bank dolphins. While home range studies are more common for terrestrial species, they are lacking for cetaceans, particularly in offshore ecosystems, due to the challenging nature of tracking and monitoring these populations. This study provides a rare opportunity to focus on a marine species for which there is long-term data available for comparison before and after a home range shift. The results have helped inform conservation efforts to stop a 2020 oil drilling license permitted in the dolphins' home range.

Keywords: biology, ecology, geography, home range, dolphins, cetaceans, emigration, conservation, Bahamas

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Presenters:	Julia Hilliard	Graduate Student	College of Letters, Arts and Sciences	Biology

Authors: Julia Hilliard

Title: Elucidating the Function of the Small Regulatory RNA SR0947 in Borrelia burgdorferi

Abstract: Lyme disease is an emerging infectious disease with increasing incidence in North America. The causative agent of this infection is the spirochetal bacterium Borrelia burgdorferi which is carried by multiple species of Ixodes tick. Borrelia burgdorferi's survival depends on successful navigation of its enzootic cycle: acquisition of the spirochete by a tick vector from an infected vertebrate host, and transmission from the tick vector to an uninfected vertebrate host. Specific and coordinated gene expression is critical during this enzootic cycle with each stage controlled by different regulatory molecules. Rrp1 is a response regulatory protein that synthesizes the second messenger c-di-GMP altering gene expression during borrelial acquisition. Recently, small RNAs have emerged as crucial modulators of gene expression in bacteria. RNA sequencing of the borrelial genome revealed 560 genes and 136 small RNAs regulated by Rrp1. SR0947 is small RNA regulated by Rrp1 with an unknown biological role in B. burgdorferi. Preliminary data indicate SR0947 is important for B. burgdorferi in the tick, and functions via binding to its mRNA targets. SR0947 has several predicted targets including the DNA/RNA binding protein BpuR. BpuR is elevated during tick colonization implicating this protein's role for crucial gene regulation during this stage. Preliminary data suggest that SR0947 binds to the start codon of the bpur transcript preventing its translation and affecting the bacterium's ability to survive in the tick.

Keywords: Lyme disease, tick, borrelia burgdorferi, small RNA, gene expression, gene regulation

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Presenters:	Haley Klemp	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Haley Klemp, Annaliese Calzadilla, Ahn Nguyen, David Doran and Dr. Amy L. Klocko

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

Abstract: Perfluorinated compounds are a group of chemicals that are per- and polyfluoroalkyl substances. These chemicals are utilized to produce waterproof fabrics as well as fast food wrappers. These compounds do not naturally occur in nature and persist for many years as they bioaccumulate within environments. Accumulation of PFCs in water supplies are believed to be linked to human health concerns; In 2016 150,000 gallons of water containing PFC fire suppressant foam was released into the Fountain Creek watershed. We will be analyzing possible ecological effects on trees in this ecosystem. Samples will be taken from three tree species at two different test sites which vary in PFC concentration; three trees of each species at each site will constitute our sample population. Leaves from each tree were collected and being chemically analyzed to quantify the amount of PFCs the trees have absorbed. The dimensions of these leaves were measured to observe stress. Wood cores from cottonwood trees were also obtained to analyze annual tree growth before and after the 2016 spill. Monument Creek flows into Fountain Creek where higher concentrations of PFCs accrue. These sites were chosen based on previous analysis of PFCs in the water.

Keywords: PFCs, Tree growth, ecology

Presenters:	Trenton Reinicke	Undergraduate Student	College of Letters, Arts & Sciences	Biology

Authors: Trenton Reinicke, Federica Piani, David Cherney, Bruce Perkins, & Petter Bjornstad

Title: Copeptin Affects Renal Vascular Resistance in Adults with Longstanding Type 1 Diabetes with and without Diabetic Nephropathy: Results from the Canadian Study of Longevity in Type 1 Diabetes

Abstract: Objective: Arginine vasopressin (AVP) and its surrogate, copeptin, have been implicated in diabetic kidney disease (DKD) pathogenesis, which develops in a subset of people with longstanding type 1 diabetes, but not in others (DKD Resistors). We hypothesized that patients with DKD would exhibit higher copeptin concentrations vs. DKD Resistors.
Methods: Participants with type 1 diabetes (n=62, duration ≥50 years) were stratified into 42 DKD Resistors and 20 with DKD (eGFR ≤60mL/min/1.73m2 or ≥30 mg/day urine albumin), and age/sex-matched controls (HC, n=74) were included. Glomerular filtration rate (GFR) and effective renal plasma flow (ERPF) were calculated by inulin and p-aminohippurate clearance before and after angiotensin II (ang II) infusion. Renal vascular resistance (RVR) were calculated as mean arterial pressure / renal blood flow. Plasma copeptin, renin, aldosterone, neutrophil gelatinase-associated lipocalin (NGAL), and urea concentrations were measured, along with 24-hour urine volume.
Results: DKD resistors had lower copeptin (95% CI: 4.0 [3.4-4.8] pmol/l) compared to DKD (5.8 [4.5-7.6] pmol/l, p=0.02) and HC (4.8 [4.1-5.5] pmol/l, p=0.01) adjusting for age, sex and HbA1c. In type 1 diabetes, higher copeptin correlated with lower GFR (r: -0.32, p=0.01) and higher renin concentration (r: 0.40, p=0.002) after multivariable adjustments. These relationships were not evident in HC. Copeptin inversely associated with RVR change following exogenous ang II only in participants with type 1 diabetes (β±SE: -6.9±3.4, p=0.04).
Conclusions: In longstanding type 1 diabetes, copeptin was associated with intrarenal renin–angiotensin–aldosterone system (RAAS) activation and renal hemodynamic function, suggesting interplay between AVP and RAAS in DKD pathogenesis.

Keywords: Copeptin, Type 1 Diabetes, Diabetic Kidney Disease, Diabetic Nephropathy, Arginine Vasopressin, Renal Vascular Resistance

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Presenters:	Abbey Swift	Undergraduate Student	College of Letters, Arts and Sciences	Biology

Authors: Abbey Swift and Clint Hamilton

Title: Analysis of the Mutualism between the Blue Hops Butterfly (Celestrina humulus) & Ants (Hymenoptera).

Abstract: A number of ant species have been documented tending the blue hops butterfly larvae (Celastina humulus) in the Rocky Mountain region of Colorado. The larvae feed on the male flowers of the wild hops plant (Humulus lupulus) which typically grows along riparian areas. In order to determine which factors most affected the presence & frequency of ant tending, we documented patch size, average temperature & humidity, light exposure & flower phenology. We also documented the ant species to determine which species were most likely to be found tending.

Keywords: mutualism, butterfly larvae, ants

Presenters:	M. Brandon Titus	Graduate Student	College of Letters, Arts and Sciences	Biology

Authors: M. Brandon Titus & Meg Super

Title: The RNA-binding protein Caper interacts with FMR1 to regulate behavior in Drosophila.

Abstract: Disruption of development and maintenance of the nervous system can lead to devastating neurological diseases, such as amyotrophic lateral sclerosis (ALS), Alzheimer's Disease (AD), and epilepsy. Recent studies have found associations between epilepsy and later onset neurodegenerative disorders such as Huntington's and Parkinson's disease. Increasingly, neurodegenerative disorders have been linked to mutations in genes encoding RNA-binding proteins (RBPs). An RBP and alternative splicing factor, Caper, has previously been shown to regulate the development and maintenance of the peripheral nervous system in Drosophila melanogaster and its dysfunction results in aberrant neuron morphology and behavioral consequences, including seizure-like and grooming behavior. We previously identified proteins that interact with Caper through co-immunoprecipitation and mass spectrometry. One of the interacting proteins identified was a RBP associated with Fragile X syndrome, FMR1. Interestingly, seizures are a common symptom of Fragile X syndrome in humans and the interaction between fmr1 and caper may play a role in seizure-like behavior. This genetic interaction was further confirmed by western blot and epistasis analysis of multiple behavioral phenotypes including negative gravitaxis and grooming. Understanding the molecular, morphological, and behavioral significance of these highly conserved genes and their interactions can help further our understanding of the nervous system and its role in human disease and aging.

Keywords: Neurodevelopment, genetics, RNA, neurodegenerative disease, aging, seizures

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

Authors: Erika Tixtha, Adeline Chang, Sylvia Conquest, Meg Super, and Eugenia Olesnicky-Killian

Title: Using a Modifier Screen to Identify Proteins that Interact with the RNA-Binding Protein Caper

Abstract: Genes do not function in isolation, and identifying genes that interact can provide vital insight into genetic pathways. Modifier screens are an efficient method of identifying genes that function in the same pathway. The pathway in which Caper, a highly conserved RNA-binding protein involved in neuronal development, functions has not been identified to date. Caper dysfunction results in an age-dependent decline in locomotor ability and decreased longevity, both of which are trademarks of accelerated aging and neurodegenerative disorders in humans. The pilot modifier screen will use the model organism Drosophila melanogaster to determine which genes on the third chromosome operate in the same pathway as caper. To do this, we will cross fly lines containing deletions in various genes on the third chromosome, termed deficiency lines, to our caper mutants. The progeny of these crosses will be assessed for modifications in three aging-associated phenotypes: longevity, gravitaxis, and bristle patterning. Modifications in these phenotypes will indicate genetic interaction with caper, and the specific genes involved can be narrowed down. Identifying caper-interacting genes will improve our knowledge of biological pathways involved in neurodegeneration and senescence. This knowledge may contribute to the development of therapeutics that mediate neurodegenerative diseases and promote healthy aging.

Keywords: Neurodegeneration, genetics, Drosophila

Chemistry and Biochemistry Presentations

Presenters:	Luke Arsenault	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Luke Arsenault, Henry Thomas, & Wendy Haggren

Title: The Role of Indole in E. coli Survival upon Exposure to Ampicillin

Abstract: Bacterial persistence, a state in which bacterial cells appear to be metabolically dormant, has been shown to contribute to survival during exposure to concentrated ampicillin. Our laboratory is exploring whether the production and presence of the bacterial signaling molecule indole plays a role in the generation of persister cells through inspection of survival upon ampicillin challenge. The research model consists of two E. coli strains which differ in one gene only: a gene for an enzyme required to convert tryptophan to indole. Comparing cell survival in a high concentration of ampicillin, early data from our lab showed a decrease in persister formation for indole-producing cells. Published literature reflects both increased and decreased formation of persisters by indole-producing cells. Our current studies suggest the growth state of both strains impacts persister formation upon exposure to ampicillin. Further experimentation has suggested a positive relationship between indole production and formation of persisters collected from cultures in logarithmic growth.

Keywords: E. coli, cell, indole, persister, persistence, survival, ampicillin, cell survival, logarithmic phase, growth

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Presenters:	Danielle Browne	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Danielle Browne, Yvonne Weissbarth, Hans Gabius, Jaroslaw Majewski, & Crystal Vander Zanden

Title: Determining the Effects of Galectin/GM1 Interaction on Cellular Membrane Structure and Organization

Abstract: Lectin and glycolipid interactions facilitate numerous cellular functions such as signaling, regulation, and adhesion. Understanding these interactions could provide insight to immune, inflammatory, and neurodegenerative diseases and serve as therapeutic targets. Experiments were performed to elucidate the interactions between galectins (wild type galectin, Gal-1 and galectin mutants, Gal-3NT/1 and Gal-1 [8S] Gal-1) and glycolipid GM1. The goal is to determine if the mutant proteins' molecular architecture induces novel binding interactions with GM1 in a model membrane. Binding interactions with GM1 occur in the liquid condensed domains of the membrane. By studying these domains, it is possible to observe changes induced by protein interactions. Experiments using a Langmuir trough, fluorescence microscopy, and grazing incidence x-ray diffraction (GIXD) have characterized membrane organization after the introduction of galectin variants. These experiments were done using a lipid monolayer composed of a molar ratio of 80:20 DPPC lipid and ganglioside GM1 within a lipid monolayer. The results obtained support the interaction of each protein variant with the model membrane as well as reorganization. These experiments can help to unveil the nature of the interactions between GM1 and Gal-1.

Keywords: biochemistry, membranes, lipids, protein, signaling, lipid rafts

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

Authors: Jennifer Burrows & Amanda Morgenstern

Title: Computer-Aided Drug Design 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. While there are several medications approved for treating HAT, most have side effects that are as severe as the disease. It would be beneficial for HAT patients and medical teams to have an effective medication with diminished side effects. This project's focus is on inhibiting T. brucei's GSK3 enzyme, which is essential for cell growth, leading to parasitic death. The biomolecular docking software HADDOCK is used to investigate interactions between potential drug candidates and GSK3. The drugs tested in this study contain either a pyrazole-pyridine group or indirubin, which were found to be primarily stabilized by alanine and valine residues within the hydrophobic regions of the GSK3's active site. Secondary stabilizations were found in peripheral hydrophilic residues were secondary to the hydrophobic residues stabilizing the drug candidates. Ongoing work uses ab initio modeling with Amsterdam Density Functional (ADF) to examine binding at the molecular level to better understand how drugs may interact within T. brucei's active site with the goal of proposing novel drugs candidates.

Keywords: African Sleeping Sickness, HAT, T. brucei, drug design, GSK3, HADDOCK, ADF, ab initio

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

Authors: Logan Epperson

Title: Computational Modeling of Relationship Between Electric Fields and Enzyme Catalytic Abilities

Abstract: Enzymes are known to greatly increase the rate of reactions, but the exact mechanism for how this rate increase occurs is not fully understood. The theory of electrostatic preorganization (EP) explains this catalytic ability as the full enzyme structure inducing an electrostatic field on the active site where reactions occur. This electrostatic field forces reactants into the most optimal conditions for a reaction to proceed, lowering the activation barrier. Increased understanding of the role of electric fields in enzymes will provide strategies for more efficient enzyme design and drug development. Investigation of EP is performed computationally using density functional theory (DFT). Small model systems based on the active site in ketosteroid isomerase (KSI) are built modeling the first proton transfer step of the reaction. A substrate carbonyl which facilitates charge transfer is key to this step. First, an external electric field (EEF) is applied to the C—O bonds in carbon monoxide and carbon dioxide. Results are quantified by the Quantum Theory of Atoms in Molecules (QTAIM), providing a representation of the structure based on charge density. Next, the full reaction coordinate for a model reaction is created and optimized. Current work involves QTAIM analysis after an EEF is applied to this model reaction. The importance of the electric field to reaction rate will be determined.

Keywords: computational modeling, enzymes, biology, reaction rate

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

Authors: Madison Fox

Title: Enzymatic Bioremediation of Perfluorinated Compounds

Abstract: High levels of toxic contamination of perfluorinated compounds, PFC's, found in the Southern Colorado Springs Metro Area have been measured in drinking water and degraded in organisms found in chemical spill areas. They have been known to cause significant health effects in exposed populations. 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 PFC's using enzymes genetically designed and bioengineered to degrade per-halogenated compounds. This method is a better alternative than the previously proposed methods since the enzyme works to remove the fluorine atom from the compound making 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 BL21 cells. Cells were then lysed to expose the enzyme and purified through a HisTrap affinity column and collected through FPLC. SDS-Page gels and restriction digest reactions confirmed the molecular weight, the target number of base pairs, and the proper cross linking of disulfide bonds in the protein which was measured to weigh approximately 73 kDa. Our next steps begin by quantifying dehalogenase activity of our enzyme using a colorimetric assay using 1,2-dichloroethane as our initial test substrate.

Keywords: Enzyme Bioengineering, Protein Purification, Perfluorinated Compounds, PFC's

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Presenters:	Whitney Herring	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Whitney Herring

Title: Establishing the HIV Reservoir: the Role of Complement

Abstract: Current HIV therapeutics target all stages of HIV's life cycle, except the establishment of an infectious reservoir. This stage has yet to be targeted as how this reservoir is established has not yet been elucidated. Previous research indicates that the reservoir may be established using components from the complement system. We believe this establishment involves interaction between complement receptor 2 (CR2) and HIV's envelope glycoprotein, specifically gp120. Understanding this interaction and what other proteins are involved is crucial in discovering how and why HIV establishes its infectious reservoir.

Keywords: virus, HIV, infectious reservoir, immune system, complement system, proteins

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Presenters:	Zexin Li	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Zexin Li & Jacob Miratsky

Title: New Tri-metallic [(Cl)3Pt(dpop')M(dpop')Pt(Cl)3] (M=Ru(II) and Os(II)) Complexes In Comparison To Bi-metallic Counterparts

Abstract: The ligand dipyrido (2,3-a: 3',2'-j)phenazine (abbreviated dpop') was previously shown to undergo bidentate and tridentate coordination with transition metals. Two bi-metallic [(Cl)3Pt(dpop')Ru(dpop')](PF6) and [(Cl)3Pt(dpop')Os(dpop')](PF6) complexes in which dpop' served as a bridging and a terminal ligand were synthesized. New tri-metallic counterparts [(Cl)3Pt(dpop')Ru(dpop')Pt(Cl)3] and [(Cl)3Pt(dpop')Os(dpop')Pt(Cl)3] were synthesized and the physical properties compared to the previous dimers. Kinetic studies conducted in dimethyl sulfoxide of the tri-metallic complexes suggested that the pattern of disintegration was a two-step reaction. This was further supported by NMR spectroscopy the result of which provided evidence for the existence of bi- and tri-metallic complexes over a course of 24 hours. A DNA-binding study is currently underway to investigate the photo-binding effects of these complexes for possible application in photodynamic therapy as anti-tumor agents.

Keywords: Ruthenium(II)complexes, Osmium(II)complexes, Platinum(II)complexes, bridging ligands, bimetallic complexes, trimetallic complexes

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Presenters:	Ericka Rivera	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Ericka Rivera, Luis E. Lowe, & Janel E. Owens

Title: It's in the Juice: Development of a Silver Nanoparticle Antioxidant Assay for Quantitation of Vitamin C in Beverages

Abstract: Vitamin C, or L-ascorbic acid, is an essential vitamin and an antioxidant that can be quantitated in food and drink by fast and convenient total antioxidant capacity assays. This study aims to apply a modified and validated silver nanoparticle (SNaP-C) assay that employs silver nanoparticles (AgNPs) synthesized using microwave technology to determine the antioxidant capacity in assorted juice and sports beverages. Vitamin C concentrations determined by the SNaP-C assay will be validated by high-performance liquid chromatography (HPLC) and against two other assays: Folin-Ciocalteu (FC) and the cupric reducing antioxidant capacity (CUPRAC) assay. Currently, the SNaP-C assay is being applied to various beverages with cross comparison to the FC & CUPRAC assay and validation with HPLC.

Keywords: Antioxidant, Food Chemistry, Silver Nanoparticles, Vitamin C, Antioxidant assays, analytical chemistry

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

Title: Role of Large Genome Rearrangements on Genome Organization and Gene Expression in Neurospora crassa

Abstract: In eukaryotes, the nuclear arrangement of DNA is influenced by multiple inter- and intra-chromosomal interactions that may influence gene expression. Gene regulation in these nuclei involves the coordinated interactions between transcriptional DNA elements like promoters, enhancers and silencers. Large-scale genome rearrangements, in which a chromosome is broken and incorrectly repaired, may result in aberrant DNA contacts that may induce unregulatable protein production. Some of these deleterious effects have been observed at the fusion points of “translocations” in human cancers. To better understand the role of rearrangements , the use of single translocation Neurospora crassa strains are being employed as a model organism as it shares certain homology with genomic organization in the human cells. Genomic organization is studied through the use of Hi-C (chromosome conformation capture coupled with high throughput sequencing) which identifies long- and short-range contacts which reveal global organization and local disruptions. Published H3K29me2/3 ChIP-seq data for these strain with the Hi-C data provides information on altered interactions as it relates to this heterochromatic epigenetic marker. Analysis shows changes in local interactions centered around the breakpoint fusion and new telomeric interactions that result from novel telomeric regions and new methylation. Further, the topologically associated domains, regions of associated regulatory function, are experiencing changes in organization where the translocation is involved.

Keywords: translocations, bioinformatics, Neurospora crassa, genomic organization

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

Title: Analyzing curcumin’s membrane mediated neuroprotection against the fibrillar oligomer isoform of amyloid beta protein.

Abstract: Alzheimer’s disease (AD) is a neurodegenerative disease that effects ten percent of the population 65% and older. There currently is no cure, and the death rates are continuing to grow, as deaths from AD have increased 146% from 2018 to 2020. One of the main hypothesis of what causes AD is the misfolding of the normally benign Aβ protein. When Aβ misfolds, it is prone to either resulting in a monomeric, fibrillar oligomeric, or non-fibrillar oligomeric isoform. Each isoform has its own mechanism of membrane mediated-neurotoxicity. One molecule that has been proposed to alleviate the membrane mediated neurotoxicity of the Aβ isoforms is curcumin. Curcumin is a small polyphonic molecule. In depth Grazing Incidence X-ray diffraction (GIXD) data was collected at the Advanced Photon Source at Argonne National Labs and subsequently analyzed. From this data, models were generated hypothesizing how curcumin provides a membrane mediated neuroprotective effect on the cell membrane. The data showed that when curcumin was present, it significantly reduced the area under the curve of the representative of the fibrillar oligomer. This indicated that curcumin may provide membrane mediated neuroprotection for the cell in AD. This presentation focuses on the GIXD data of curcumins neuroprotective effects of the fibrillar oligomer isoform of Aβ.

Keywords: Amyloid Beta, Alzheimer's disease, Neurodegenerative disease, lipid packing, membrane disruption, curcumin.

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

Title: Influence of Translocations on Genomic Organization and Gene Expression in Neurospora crassa

Abstract: Translocations are large-scale genome rearrangements caused by incorrect repair of a double-strand break, whereby a segment of DNA is moved from one chromosome to another; translocations can compromise genome function and lead to cancer.
While it is known that if a breakpoint occurs in a gene, it can result in unregulated proteins, yet little is known for how translocations impact long-range contacts. In fact, gene regulation often requires an exact genome organization to facilitate long-range contacts between core promoters and enhancers within the spatial confines of the nucleus; these elements may normally be separated by thousands of base pairs of DNA, and translocations would physically segregate these elements on different chromosomes. It is difficult to study the impact of translocations on genome organization in human cancer cells, rendering
the need for a more simplistic system. Here, we use single, pure translocation strains of Neurospora crassa to study the link between genome organization and gene expression. Genomic organization is analyzed through Hi-C (chromosome conformation capture coupled with high throughput sequencing) which identifies long-range contacts providing organizational information. We performed Hi-C experiments on seven N. crassa strains, one of which will be outlined in this report, and examined for how translocations disrupt long-range contacts and if gene expression is altered.

Keywords: genome organization, cancer, translocations, gene expression

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Presenters:	William Stone	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry
Authors:	William Stone & Crystal Vander Zanden			

Title: MOLECULAR DYNAMICS SIMULATIONS TO DETERMINE THE NEUROPROTECTIVE MECHANISMS OF CURCUMIN

Abstract: Since 1992, Amyloid Beta (Aβ) protein has been investigated as the causative agent in Alzheimer's Disease (AD) due to its neurotoxic effects on cell membranes. Curcumin is a polyphenol found in turmeric and has been demonstrated to have neuroprotective effects against Aβ. In order to investigate the chemical mechanisms of this protection, atomistic molecular dynamics (MD) simulations were designed to model Aβ interactions with a model lipid membrane. In a parallel system, curcumin was embedded into the lipid membrane and simulations were performed to determine how the polyphenol alters Aβ interactions with the membrane. Simulations were analyzed to measure the perturbation to native membrane structure and protein structure. Systems containing a protein showed decreased membrane thickness in a localized region around the protein. The addition of curcumin decreased the size of this region, but also caused further decreases in thickness within the region. Calculations of the frequency of interactions between Aβ and curcumin revealed a preference for the curcumin to bind to non-polar and cationic residues. These interactions were confirmed to alter protein structure through Root Mean Square Deviation (RMSD) calculations of the protein's backbone. These initial results show promise in the efficacy of curcumin as a potential therapeutic for AD, but more analysis needs to be done to confirm our hypothesis.

Keywords: Molecular Dynamics, Curcumin, Amyloid Beta

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

Title: Neuroprotective impacts of Epigallocatechin-3-gallate (EGCG), an active compound found in green tea, in Alzheimer's Disease (AD).

Abstract: Epigallocatechin-3-gallate (EGCG) is a water-soluble member of the catechin family (flavanols), which allows it to be steeped from the tea leaves it originates from. EGCG's molecular shape has been hypothesized as the reason it can greatly impact the amyloid cascade pathway. The amyloid cascade is centered on the formation of Amyloid Beta (Aβ), a protein that is derived from the larger amyloid precursor protein (APP). Aβ is the primary component of plaques that are characteristic of AD. The current predominant hypothesis of Aβ toxicity is based on its interactions with cell membranes where it nucleates fibril formation. Currently, it is suggested that EGCG may be able to shift pathway aggregation within the lipid membrane by directly binding to unfolded polypeptide chains and inhibiting β-sheet formation, which is an early stage in the amyloid formation cascade. Using a Langmuir trough and X-ray diffraction, the interactions between Aβ, the membrane, and EGCG will be analyzed, to determine if EGCG can inhibit Aβ interactions in the membrane. Using Molecular Dynamics, and focusing on the molecular level, ECGC interactions with Aβ will be monitored to determine the specific molecular interactions that.

Keywords: Epigallocatechin-3gallate, Alzheimer's Disease, Amyloid Beta, Toxicity, Membrane

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

Title: Towards Understanding the EBV gp350 – Complement Receptor 2 Interaction

Abstract: Complement Receptor 2 (CR2) is the obligate human host receptor for the Epstein Barr Virus (EBV). The viral surface glycoprotein 350 (gp350) is known to interact with CR2 on human immune cells, resulting in viral infection. EBV infection results in either, an asymptomatic response as a result of infant infection, or a symptomatic response clinically known as infectious mono resulting from infection later in life. Regardless of when the initial infection occurs, the virus will remain latent in the body until the immune system becomes compromised. This latency has been suggested to be related to many different cancers and diseases. Currently, there are no therapies or vaccines against EBV. The results we present are the first steps in understanding the molecular interactions required for the infection of immune cells by the EBV. We have cloned and expressed the CR2 and gp350 protein and have analyzed the binding kinetics between them via bio-layer interferometry (BLItz) analysis. Lowered salt concentrations will be tested to determine if a reduction in binding interference can occur. Crystallography will be used to analyze the protein-protein interactions of CR2 and gp350 to create a 3D structure of the protein binding complex.

Keywords: Epstein-Barr Virus, Complement Receptor 2, Cloning, fast protein liquid chromatography, bio-layer interferometry, crystallography

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Presenters:	Laura White	Graduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Laura White & Amanda Morgenstern

Title: Incorporating electrostatic preorganization in the enzyme design process with QTAIM

Abstract: The concept of electrostatic preorganization (EP) first proposed by Warshel in 1998 has steadily gained acceptance as the driving force for enzyme catalysis. However, questions still remain as to how to apply this concept to the enzyme design process for the creation of synthetic enzymes. Recently, it has been shown that the charge density (ρ) in the active site can provide insight on EP in enzymes. One method for studying the effect of EP is to track the positions of critical points (CPs) in ρ defined by the quantum theory of atoms in molecules (QTAIM). Here, we perform density functional theory (DFT) calculations on a well-studied enzyme with an impressively high unimolecular rate, ketosteroid isomerase (KSI). We apply an external electric field (EEF) as a simplified model of the electric field created by the full protein. We then investigate the motion of CPs within KSI's active site due to the EEF to search for correlations between CP motion and the energy barrier of the enzyme. Our hope is to find methods that can be used to exploit QTAIM as a powerful tool in the optimization of EP for synthetic enzyme design.

Keywords: QTAIM, electrostatic preorganization, charge density, critical points, enzyme design

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Presenters:	Ian Wisniewski	Undergraduate Student	College of Letters, Arts and Sciences	Department of Chemistry & Biochemistry

Authors: Ian Wisniewski & Bailee Troutman

Title: Engineering Living Cells to Synthesize an Antitumorigenic Agent

Abstract: Magnetospirillum magneticum (AMB-1) is a bacterium that synthesizes magnetic nanoparticles within membrane bound organelles, allowing the cells to align with Earth's magnetic field and swim to regions of low oxygen concentration in their environment. Inspired by the work of a group in Montreal, this project will explore the use of these bacterial cells to deliver a chemical agent as a treatment for some types of cancer. In contrast to the Montreal study, our research will genetically engineer the cells to synthesize the agent themselves. The agent is a synthetic peptide shown to have antitumorigenic, as well as antimicrobial, properties. Our lab has designed two genes to code for the expression of this peptide and introduced the DNA into Escherichia coli (E. coli) cells. Moving forward we will observe expression of this peptide in both E. coli and AMB-1 cells, paving the way for future studies into peptides that have biomedical applications.

Keywords: Genetic engineering, magnetic cells, antitumorigenic agents

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Computer Science Presentations

Presenters:	Lynn Anderson	Undergraduate Student	College of Engineering	Computer Science
Authors:	Lynn Anderson & Ethan Priebe			
Title:	Implementing Visual SLAM (Simultaneous Localization and Mapping) and YOLO (You Only Look Once) to Generate a 2D Map and Detect a Rocket Using UAV			
Abstract:	Most modern rockets have Global Positioning System, or GPS, modules so that the rocket bodies and package are easier to find after launch. However, it is not always the case that the rocket will have a GPS module or even be in an environment where GPS is available. Even if the rocket does contain a GPS module, the terrain where the rocket landed is often difficult to travel on and can be well out of walking range. This project uses Artificial Intelligence to implement a method capable of addressing the problem of identifying and recovering lost rockets using autonomous unmanned arial vehicles (UAVs). Our solution is to use a cheap semi-autonomous UAV platform equipped with Visual SLAM (Simultaneous Localization and Mapping) and YOLO (You Only Look Once) deep neural network models to a) build a map of an unknown environment, b) keep track of the drone's location, and c) detect the rocket and its location. The 2D map generated by Visual SLAM algorithm on the drone will be passed to a more expensive UAV that will be tasked to fly to the location of the rocket from the base using Dijkstra's shortest path algorithm, take images at a variety of different angles, and return home.			
Keywords:	YOLO, VSLAM, Drones, Artificial Intelligence			

Presenters:	Prajjwal Dangal	Graduate Student	College of Engineering	Computer Science
Authors:	Prajjwal Dangal			
Title:	Industrial Security Through Real-Time Analytics			
Abstract:	The industrial security landscape suffers from the Data Rich Information Poor (DRIP) syndrome, i.e. massive data sit silently at Industrial Control Systems sites which could be put to better use. Moreover, given the increasing sophistication of attacks, a proactive solution is warranted. We present one such solution, real-time analytics that makes use of the existing data to provide active monitoring services for plant health. Specifically, we perform experiments with a hybrid methodology consisting of a testbed combined with a data-driven architecture.			
Keywords:	IIoT, computer networks, bounded, data			

Presenters:	Shawn Emery	Graduate Student	College of Engineering	Computer Science

Authors: Shawn Emery

Title: Post-Quantum Secure Electronic Voting Systems

Abstract: Can a full-featured, scalable, transparent, secure, and verifiable electronic voting system be post quantum computing secure? With recent advancements in quantum computing technology and large investments in this space, current encryption and authentication schemes may be obsolete in the coming decade(s). Given the understandably slow adoption of any new computer/network security infrastructure we are only a few US presidential elections away from a crisis unless we start planning now.

This presentation explores the requirements of the various phases of a secure electronic voting system. We'll cover why current systems will become vulnerable in a post quantum world. An analysis of existing post quantum secure electronic voting system designs and their limitations will also be presented. We finish by presenting our potential contributions that will meet the strenuous requirements of an electronic voting system that is post quantum secure.

Keywords: electronic voting, computer security, network security, quantum computing

Presenters:	Adria Llop Girones	Graduate Student	College of Engineering	Computer Science

Authors: Adria Llop Girones & Jonathan Contreras

Title: Conversation adaption in a social robot using Sentiment Analysis and Emotion detection

Abstract: Social robots are designed to interact with people in a natural, interpersonal manner, often to achieve positive outcomes in diverse applications. Although their integration in the society is still far, progresses in the area are happening fast and this research intends to help pushing in this direction.

Recognizing feelings and understanding emotional concepts are indispensable skills when it comes to human-robot interaction, for this reason, this study is focused on incorporating conversational capabilities in a NAO humanoid robot which will allow the robot to adapt itself in a conversation environment where sentiments are involved.

Taking into account that a human conversation is made of a verbal-part and a non-verbal part we developed the capability of understanding emotional components of a human conversation, in this project, the task known as Emotion Detection is performed on both components of the conversation. This allowed to extract emotions from the speech itself, as well as, the face of the interlocutor.

Joining these two approaches provides opportunity to have a very consistent “emotion extractor” that can be integrated in a NAO humanoid robot. To do so, two well-studied branches of Artificial Intelligence of Natural Language Processing (NLP) and Computer Vision (CV) are considered.

In the NLP component we came up with a Logistic Regression model with TF-IDF embedding that classifies sentences into 4 different category of Joy, sadness, anger and fear is utilized.

In the CV part, a convolutional neural network that classifies each emotion (Joy, sadness, anger, fear, disgusted, neutral, and surprised) detected on a human face is used. The CNN architecture is composed of 5 convolutional layers and 5 max pooling layers along with 2 fully connected layers and the output layer. The model uses rectified linear unit (ReLu) as the activation function on all layers except for the output layer which uses a softmax function.

The ultimate goal of the project is to integrate these functionalities to a NAO humanoid robot, since we think that modeling the robot behavior when interacting with humans is a really important question that can lead to better designs in human robot interaction. We want to make the robot flow appropriately through a conversation, so that the robot can choose what sentences to use taking into account the sentiment involving the conversation.

Keywords: Robotics, machine learning, artificial intelligence, computer vision, natural language processing, emotion detection

Presenters:	Colin Henson	Undergraduate Student	College of Engineering	Computer Science

Authors: Colin Henson & Bryce George

Title: Graphically Visualizing a Complex System with the Integration of Deep Learning Object Detection and Tracking

Abstract: The objective of this research is to develop a method for enhancing human visual perception of complex systems and interactions. Specifically, for our Computer Graphics class term project, we are analyzing a video recording of the "Variation" exhibit by Celeste Boursier-Mougenot in Brazil's Pinacoteca de Sao Paulo museum. The exhibit consists of three pools containing various-sized, floating ceramic bowls which are set in motion by the pools' jets. The motion and collisions of the bowls produce complex visual and harmonic patterns. Our research has focused on combining deep learning object detection and tracking techniques to follow the paths of the bowls over time and then apply colored graphical overlays which visualize their motion. The number of bowls, their homogeneity within the system, and the changing camera perspectives throughout the video make this task difficult. Our approach is to apply object re-detection phases which feed into intermediate object tracking sequences. Re-detection phases offer the opportunity to detect bowls which enter and remove bowls which have exited the scene over the course of a tracking sequence. The integration of detection data into the tracking algorithm functions by comparing objects between the final frame of a tracking sequence and those found by the detection algorithm applied to the same frame.

Keywords: Deep Learning, Tracking, Graphical Visualization,

Presenters:	Alexander Korobchuk	Undergraduate Student	College of Engineering	Computer Science

Authors: Alexander Korobchuk

Title: Automatically Constructing Custom Network Security Datasets with Word Embeddings

Abstract: A common challenge in any machine learning task is constructing the proper dataset. This challenge becomes greater when the task is for network security, such as for an intrusion detection system. For instance, handpicking features from network packets to use in classification tasks can be a strenuous process. Furthermore, every network is different, therefore it is difficult to create a dataset that can represent most networks. Thus, there is a need for the ability to easily create custom datasets that are tailored to a specific network. In this research, the potential of creating datasets by automatically extracting features from network packets is explored. Attacks are simulated by using common enumeration tools utilized by hackers, while also capturing all the packets on the network. The packet data is preprocessed and used to train a Word2Vec neural network model, of which features are automatically extracted from each packet and compiled as a vector representation. Using the vectors, a dataset can be created, thus being a simple means to formulate a custom-tailored dataset to a network. The results are shown by applying the datasets to a logistic regression machine learning model for the classification task of malicious and benign network packets.

Keywords: machine learning, neural networks, word embeddings, network security, intrusion detection, network data, word2vec, data science

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Presenters:	Michael Middleton	Undergraduate Student	College of Engineering	Computer Science
Authors:	Michael Middleton, Trevor Miller & Bder Khan			

Title: Underwater Cave Exploration and Research via Danger Noodle

Abstract: Cave exploration is a daunting task needed for the extended research of the Earth. Many caves are left unexplored due to the dangers that come with researching them. Often, the formation of these caves leaves them deep underwater and out of reach through regular means. The goal for this project is to create a robotic entity that has the ability to explore and map previously inaccessible caves for the purpose of acquiring broader information on the way they developed and the possible ecosystems within them. We propose using the ACM-R5H amphibious snake robot to fulfill this purpose. The ACM-R5H has the ability to navigate through water which makes it ideal for moving through and mapping underwater caves. It also has a slim snake-like design that allows it to more easily maneuver through narrow paths than a human or larger robot would be able to. By using an advanced navigation algorithm, we can employ strategic SLAM methods to map and navigate through these waterlogged caverns.

Keywords: Navigation, Underwater, Mapping, Robotics, Cave

Presenters:	Lukas Miller	Undergraduate Student	College of Engineering	Computer Science
Authors:	Lukas Miller, Janine Aquino, & Joshua McBride			

Title: Robotic Arms in Manufacturing

Abstract: Robotics is becoming a necessary part of the modern world. Ability to perform repetitive motions in synchrony resulted in industrial revolution. Industrial robots are a needed part of the workforce and will continue to grow in the future. The next phase of revolution in industrial robotics involves collaborative robotic platforms that their collective behaviors and their adaptability to the dynamics of workspace allows cost effective, efficient, and high quality production. In the use of robotics, there are different methods to complete the required tasks. Throughout the lifetime of robotic arms different implantations have continually proceeded towards the common goal of completing tasks in the most efficient way possible. This study is focused on collaborative robotics arms that collectively perform a complex task that no single robot can perform. In this study, we will explore three different methods on how robotic arms can interact and move objects between themselves. These three methods are: a) Forward kinematics in which the joints of the robotic arm move to certain angles to reach a given position, b) ANFIS network where the arm will use fuzzy logic to find where it needs to move to in order to be at a certain position, and c) vision based motion where the arm will find the object using sensory vision and assess its location and plan the required motion.

Keywords: Robotic Arms, intelligent robotics, forward kinematics, inverse kinematics, vision based sensors, ANFIS network, manufacturing

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Presenters:	James Peng	Graduate Student	College of Engineering	Computer Science

Authors: James Peng

Title: Fuzzing Satellite Space Systems

Abstract: Satellite systems inherit all challenges in embedded systems, along with its even worse remote-wireless, unmanned, and untouchable nature. Satellite systems testing becomes costly and infeasible thereby. The goal of testing is to find bugs before bugs are exploited by adversaries. Fuzz testing may be more authoritative with its unique tradeoffs: low cost, high efficiency, effectiveness, and flexibility. However, comparing to prevalent test frameworks, not enough attention has been given to satellite and satellite systems fuzzing. Specifically moreover, path exploding challenges happen when bugs don't reside in the same regions in program under test. Directed Greybox Fuzzing (DGF) may resolve the path exploding challenges in embedded systems---including input space, configuration space, state space, memory space, and disk space---by replacing path indicators such as coverage with the directedness, the indicator for relation and knowledge about bugs. This may make DGF more promising than other fuzz testing and prevalent test frameworks.

Keywords: Vulnerability Discovery, Embedded Systems, IOT, SIGINT, Network and Communications

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Presenters:	Manohar Raavi	Graduate Student	College of Engineering	Computer Science

Authors: Manohar Raavi, Simeon Wuthier, Pranav Chandramouli, Yaroslav Balytskyi, & Xiaobo Zhou

Title: Post-Quantum Cryptography

Abstract: Quantum computing challenges the mathematical computational hardness assumptions anchoring the security of public-key ciphers, such as the prime factorization and the discrete logarithm problem. To prepare for the quantum era and withstand attacks equipped with quantum computing, the security and cryptography communities are designing new quantum-resistant public-key ciphers. National Institute of Standards and Technology (NIST) is collecting and standardizing the post-quantum ciphers, similar to its involvement in establishing DES and AES as symmetric cipher standards in the 1970s and the late 1990s, respectively. The NIST finalist algorithms for public-key signatures are Dilithium, Falcon, and Rainbow. Finding common ground to compare these algorithms can be difficult because of their design, the underlying computational hardness assumptions (lattice based vs. multivariate based), and the different metrics used for security strengths analyses in the previous literature (qubits vs. quantum gates). We overcome such challenges and compare the security and the performances of the finalist post-quantum ciphers of Dilithium, Falcon, and Rainbow. For security comparison analyses, we advance the prior literature by using the depth-width cost for quantum circuits (DW cost) to measure the security strengths and by analyzing the security in Universal Quantum Gate Model and with Quantum Annealing. For performance analyses, we compare the algorithms' computational loads in the execution time as well as the communication costs and implementation overheads when integrated with Transport Layer Security (TLS) and Transmission Control Protocol (TCP)/Internet Protocol (IP). Our work presents a security comparison and performance analysis as well as the trade-off analysis to inform the post-quantum cipher design and standardization to protect computing and networking in the post-quantum era.

Keywords: Quantum-Resistant Cryptography, Post-Quantum Cryptography, Quantum Computing, Digital Signature Algorithms

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Presenters:	Arijet Sarker	Graduate Student	College of Engineering	Computer Science

Authors: Arijet Sarker, SangHyun Byun, Wenjun Fan, Maria Psarakis, & Sang-Yoon Chang

Title: Voting Credential Management System for Electronic Voting Privacy

Abstract: Electronic voting requires voting privacy to protect the voter anonymity. We present a novel design framework for credential management called Voting Credential Management System (VCMS) which preserves voting privacy against advanced attackers who do not only monitor the voting transactions and communications but are also capable of compromising an authority involved in the credential management and generation. Such requirement against the advanced threat model based on an authority compromise is inspired by the recent attacks in voting privacy and is adopted in the state of the art credential management systems. VCMS achieves such properties by building on the well-established cryptographic primitives and by separating the voting token (the VCMS output credential used for the voting) and the intermediate key token (which is used within VCMS and bridges the registration/certificate with the voting token). VCMS is specifically applicable to electronic voting and is simpler than other sophisticated credential management systems achieving comparable security properties.

Keywords: Electronic Voting, Credential Management, Public-Key Infrastructure, Voting Privacy

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Presenters:	Dustin Trujillo	Graduate Student	College of Engineering	Computer Science

Authors: Dustin Trujillo

Title: Project MICE (Money, Ideology, Compromise, and Ego):
Understanding Hacker Mentality, Threat Hunting, and Splunk

Abstract: In today's modern technological age, data breaches are on the rise. What's more, there are now more techniques and tools available to modern day hackers than ever before. Conversely, many organizations have limited resources to protect against hackers. As such, organizations must use every tool they have to its fullest. My research investigates and explores the psychology of a hacker, their intents, motivations, and goals. I consider how to effectively apply this knowledge to threat hunting and what defending or detecting hackers would look like through the use of specific tools (such as Splunk). Ultimately, recommendations that organizations can use to enhance their threat hunting teams and techniques, such as specific Splunk commands, use, and intent, will be presented.

Keywords: cybersecurity, computer hacking, hacker business models, hacker psychology, hacker motivations, threat hunting techniques, splunk query language commands, darkweb, phishing, malware, ransomware, spoofing, denial of service, ddos, bruteforce, botnet

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Presenters:	Mark Vaszary	Graduate Student	College of Engineering	Computer Science

Authors: Mark Vaszary, Andreas Slovacek, Yanyan Zhuang, & Sang-Yoon Chang

Title: Securing Tire Pressure Monitoring System for Vehicular Privacy

Abstract: Modern vehicles are equipped with vehicular sensors for smart navigation, vehicle state awareness, and other intelligent operations. Despite the previous belief that the sensor operations stay within a vehicle, as it is designed to be, we study information leakage through the tire pressure monitoring system (TPMS) sensors and the corresponding privacy breach. We demonstrate that, using a low-cost and off-the-shelf software defined radio (SDR), an unauthorized attacker can track uniquely identifiable sensor IDs up to 40 meters away from the vehicle.

To address the issue and protect the vehicular privacy, we also propose an effective and lightweight TPMS ID randomization scheme, tailored for vehicular sensors, and analyze the security and the costs of implementing the scheme. Our work informs and advances vehicular security research and development.

Keywords: Vehicular Sensor, TPMS, Vehicular Privacy, Signal Leakage

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Electrical and Computer Engineering Presentations

Presenters:	Autumn Knight	Undergraduate Student	College of Engineering	Electrical and Computer Engineering

Authors: Autumn Knight & Byeong Lee

Title: Performance Analysis of Network Pruning for Deep Learning based Age-Gender Estimation

Abstract: With the advance of visual AI technology, age-gender estimation plays a fundamental role in identifying individuals. As deep learning technologies are emerging, identification schemes show significant progress and can handle many challenges of unconstrained imaging conditions. Research on age-gender estimation has begun applying deep convolutional neural networks (CNN) as a framework. However, due to large memory footprints and computational workloads, deep neural networks are hard to apply to on-device training and inference for embedded devices which have limited hardware resources. To solve this issue, network model pruning has been proposed as an efficient approach to reduce the model redundancy without significant degradation of the performance. In this research, we modeled and characterized several pre-training models with architecture variations on baseline age-gender estimation before applying pruning schemes. For each of the models, three types of pruning comprised of weight, layer and filter pruning are applied and the pruning results are analyzed in terms of complexity and accuracy to find optimal pruning conditions. Combined schemes of pre-training models and network pruning techniques are discussed, and their results are compared with the original model's. Based on our experiments, the actual size of a fully trained prediction model can be reduced by as much as 90% with an accuracy loss of 2%~9%.

Keywords: network pruning, deep neural network, machine learning, age estimation, gender estimation

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Presenters:	Jakob Sharp	Undergraduate Student	College of Engineering	Electrical and Computer Engineering

Authors: Jakob Sharp

Title: The Mountain of the Unreleased Soul

Abstract: You are an adventurer who began their journey up a mountain. After several hours of climbing up ragged paths and observing the thinning tree line, you come across a lone cabin in the woods. Looking at your map, you discover that this cabin and the lake near it aren't marked on it. Observing that it will soon become night, you approach the cabin in hopes to find somewhere to rest safely on the path. As you get closer you find a singular grave next to the cabin. Walking up to it, you find a soul, lost and unable to escape the land of mortality. It hopes to guide you down the path of freedom for it.

Keywords: Unreal Engine 4, Level Design, Ray Tracing, Mountains

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Presenters:	Kyle Smart	Undergraduate Student	College of Engineering	Electrical and Computer Engineering
Authors:	Kyle Smart			

Title: How Ugly can a Table get?

Abstract: When the time came to get started on my first programming assignment for CS4800, Computer Graphics, I wasn't sure where to go with it or what to do. I read the requirements and got started on thinking. The requirements, for the first part, was to make a table with each of the four legs being different parts. I began thinking about it, and realized that a table designed with this requirement in mind could be rather interesting. I got started in Maya by just exploring the program and discovering features Maya offers. Then I thought to myself: What can Maya do? I went from there with one goal in mind, to make the ugliest table that I can think of with the help of Maya.

Keywords: Maya, 3D Graphics, 3D modeling, 3D

Presenters:	Christopher Weber	Undergraduate Student	College of Engineering	Electrical and Computer Engineering
Authors:	Christopher Weber & Ethan Sherman			

Title: Simulation Testbed for Performance Analysis of Connected and Autonomous Vehicles

Abstract: Connected and autonomous vehicle (CAV) is a technological advancement that is becoming more widespread for both the scientific community as well as the average consumer. It is therefore critical that the performance of CAVs is elevated to the pinnacle of safety and computation standards and to meet the stringent service requirements for high data transfer and low latency communications between CAVs and the wireless infrastructure. To achieve such an ultra-reliable low latency communication (URLLC) system, new wireless and computing solutions are needed in the sixth generation (6G) wireless networks to enable CAVs to operate as a cohesive, interconnected units. In fact, one of the main challenges that 6G networking aims to address is the ability to render high definition (HD) maps in real time to be used in CAVs' decision making and understanding the associated service constraints. Accordingly, this research project focuses on building a testbed that integrates both simulations (using SUMO simulation platform) and real time data sets (from Waymo dataset) with the purpose of evaluating the performance of the URLLC in tandem with edge computing for supporting HD maps in CAV networks.

Keywords: Wireless Communications, Edge Computing, Autonomous Vehicle

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Geography and Environmental Studies Presentations

Presenters:	Spenser Mehew	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Authors: Spenser Mehew

Title: ANALYSIS OF TWO UNIDENTIFIED SHARK TEETH FROM THE JUANA LOPEZ MEMBER, LA JUNTA, CO

Abstract: This paper examines two unidentified shark teeth specimens from the Juana Lopez Member in Colorado. These particular specimens are estimated to be roughly Turonian (93.9-88.8 Ma) in age. The first tooth, JLPST-01, is notable by its elongate central cusp with two small cusplets on each side. The other tooth, JLPST-02, is separated by others with a triangular cusp alongside a distal heel (Bice, K.N. 2015). To help understand what classification these fossils fall under, Upper Cretaceous shark taxa from the Juana Lopez member and the Codell Sandstone Member were cross-examined. The structure of JLPST-01 seems to be a member of the family Otodontidae, possibly falling under the genus Cretalamna. There are not many species of shark teeth published from the Juana Lopez Member that resemble JLPST-01, except Credotus semiplicatus. Kenolamna gunsoni is a shark from the Upper Cretaceous that is nearly identical to JLPST-01, however its type specimen originates from Australia (Siversson, M., Lindgren, J., Newbrey, M.G., Cederström, P., Cook, T.D. 2015). The similarities of the two species could have implications of future research regarding JLPST-01. Another possible family for this specimen is Mitsukurinidae, with the other genus candidate being Scapanorhynchus. JLPST-02 is most likely Squalicorax falcatus, or S. pawpawensis.

Keywords: Shark, fossil, teeth, Squalicorax, Cretalamna, Cretodus, Kenolamna, Codell Sandstone, Juana Lopez

Presenters:	Erinn Pablo	Undergraduate Student	College of Letters, Arts and Sciences	Geography and Environmental Studies

Authors: Erinn Pablo, Katie Martins, & Callista Yarian

Title: Examining Fire in the Kavango-Zambezi Transfrontier Conservation Area

Abstract: The Kavango–Zambezi Transfrontier Conservation Area (KAZA) is a transboundary land management region in Southern Africa. This diverse region was established for conservation and tourism purposes. It is found within the borders of Angola, Botswana, Namibia, Zambia, and Zimbabwe, and is home to a variety of different land conservation strategies, such as protected areas. Fire occurrence and prevalence varies across the KAZA region and is an important feature of the landscape as it directly impacts vegetation patterns. Vegetation is a particularly critical resource for a region where tourism is tightly connected to herbivore conservation. In our research, we analyze the relationship between fire and vegetation within two conservation units in the KAZA region over the time span of 2001 to 2019. The analysis integrates multiple sources of remotely sensed data. We present our preliminary results from this fall 2020 course project and show that there is a statistically significant difference in the NDVI values between groups of observations collected from areas characterized by different fire patterns.

Keywords: Fire, KAZA, Land Degradation

Health Sciences Presentations

Presenters:	Nicole E. Odell	Graduate Student	College of Nursing and Health Sciences	Health Sciences

Authors: Nicole E. Odell & Joey A. Lee

Title: Greenway Trail usage during COVID-19 restrictions in Colorado Springs

Abstract: Background/Purpose: The public health response to the COVID-19 pandemic may have changed physical activity behavior. From March 26 through June 1, 2020, most gyms and indoor exercise facilities were closed in Colorado by state public health orders. Utilizing outdoor trails is one way to safely be physically active, while limiting COVID-19 transmission risk. The purpose of this study was to examine the impact of COVID-19 restrictions on trail usage in Colorado Springs.
Methods: The Greenway Trail is a multi-use, non-motorized trail and has a permanent counter measuring time-stamped, bi-directional traffic. For the current study, daily count totals for February-August 2019 and 2020 were extracted for analysis. A two-way (month*year) ANOVA was used to examine the impact of COVID-19 on Greenway Trail usage.
Results: Results of the two-way (month*year) ANOVA examining trail usage identified a statistically significant interaction effect (F(6, 349)=7.33, p<.001). Post hoc analyses revealed significantly higher trail usage in May 2020 (M=973, SD=217.2) compared to May 2019 (M=676, SD=274.8) and the effect size was large (d=1.2).
Conclusions: Greenway Trail usage increased during the COVID-19 restrictions. This demonstrates that trails may play a key role in providing safe opportunities for physical activity when access to other modes is limited.

Keywords: physical activity, COVID-19

History Presentations

Presenters:	Heather Bergh	Graduate Student	College of Letters, Arts, & Sciences	History

Authors: Heather Bergh

Title: Spiritualism, Spirit Frauds & the New Woman

Abstract: Women during the mid-nineteenth and early twentieth centuries eagerly flocked to the Spiritualist movement in order to challenge the patriarchal centered dominance structure of society. Spiritualism compromised of two major attractions, such as: “rebellion against death” and “rebellion against authority.” The movement promoted the idea that an individual could “[prove] the immortality of the soul by establishing communication with spirits of the dead. Indeed, Spiritualism was a pivotal movement for women because it promoted equality for women within the religious sphere, assisted in the formation of the New Woman, and fostered a popular, public image for women during the Victorian era. Spiritualism and the Women’s Movement became intertwined with a common connection in femininity. Mediumship became closely identified with womanhood in what Spiritualist writer Cora Wilburn said was “the persuasive accents of inspired woman’s tongue.” Spiritualists played a massive role in challenging and maintaining the New Woman and propelling her forward within public media and Victorian literature. Victorian ghosts and Victorian women had many characteristics in common, as both were met with constant criticism and dismissiveness by those that surrounded them. Mediumship propelled women to subvert structural barriers that excluded them from any form of religious leadership. Mediums did not choose the women, but rather, spirits chose the conduit. Women that embraced Spiritualism, the role of the New Woman, and their newly created public image actively subverted the nineteenth and early twentieth-century ideology that women were naturally submissive, pious, domesticated and passive creatures.

Keywords: physical activity, COVID-19

Leadership, Research, & Foundations Presentations

Presenters:	Jeanette Dias	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Jeanette Dias

Title: The Impact of Delivery Mode on Student Evaluations of Teaching

Abstract: Student evaluations of teaching are commonly used for teaching evaluation in higher education. However, several issues of bias, including bias related to course delivery mode, have caused researchers to express concerns about their use for promotion, tenure, and salary decisions. A mixed methods study was conducted to determine if there is a significant difference in student evaluation of teaching ratings between online and face-to-face courses, and to examine faculty perceptions of the use of student evaluations of teaching when evaluating online teaching. Independent and paired t-tests and multiple regression were used to compare student evaluation of teaching ratings for 1,451 business course sections; while phenomenological interviews, under the theoretical framework of sensemaking, were conducted with eight faculty teaching online courses. Findings indicate that course delivery mode can significantly impact student evaluations of teaching and that faculty perceive student evaluations of teaching to be a good tool for collecting student feedback but not an accurate means of measuring teaching effectiveness for online courses. This study illuminates several important considerations for implementing higher education faculty evaluation processes and indicates a need for using multiple measures when evaluating an online course.

Keywords: student evaluations of teaching, delivery mode, higher education, faculty evaluation, sensemaking

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Presenters:	Bradey Disbrow	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Bradey Disbrow & Joseph Wehrman

Title: Emotional Intelligence in Officer Training Programs: An Applied Review

Abstract: The concept of emotional intelligence (EI) has received considerable attention since the inception of the term nearly 30 years ago. The topic of how people understand, relate, and convey emotion has been applied extensively to general leadership and workforce studies (Barbuto & Burbach, 2006; Barbuto & Bugenhagen, 2009; Dartey-Baah & Mekpor, 2017; Miao, Humphrey & Qian, 2017); however, few works have examined the relationship of emotional intelligence and leadership development within a military context (Valor-Segura et al., 2020). One military leadership setting worth further examination is the Air Officer's Commanding Program, a joint officer training program developed by The United States Air Force Academy and The University of Colorado Colorado Springs. This review seeks to expand on the concept of EI and its applied understanding within a military leadership setting through direct examination of this officer training program.

Keywords: Emotional Intelligence, Leadership, Leader Development, Military, Air Force, Higher Education

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Presenters:	Jonathan Hood	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Jonathan Hood

Title: Student-Athlete Career Readiness

Abstract: While there are approaches being taken by universities to prepare student-athletes for life after college, the research in this area is limited, especially for those competing in non-revenue generating sports. Framed in a mixed-method design, this study had two primary objectives. The first was to understand the perceived career readiness for the workforce among former NCAA student-athletes. While also running a series of logistic and multiple regression analyses to identify possible predictors of student outcomes and annual salary.

In utilizing Astin's student involvement theory (SIT), this study investigated how the involvement in playing a college sport influences career readiness through the combined lived experiences of former student-athletes and analyzing First-Destination Survey (FDS) data. The qualitative and quantitative samples came from the same graduating class at a single, private liberal arts college in the western region of the United States. I also collected resumes from the interview participants as another form of data. Upon completion of the data collection process, I applied a modification of the stevick-colaizzi-keen (SCK) method developed by Moustakas, to analyze the qualitative data.

The study participants described a consistent theme of former student-athletes feeling that their participation in a NCAA sport helped prepare them for the workforce. Additionally, the quantitative sample demonstrated athletic participation as a positive indicator of student outcome and increased annual salary.

Keywords: career, readiness, preparation, phenomenology, outcome, involvement, student-athlete, workforce

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

Authors: Kristi McCann

Title: A Mixed Methods Study of Science Motivation and Pre-Nursing Students Success in First-year Chemistry

Abstract: Using Social Cognitive Theory (SCT) as a framework, this mixed methods study explored the role of STEM adjacent pre-nursing student's motivation and perceptions of success in a second-semester chemistry course. This population is rarely studied from a STEM perspective of motivation despite coursework requirements that are heavy in the sciences. Student chemistry motivation was measured using the Chemistry Motivation Questionnaire II (CMQ-II), and logistic regression models were created to predict the probability of passing based on self-efficacy, intrinsic motivation, grade and career motivation, while controlling for university classification and first-semester grades in chemistry. First-semester grades in chemistry best predicted the probability of passing second semester chemistry. To better understand student motivation, interviews of students were conducted and analyzed using grounded theory methods. Emergent themes revealed the CMQ-II does not fully capture student motivation and outcomes for STEM adjacent students. Students showed a high level of career motivation, grade motivation, and moderate levels of intrinsic motivation and self-determination, consistent with SCT. These findings suggest a mixed method approach to this population produces a better understanding of STEM adjacent students and their motivations and perceptions of success than a quantitative or qualitative study alone.

Keywords: motivation, STEM, social cognitive theory, nursing, success

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Presenters:	Amanda Smith	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Amanda Smith

Title: Building Bonds Family Literacy Program

Abstract: Research shows that strong parental involvement correlates with positive academic outcomes for English Language Learners (ELLs). As a result, the Falcon Zone of District 49 has implemented its first family literacy program for ELLs. As the on-going school initiative progressed, I saw an opportunity for the district to gather data on the effectiveness of the literacy program by using the scores provided through the Test of English Language Learners (TELL).

I am currently working through the IRB review process to conduct in-person research on the ongoing family literacy program meetings taking place at the school once a month for literacy support. When approved, the prospective research will compare the scores of students classified as Limited English Proficient (LEP) that elected to be in the program to those who did not. Only the TELL sub-skills of vocabulary, grammar, fluency, and expressiveness will be compared. This same process of comparing scores will occur again in the spring semester.

This presentation will discuss the research question, the design, and implications for practice.

Keywords: English Language Learners, Literacy

Presenters:	Kathryn Starkey	Graduate Student	College of Education	Leadership, Research, & Foundations

Authors: Kathryn Starkey

Title: Policy Interpretation and Implementation: An Investigation of the Second Chance Pell Program

Abstract: The Second Chance Pell program, as part of the 2016 Department of Education Experimental Sites Initiative, enabled colleges and universities around the nation to offer Pell grants to incarcerated students since the ban in 1994. This instrumental case study sought to understand the application and implementation processes of administrators involved with their school's program using an organizational policy conceptual framework. Three themes emerged from document analysis of the 67 institutions' application letters and 15 semi-structured interviews with program administrators: the college's perspectives in intent, the organizational culture clash between the colleges and Department of Corrections, and the expectations versus realities experienced during implementation. Findings offer higher education administrators suggestions for effective implementation of complicated, dual-bureaucracy programs.

Keywords: Second Chance Pell, policy analysis, application, implementation

Mechanical and Aerospace Engineering Presentations

Presenters:	Pau Saldana Baque	Graduate Student	College of Engineering	Department of Mechanical and Aerospace Engineering

Authors: Pau Saldana Baque & Jena McCollum

Title: DIFFUSION PHENOMENA IN THE FUSED DEPOSITION MODELING PROCESS OF FLUORINATED THERMOPLASTIC BINDERS

Abstract: Motivated by the lack of polymer welding information in the additive manufacturing (AM) field, this work studies the effect of diffusion phenomena in fused deposition modeling (FDM) of fluorinated thermoplastic binders. In particular, this study compares the anisotropic response of 3D printed, binary blends of poly(vinylidene fluoride) (PVDF) and poly(methyl methacrylate) (PMMA) with the isotropic response of these blends fabricated via molding techniques. PVDF/PMMA filaments were produced by twin screw extrusion and, subsequently, injection-molded or 3D printed into dog-bone shapes. Specimen mechanical and thermal properties were evaluated by tensile testing and differential scanning calorimetry, respectively. Results show that higher PMMA concentration not only improved the processability and increased specimen fragility but prevented the crystallization. Blends with a higher PMMA concentration demonstrated a better mechanical response than those with a lower amount of PMMA. Similarly, injection molded samples reveled better mechanical properties compared to 3D printed specimens. The present study provides new data to improve the description of the effect of PMMA in processed PVDF/PMMA blends. This will be useful to optimize the mixture composition when producing energetic thermoplastics through FDM.

Keywords: Diffusion, Adhesion, Fluorinated Thermoplastic.

Presenters:	Ashton Craig	Undergraduate Student	College of Engineering	Department of Mechanical and Aerospace Engineering

Authors: Ashton Craig & Matthew Knott

Title: Balancing processing ease with combustion performance in aluminum/PVDF energetic filaments

Abstract: Molecular weight (Mw) effects in poly(vinylidene fluoride) (PVDF) influence both processability and combustion behavior in energetic Al–PVDF filaments. Results show decreased viscosity in unloaded and fuel-lean (i.e., 15 wt% Al) filaments. In highly loaded filaments (i.e., 30 wt% Al), reduced viscosity is minimal due to higher electrostatic interaction between Al particles and low Mw chains as confirmed by Fourier-transform infrared spectroscopy. Thermal and combustion analysis further corroborates this story as exothermic activity decreases in PVDF with smaller Mw chains. Differential scanning calorimetry and Thermogravimetric analysis show reduced reaction enthalpy and lower char yield in low Mw PVDF. Enthalpy reduction trends continued in nonequilibrium burn rate studies, which confirm that burn rate decreases in the presence of low Mw PVDF. Furthermore, powder X-ray patterns of post-burn products suggest that low Mw PVDF decomposition creates a diffusion barrier near the Al particle surface resulting in negligible AlF3 formation in fuel-rich filaments.

Keywords: PVDF, aluminum, energetic, filaments, viscosity, thermal

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

Authors: Andrew Gibson & Xin (Cindy) Yee

Title: Koopman analysis and control of nonlinear bubble oscillators

Abstract: Volume and shape oscillations of gas bubbles in liquids form a central area of study in multiphase fluids, with important applications to intravenous drug delivery, contrast-enhanced ultrasound imaging, and cavitation-induced flow instabilities and damage in turbomachinery. In this study, we use emerging tools from Koopman operator theory to analyze the Rayleigh-Plesset equation governing spherical bubble oscillations. Koopman operator theory is an emerging framework that provides a globally linear representation of even strongly nonlinear dynamical systems, and that can extract coherent spatio-temporal structures from data. Such a Koopman embedding allows for future state prediction and admits the application of classical control techniques, including optimal control. By combining this approach with data-driven and machine learning methods, the system can train on both numerically simulated data and experimentally obtained time series. Here we apply several methods from the Koopman framework to the classical Rayleigh-Plesset equation (RPE). Using algorithms called Hankel-DMD (dynamic mode decomposition) and SINDy (sparse identification of nonlinear dynamics), we extract eigenfunctions of the Koopman operator for the RPE. These nonlinear functions then provide a basis, analogous to Fourier modes, for a linear embedding of the nonlinear dynamics. Fundamental frequencies and harmonics emerge naturally. The Koopman eigenfunctions also define a coordinate system through which to enact linear control. For example, we build an acoustic linear-quadratic regulator (LQR) controller that drives the RPE to a specified nonequilibrium radius, and we demonstrate its effectiveness with numerical simulations. Future directions, such as the analysis and control of the nonspherical shape modes of bubbles, are discussed.

Keywords: machine learning, Koopman theory, control, dynamic mode decomposition, dynamical systems, Rayleigh-Plesset equation, bubble oscillations, ultrasound contrast agents, drug delivery

Presenters:	Emilie Henning	Graduate Student	College of Engineering	Department of Mechanical and Aerospace Engineering

Authors: Emilie Henning, Ryan Reger, Daniella Patton, Karl Jepsen & Todd Bredbenner

Title: Deep learning-based image segmentation performs well when trained and tested on similar, dissimilar, and combined image data.

Abstract: Separating bone from background is crucial to quantifying bone structure in image data. We previously demonstrated that image segmentation via deep learning with fully convolutional neural networks (FCNNs) outperforms methods based on global or local thresholding [1]. The objective of this study was to investigate the performance of FCNN-based segmentation of human vertebral body and femoral neck data when segmented using similar, dissimilar, and combined data.

Six evenly spaced slices from 28 human L1 vertebral bodies and 28 human femoral necks were manually segmented to create ground-truth masks. FCNNs were separately trained with femoral neck, vertebral body, and combined data using a nested four-fold cross-validation approach and tested by segmenting femoral neck and vertebral body data. Segmentation performance was evaluated using five metrics to quantify similarity between segmented and ground-truth masks. Nonparametric multivariate analyses (Wilks' lambda test) were used to simultaneously consider all metrics in evaluating the relative segmentation performance of the FCNNs.

Relative model effects were significant (p < 0.001), indicating differences in the performance of the FCNNs. The combined FCNN performed comparably to the femoral neck FCNN when tested on femoral neck data and less well than the vertebral FCNN when tested on vertebral body data. FCNNs tested on similar data performed better than when tested on dissimilar data; however, they outperformed or matched the performance of thresholding methods.

This work suggests that deep learning-based segmentation may allow broad application of FCNNs trained with varied imaging data on unseen data.

1. Patton, et al. Trans. ORS. 2020.

Keywords: Deep-learning, computed tomography, bone, image segmentation

Presenters:	Riley Sorency	Undergraduate Student	College of Engineering	Department of Mechanical and Aerospace Engineering

Authors: Riley Sorency

Title: Mechanical Testing and Applications of Irradiated Materials

Abstract: The mechanical capabilities of irradiated samples and Digital Image Correlation (DIC) analysis provides accurate information about the accumulation of stress and radiation effects. Exploring the irradiated sample properties and how the structure is affected by uniaxial stress provides data about areas with the most stress buildup. DIC can further provide insight into stress-strain behavior by quantifying strain field evolution during mechanical testing. The main objective is the mechanical properties associated with applied radiation. DIC can improve methodology when incorporated to accurately predict the stress buildups. Samples were prepared by painting a base coat of black on the sample and spraying a white speckle pattern from approximately one foot away until a noticeably fine speckle formation is achieved. Then, the samples were tested at a rate of 0.1 mm/sec at a prescribed uniaxial load before fracture while an image was captured every two seconds. The stress analysis and elongation results proved that irradiated samples had weaker plastic structures. DIC provided visual strain fields to highlight stress. The irradiated samples had a weakened tensile strength and decreased elongation of 30-55% compared to control samples. Studying the effects of irradiated materials and possible improvements can utilize numerous collections of data to recognize these impacts.

Keywords: mechanical properties, irradiated, applications, improvement due to radiation

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Presenters:	Jared Strutton	Graduate Student	College of Engineering	Department of Mechanical and Aerospace Engineering

Authors: Jared Strutton & Matthew Knott

Title: Manipulating polymer decomposition to alter burn performance in aluminum/poly (vinylidene fluoride) filaments

Abstract: Filaments composed of aluminum powder and poly(vinylidene fluoride) (PVDF) were produced by melt-processing to investigate the effect of particle size and loading on decomposition behavior and burn performance. Thermal analysis revealed that nanoscale Al samples decompose PVDF in one step through interactions with the Al particle surface. Microscale samples presented with two distinct decomposition steps: (1) accelerated decomposition through interactions with the Al particle surface and (2) pyrolysis. This behavior occurs due to the drastic change in Al specific surface area. The burn test revealed that the filaments experience a maximum flame speed near the stoichiometric concentration for each fuel size. Although there are variations in decomposition and burn behavior between particle sizes, burn product analysis shows that all melt-processed filaments result exclusively in AlF3 formation in open-air burns. This behavior is unique to melt-processed energetic composites and may provide more insight to binder–particle interactions and the effect on burn properties in energetic composites.

Keywords: Pyrolants, Additive Manufacturing, Thermal Analysis

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Nursing Presentations

Presenters: Nita Sawh Undergraduate Student Beth-El College Department of Nursing

Authors: Nita Sawh, Helen Graham, & Melissa Benton

Title: Relationship Among Physical Activity and Mental Health in Women with Heart Disease

Abstract: Relationship Among Physical Activity and Mental Health in Women with Heart Disease

Background/Purpose: Mental health is a component of general well-being and physical activity (PA) is associated with mental health. The purpose was to determine whether PA is a good indicator of mental health (MH) in older women with heart disease (HD).
Methods: A cross-sectional, observational study of community-based women with HD 50 years and older was conducted. According to PA level, women were placed into one of two groups; “Not/Somewhat Active” or “Active/Very Active.” To evaluate mental health, energy/fatigue (EF), well-being (WB), psychological health (PH), and emotional role limitation (ERL) were measured. HD was defined as “heart disease,” “coronary heart disease,” “heart attack,” “myocardial infarction,” “angina,” or “other heart problems,” when asked, “Has a doctor, nurse, or other health professional EVER told you that you had any of the following?” Quality of Life questionnaires, RAND-36, and the WHOQOL-BREF assessed PA and MH. Between group differences were analyzed using an independent t-test.
Results: Twenty-eight women (mean age of 74.4 ± 8.8 years), active/very active (n=8) and not active/somewhat active (n=20), participated. Mean BMI was 27.4 ± 4.8, mean HR was 72.1 ± 13.2, and 75% reported medication use. The “Active/Very Active” group had more energy (69.4 ± 22.3 vs. 42.3 ± 19.8, p = 0.004), WB (88.0 ± 10.9 vs. 74.2 ± 13.4, p = 0.016), PH (79.8 ± 16.9 vs. 66.0 ± 15.5, p =0.048), and ERL (83.3 ± 31.0 vs. 48.3 ± 43.9, p = 0.029) compared to the “Not/Somewhat Active” group.
Conclusion: Women with HD who were more active had greater mental health. Therefore, to improve mental health, nursing interventions should prioritize PA.

Keywords: "Mental health," "Physical activity," "Nursing," "Heart disease," "women," and "older."

Physics Presentations

Presenters:	Yaroslav Balytskyi	Graduate Student	College of Letters, Arts, & Sciences	Department of Physics and Energy Science
Authors:	Yaroslav Balytskyi, Manohar Raavi, Anatoliy Pinchuk, Sang-Yoon Chang'			

Title: Detecting Bias in Randomness by PT-Symmetric Quantum State Discrimination

Abstract: Random number generators are used in multiple computing, security, and cryptographic applications. It is important to detect a change in the state of the random output including an introduced bias and a decreased information entropy. PT-symmetric quantum mechanics provides a mechanism to improve the detection of the bias in randomness since it can discriminate two non-orthogonal quantum states, in principle, by a single measurement. We propose a new randomness bias detection and quantification method by using PT-symmetric quantum mechanics. If the amount of bias is a priori known, its presence can be detected by a single measurement in PT-symmetric system. Taking advantage of an additional degree of freedom provided by PT symmetry, we extend this approach for the case when the bias amount is not a priori known. Building on the recent research and developments of the PT-symmetric devices and systems, our work provides an algorithm and the analysis for using PT symmetry for randomness bias detection and quantification.

Keywords: PT symmetry; Bias detection; Quantum state discrimination.

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

Title: Design and production of low-cost microwave circuits for magnetism experiments

Abstract: The excitation of magnetic waves is an essential part of my PhD project, which is devoted to studies of magnetic waves and their coupling to acoustic waves. To generate magnetization waves, we need inductive antennas and resonators. Quick manufacturing times are also essential for research purposes. Commercial production of microwave circuits often requires $$$ in addition to weeks of production time.

One of the fastest techniques to produce printed circuit boards in the lab is Computer Numerical Control (CNC) milling out of copper-plated sheets of microwave substrate. For this purpose, we adapted one of the cheapest CNC machines on the market. Unfortunately, the minimal tool size is limited to 150 µm. This restriction results in more sophisticated designs. For example, a half-wavelength microstrip resonator at 14 GHz requires an interdigital capacitive coupler to achieve critical coupling. Before fabrication, all structures were simulated using Cadence AWR software. The milled microstrip resonators demonstrate good agreement between experiment and simulation and have high quality factors of more than 60.

The results of this project are expected to have a huge impact on the production of microwave elements in the department. The support by UCCS Office of Research within CRCW Seed Grant is acknowledged.

Keywords: Microwave circuits, PCB milling, Microwave simulations, Magnetism Research

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Psychology Presentations

Presenters:	Daniela Catarino	Graduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Daniela Catarino and Colin Adams

Title: Examining Cognitive Function and Self-Esteem of Middle-Aged and Older Adults

Abstract: Research shows that self-esteem and well-being have a strong correlation to cognitive abilities. People with high self-esteem, compared to those with a low self-esteem, tend to evaluate themselves as more favorable after both high and low performance. However, less research has been conducted on self confidence among the older population and how this can potentially negatively or positively influence the aging process. The purpose of the study was to examine if there is an effect of age on cognitive function. The second aim was to examine if there is an effect of cognitive function on self-esteem. The first hypothesis was that middle-aged adults would exhibit higher cognitive functioning than older adults. The second hypothesis was that those with lower cognition would exhibit lower self-esteem. A secondary analysis of data from the National Social Life, Health, and Aging Project (NSHAP) was performed on 60 randomly selected individuals from a total of 3,005 participants. A 2 x 2 chi square test revealed that the younger group (63%) compared to the older group (37%) were significantly more likely to exhibit perfect cognitive functions (versus not), Ï‡Â² (1) = 4.27, p < .05. A One-Way ANOVA revealed no significant main effect of cognitive function on self-esteem, F(1, 58) = 2.97, p = .09. This suggests that cognitive functions are more likely to decline as one ages but cognitive function alone might not strongly influence self-esteem. Future research should aim to understand under what conditions confidence influences cognitive function to promote healthy interventions for successful aging.

Keywords: Cognitive function, self-esteem, older adults

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

Authors: Brian Foster, McKenzie Lockett, Ben Graff, & Tom Pyszczynski

Title: Politics and Violence in an Age of Social Justice: Assessing the Effects of Priming on Sociopolitical Attitudes and Voting Behavior.

Abstract: Over the past decade, police killings and the subsequent protests and riots in response to these killings have become increasingly central to political discussion. This study investigated how exposing people to videos of police violence and protests affect political attitudes and voting intentions for the 2020 Presidential Election. 613 participants were randomly assigned to view one of five videos covering one of the following: police violence, liberal and conservative violent protests, liberal peaceful protests, or a control video. Voting choice (Trump versus Biden) interacted with the manipulation to affect support for racial justice movements, $p = .03$, such that Biden supporters reported lower levels of racial justice support when viewing the violent left protest video compared to the other videos. Trump supporters' reported support for racial justice was not affected by the manipulation. Another analysis found an effect of the manipulation on voting certainty, such that exposure to the left peaceful protest increased voting certainty (regardless of whether the person was voting for Trump or Biden) compared to the other conditions p's $< .02$. These findings help clarify the role that voting choice and media exposure play in affecting people's opinions towards the recent racial justice events in the United States.

Keywords: sociopolitics, priming, racial justice, liberal, conservative

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Presenters:	Tanrei Hale	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Tanrei Hale, Julie Hurd & Charles Benight

Title: The Relationship Between Coping Self-Efficacy, Dissociative Symptoms, and Severity of Posttraumatic Stress Symptoms

Abstract: Severity of posttraumatic stress symptoms (PTSS) following a traumatic event have been linked to both positive (i.e., coping self-efficacy; CSE) and negative (i.e., dissociative symptoms) psychological constructs. This study aims to explore whether CSE and ongoing dissociative symptoms uniquely predict PTSS severity. We hypothesized that both CSE and dissociation would significantly predict severity of PTSS, where higher CSE would predict lower PTSS and higher dissociation would predict higher PTSS. In this study, 110 participants (54.5% female, Mage = 42.11) completed baseline self-report measures for a digital health intervention study. Using multiple regression, CSE and dissociation were included as predictors of PTSS severity. The overall model was significant and accounted for 51% of the variability in PTSS severity ($R2 = .51$, $F(2, 110) = 55.55$, $p < .001$). While holding each other constant, higher CSE significantly predicted lower PTSS severity ($\beta = -.38$, $t(110) = -5.17$, $p < .001$) and higher dissociation significantly predicted higher PTSS severity ($\beta = .47$, $t(110) = 6.44$, $p < .001$.). These data do not allow any determination of causation; however, these results suggest that trauma survivors may benefit from bolstering coping self-efficacy while decreasing dissociative symptoms in order to decrease severity of posttraumatic stress symptoms.

Keywords: Coping Self-Efficacy, Dissociative Symptoms, Postrraumatic Stress Symptoms, Multiple Regression

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Presenters:	Jamie Hansel	Graduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Jamie Hansel, Hallie Johnson, Annie Nickell, Emmeline N. Taylor, & Andrew Lac

Title: Media Framing and Credibility: A Content Analysis of Dr. Christine Blasey Ford's Sexual Assault Allegation Against Justice Brett Kavanaugh

Abstract: The study examined variables related to survivor credibility when reporting sexual assault and media framing (emotional charge or tone by the author) in newspaper coverage of the sexual assault allegation made by Dr. Christine Blasey Ford against Justice Brett Kavanaugh. A quantitative content analysis was performed on 80 newspaper articles retrieved from Lexis-Nexus. Coding variables included article characteristics, as well as variables concerning politics, rape myths, and sexual assault credibility. Four coders independently analyzed each article and achieved interrater reliability statistics ranging from fair (detail = .52) to excellent (Trump = .98). Results indicated that articles aimed at crediting or discrediting Dr. Ford's allegation had higher levels of media framing. Multiple regression analyses also indicated that articles that mentioned President Trump uniquely predicted lower news framing. Variables related to rape myths were not associated with news framing or the article's determination of the credibility of the sexual assault allegation. The research offers implications regarding the perceptions of sexual assault allegations and the way the media frames certain issues. The findings of this study suggest that political factors may be related to media framing. Additionally, media framing may be one mechanism applied in articles to make determinations of sexual assault credibility.

Keywords: Content Analysis, Media Framing, Sexual Assault Allegation, Credibility

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Presenters:	McKenzie Lockett	Graduate Student	College of Letters, Arts and Sciences	Psychology

Authors: McKenzie Lockett, Sander Koole & Tom Pyszczynski

Title: Coping with COVID-19: Investigating COVID-19-related functional impairment, existential anxiety, and coping self-efficacy in a sample of trauma-exposed adults

Abstract: The COVID-19 pandemic has brought on waves of uncertainty for the future, concern for personal vulnerability, and disruptions to the typical routine of daily life. Emerging research has shown that the pandemic is associated with higher levels of depression, anxiety, and suicidality; however, little research has investigated the effects of the near-constant exposure to the pandemic that many experience via social media, news, and social interactions. Furthermore, little research has investigated how the pandemic has affected those who already deal with mental health problems, including posttraumatic stress symptoms (PTSS). The present study investigated the effects of pandemic reminders on coping self-efficacy among trauma-exposed individuals. PTSS interacted with pandemic reminders to affect coping self-efficacy, such that pandemic reminders decreased coping self-efficacy for individuals with higher levels of PTSS; pandemic reminders had no effect on coping self-efficacy for participants with lower levels of PTSS. Similarly, trauma-exposed individuals reporting high levels of functional impairment due to the pandemic (e.g., difficulties managing daily tasks) responded to pandemic reminders with decreased coping self-efficacy. This research uniquely demonstrates the widespread effect that pandemic reminders can have on coping for trauma-exposed individuals, who are typically managing PTSS concurrently with the stress of the pandemic.

Keywords: social psychology, clinical psychology, trauma, existential anxiety, coping, pandemic, COVID-19

Presenters:	Kayla Neeley	Graduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Kayla Neeley, Kasie Miura, & Timothy Rapp

Title: Finding Love in Recovery: A Content Analysis of a Sobriety Dating Website

Abstract: The recent online dating revolution has provided researchers with the opportunity to gain insight into the dating behaviors of the general population. However, no research currently exists that examines the online dating behaviors of people who are working toward sobriety from alcohol. The majority of individuals seeking help for alcohol use disorder in the United States use Alcoholics Anonymous (AA; Kaskutas, Turk, Bond, & Weisner, 2003). In order to assess the online dating tendencies of individuals in this program, a content analysis of 90 online dating profiles from the website LoveInRecovery.com was performed. The age indicated in the profiles ranged from 25 to 66 years old (M = 47.02, SD = 9.90). Contrary to previous literature, results from the multiple regression analysis suggested that smiling, humor, and age are not related to optimism. Findings also indicated that women compared to men and non-smokers compared to smokers were more likely to smile in their profile pictures. Further, divorced people possessed greater optimism levels than people who have never been married. Implications and limitations of the study are discussed.

Keywords: Alcoholism, Sobriety, Relationships, Online Dating, Optimism

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Presenters:	Joshua Sulkin	Undergraduate Student	College of Letters, Arts and Sciences	Psychology

Authors: Joshua Sulkin

Title: Attitudes, Emotions, and You

Abstract: Meta-emotions refer to one's beliefs, attitudes, and feelings towards emotion. Notably, many individuals find their negative emotional experiences to be unimportant or unnecessary, also referred to as "Affect Intolerance," and these meta-emotional beliefs relate to the overall well-being of many individuals. However, the literature has failed to distinguish between attitudes and feelings towards individual emotional experiences and emotions more broadly. A study was conducted to investigate potential differences individuals may exhibit between their individual views of emotion and their general views of emotions. Two scales, the Need for Affect Scale and the Affect Intolerance Scale, were adapted to create individual and general versions of each. Self-report questionnaires containing either the individual or general version of each scale and the Depression, Anxiety, and Stress Scale (DASS-21) were administered to undergraduate psychology students. Independent t-tests revealed significant differences between participant's attitudes towards their individual emotions and emotions in general. Overall, participants were more intolerant towards emotions in general than they were towards their own personal emotions. Correlation analyses also demonstrated that individual views of emotions were strongly correlated with depression, more so than general views of emotions. Implications for these findings will be discussed.

Keywords: meta-emotion, affect intolerance, attitudes, emotion

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

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