DU Undergraduate Showcase: Research, Scholarship, and Creative Works

Abstracts

SPECIES-BASED MODERATION AND ATTITUDE-BASED MEDIATION OF THE HARDSHIP-TO-PAIN BIAS

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People tend to perceive others as having a lower pain sensitivity if those others have experienced hardship or are part of a disadvantaged and minoritized group, including people of color or of lower socio-economic background. To learn more about the mechanisms behind and the downstream consequences of this hardship-to-pain bias, we used an experimental approach to measure people's application of that bias on adults, children, and dogs. Results were that lay beliefs that hardship desensitizes individuals to pain were applied more strongly to adults and to children than to dogs. Perceived toughness mediated this differential effect, suggesting that general adaptation bias may not explain species-specific application of this hardship-to-pain bias. Control, paternalism, and responsibility over one's environment did not significantly moderate the mediation, indicating "humanness" as an important factor and human-specific hierarchy justification as an important mechanism behind the hardship-to-pain bias.

COMPARING CHRYSOCHUS BEETLE'S COPULATION PATTERNS

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The effects of copulation duration are understudied in heterospecific mating treatments of the Chrysochus beetles species. These species interactions and mating patterns can be closely observed in hybrid zones which are where the different species meet, mate, and reproduce. I was able to analyze the heterospecific and conspecific mating effects on copulation duration in the Chrysochus auratus beetle. The C. auratus species forms a hybrid zone with their sister species, C. cobaltinus, in south-central Washington state. The results of this study showed that the copulation duration was significantly longer in heterospecific matings compared to conspecific matings. It was also found that there was no significance of the female's previous mating partner on the overall copulation duration. Based on these results, we can further research the female preferences in the beetles' conspecific sexual partners and determine if the copulation duration affects the mating success.

MISSED EXITS: CAUSAL MECHANISMS INFLUENCING MILITARIZED INTERSTATE DISPUTE ESCALATION IN LATIN AMERICA

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Research on militarized interstate disputes (MIDs) and the reasons for their escalation to interstate war is sparse at the global level and the regional level in Latin America. This thesis contributes new research on militarized interstate dispute escalation in Latin America. In this project, I ask: how do differences in conflict escalation indicators between states affect whether a Latin American country will participate in a Militarized Interstate Dispute that escalates to the use of force? To answer this question, I conduct a case study utilizing the most similar cases analysis approach to compare the cases of the 1995 MID between Ecuador and Peru as well as the 1997 MID between Nicaragua and Honduras. I also utilize process tracing to analyze the impact of the causal mechanisms of territorial contiguity, natural resource contention, development level, and issue salience on the escalation of MIDs in the former cases to one where actual force is used. From this process tracing, I find that a difference in issue salience, or the degree of importance attached to an issue by the actors involved, between the two cases contributed to a difference in MID escalation. Overall, this thesis fills a preexisting gap in the literature on militarized interstate disputes in the Latin American region while contributing new points of discussion to research on militarized interstate disputes, conflict escalation, and conflict early warning.

DISRUPTING "GOOD" VS. "BAD" PERSON BINARIES BY HUMANIZING VICTIMS OF URBAN HOMICIDE

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In the summer of 2023, Dr. Byron, Malea Marxer, Ellie Barnett-Cashman, and Lily Baeza did a content analysis of nearly 300 obituaries in the summer of 2023. Working with obituaries from the Philadelphia Obituary Project website, we used a uniform code sheet to code for data such as the victim's demographics and the personality of victims. The motivation behind our project was to disrupt the "good" vs. "bad" person binaries by humanizing victims of urban homicide. We noticed that we as a general population know very little about the victims of everyday urban violence. This is due to things such as deficits and distortion in the media about who the victims were and little to no media coverage if the victim did NOT fit the "ideal victim" stereotype. We aim to change the narratives of urban homicide victims and hone in on critical race theory's tenet of counternarratives (in this case-giving a voice to minoritized people). For the demographics of the POP Obit samples, 72% of the victims were Black men followed by 9.4% Latino men and 74% of the sample was under the age of 30. While we do have some data on the cause of death of the victims, not all of them had the cause of death listed. For 15% of the sample, the proximal cause of death was more nuanced than typical victim-offender overlap predictions assumed. This data humanizes the victims as when we hear of a victim of urban violence, we assume that they must be a bad person. By working to destigmatize and humanize homicide victims we hope to motivate more privileged citizens to see themselves in these largely Black and Brown victims, sense the enormous familial and societal loss, and use this interest convergence to support violence prevention policy change.

HOW TO SOLVE A WICKED PROBLEM: AN INTRODUCTION TO ENVIRONMENT, SOCIETY AND SUSTAINABILITY

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What might a new normal—one that respects the Earth and all of its inhabitants—look like? How can we use our knowledge of the world and its physical and social complexities to design better systems and communities? Where should change begin? These are just of the few questions that I grappled with in working towards writing a undergraduate textbook on sustainability. Over the summer, I worked in coordination with Professors of Geography Paul Sutton and Helen Hazen as a co-author in writing a textbook titled An Introduction to Environment, Society and Sustainability that will be used for the 'Introduction to Sustainability' course offered in the department of Geography and the Environment. This involved conducting research to write two individual chapters, organizing citations, creating and/or obtaining appropriate figures, building a glossary, and developing discussion questions and learning outcomes for each chapter. This book takes a new approach to compelling contemporary questions regarding the inter-related issues of population, social justice, and environmental sustainability using the framework of what are known as "wicked problems." The idea of a "wicked problem" means that environmental issues are so complex and involve so many stakeholders that they require an understanding of systems at a broad variety of scales if they are to be addressed. For example, instead of focusing on simple solutions such as recycling, composting and renewable energy, this book will look to push towards broader economic, political, and social systemic change. Sustainability requires a complex and interdisciplinary approach, and this book aims to highlight the importance of systems thinking to develop solutions for the future. The project culminated in a full draft of the textbook including 13 chapters of 7,000-8,000 words per chapter (about 100,000 words total) which has an expected publication date later this year.

UNIQUE TRANSCRIPTOMIC PROFILES IN ATLANTIC KILLIFISH DURING SALINITY ACCLIMATION IN WARM WATER

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The warming effect of climate change threatens aquatic species' ability to maintain temperature, water, and ion balance. For example, species native to brackish water estuaries are more vulnerable to temperature changes because of frequent salinity changes that are energetically taxing. We used Atlantic killifish (Fundulus heteroclitus) as a model to examine the effects of increased temperature during salinity acclimation on fish physiology and the transcriptomic response at the gill, the major organ for oxygen and ion/water balance. We acclimated killifish to brackish water, then separated the fish into one of six treatment conditions consisting of temperate (22°C) or warm temperature (28°C) and different salinities (freshwater, brackish water, saltwater) for three days. Using plasma glucose as a general stress indicator, we found that temperature induces stress in both salinity treatments. We also found that changes in salinity altered osmoregulation: plasma osmolality increased in saltwater in both temperatures, and average osmolality in freshwater was lower in warm water than in the control temperature, indicating impaired ionic homeostasis. Using standard RNA-seq approaches, we found that variation in gill gene expression between treatments was driven primarily by salinity and to a lesser extent temperature. Furthermore, we identified unique gene regulatory pathways during salinity acclimation in warm water compared to salinity or temperature acclimation alone. Overall, our results suggest that maintaining homeostasis in warm freshwater is more challenging than in warm saltwater. Climate change may thus pose a particular challenge for brackish water species especially when acclimating to freshwater.

THE RIGHT ECUMENISM: HOW AMERICAN CONSERVATIVES USED (AND ABUSED) THE SECOND VATICAN COUNCIL

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For decades, historians of American Catholicism have examined how the Second Vatican Council (1962-1965) was received in the American context. While widely seen as an event that created progressive inroads in the Catholic Church, the conciliar documents tell a more complicated story. Developments in Catholic doctrine on ecumenical relations, religious liberty, and political participation became primary sources that, in the United States, were taken in multiple ideological directions by grassroots political activists. This project argues that thedocuments of the Second Vatican Council, received in the American context, helped foster a rapprochement between conservative Catholics and white Evangelical Protestants in the 1970s and 1980s. Using the council's documents, American conservatives engaged with Catholics to create a broad, interdenominational conservative coalition that continues to influence American politics to this day.

FLAMETHROWER VOL. 1-3: INNOVATION IN MULTIDISCIPLINARY ELECTRONIC AND ACOUSTIC MUSIC

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Electronic music is largely viewed by the music academic community as a boundless frontier for innovation. However, very few electronic music projects have been produced by students of the University of Denver's Lamont School of Music. Flamethrower, Vol. 1-3 is a series of three EPs (short albums) that combine jazz, classical, and commercial electronic music to produce an artistic work in which the perception, function, and musical context of electronic instruments is challenged. I approached these compositions treating electronic components as instruments, writing out scores as I would for brass and wind instruments. I also utilized cutting edge electronic hardware (such as the Arturia Minifreak Algorithmic Synthesizer and the Chase Bliss Lossy Digital Artifact Generator) to generate degenerated, fragmented, and evolving sounds. This type of in-depth sound design allowed me to write, perform, and record novel parts for unique instruments. The remainder of the sounds on these recordings incorporate sampling of field recordings to generate new instruments or soundscapes and unconventional recordings of woodwinds (saxophone, clarinet, flute, bass clarinet, and alto flute) from Professor Remy Le Boeuf, my faculty partner. Working on Flamethrower, Vol. 1-3 has allowed me to push the boundaries of what I am capable of creatively. By treating electronic hardware as an instrument in a more traditional sense, I was able to take the synthesizers and effects units on their own terms and write far more successfully. Once the music I've recorded and produced is released, it will likely show others within our community that experimenting with electronics is a viable and respectable avenue within music academia.

THE RELATIONSHIP BETWEEN EXPOSURE TO VIOLENCE DURING CHILDHOOD AND/OR ADULTHOOD AND GROSS COGNITIVE FUNCTIONING AMONG JUSTICE-INVOLVED INDIVIDUALS WITH TBI

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Background Recent estimates suggest approximately 2.7 million Americans were victims of violence in 2021 (USDOJ, 2022). Among justice-involved individuals, the prevalence of lifetime exposure to violence is as high as 87% (Wolff et al., 2014; Wolff & Shi, 2009). Like TBI, disruptions in cognitive functioning have been identified among individuals exposed to violence throughout their lifetimes (Daughterty et al., 2021). These disruptions, particularly impulsivity and emotional reactivity, may make individuals vulnerable to becoming involved in the criminal legal system (McIsaac et al., 2016; Ray & Richardson, 2017). **Main Objective** This study compared domains of cognitive functioning among justice-involved individuals with a significant reported brain injury history who were exposed to violence during childhood and/or adulthood. **Methods** Data from 586 justice-involved adults were analyzed. Information on cognitive functioning and exposure to childhood and/or adulthood violence was gathered from individuals with a significant reported history of TBI who completed the Colorado-Revised OSU TBI-ID (Corrigan & Bogner, 2007), the ANAM core battery, and unstructured clinical interviews. **Results** Significant differences were found in the domains of attention/processing speed, learning, working memory, and delayed memory. Specifically, individuals with a significant reported TBI history who were exposed to violence during childhood and also as an adult performed significantly poorer on cognitive tests than individuals who were exposed to violence only during childhood, only during adulthood, and individuals who were never exposed to violence. **Conclusions/Future Implications** These findings can inform secondary violence prevention efforts for individuals with TBI and exposure to violence, including routine brain injury screening and targeted interventions that address the cognitive deficits associated with exposure to violence. This study also highlights the need for primary prevention of childhood violence, as persons exposed to violence during childhood may be more vulnerable to poor post-injury outcomes if they are also victimized as an adult.

YOUTH ORGANIZING

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The motivation behind this project is to guide youth of color to foster creativity within community engagement. Youth Organizing is a youth civic engagement initiative based on the principles of community organizing, equity, and social justice. YO draws on talents of marginalized students of color who are exploring the dynamics of using their voice to organize for social change. In YO, we work closely with youth in the Socially Just Education class at Dr. Martin Luther King, Jr. Early College (DMLK) to identify, research, and act on issues that directly impact the youth in their communities. We visit the class weekly and facilitate this process for students based on the YO curriculum that draws on the traditions and diversities of youth organizing and youth participatory action research. DU Teams also engage in research on the impacts of this process and action on youth and community members. We will facilitate and support youth participatory action research, in which youth will select an issue, research the issue, design a plan to address the issue, and act on the issue. To facilitate these actions, we will facilitate class sessions utilizing a youth organizing curriculum. As the process is emergent, the issue, research questions and methods of the research phase, and action plan details are determined later on. The expected results are to be the following: to facilitate and support youth to take action and to reflect on that action, its impact, and its future in order for youth to enact public work and assess the extent to which it improved their communities; engage in quantitative and qualitative analysis of the quantitative and qualitative data to assess the impact of the YO showcase event on the community.

EFFECTS OF BIOCHAR ON SHORT-TERM GROWTH IN PINUS CONTORTA VAR. LATIFOLIA

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Rocky Mountain lodgepole pine (Pinus contorta var. latifolia) is a fire-adapted pine species that has evolved to survive a fire with serotinous cones that open to release seeds at specific temperatures. However, the increased intensity and frequency of modern wildfires has led to decreased germination of lodgepole pines, and recent widespread drought has weakened the immune systems of lodgepole pine, causing increased infestation of mountain pine beetle. As a result, there is a need for improved forest regeneration techniques in lodgepole pine forests. One method of improving revegetation could be through use of a biochar, a carbon-based substance that is produced when woody biomass is burned in a high temperature environment. Numerous studies have found that biochar has generally positive impacts on soil health and plant productivity. However, more research is needed on its impact on native plants, especially lodgepole pine and other species with serotinous mechanisms. This study looks to address how different applications of biochar can be utilized in early greenhouse growth of lodgepole pine, the primary step of many revegetation efforts. In the Olin Hall Greenhouse, following a stratification process, we compared the 6-month growth of lodgepole pine seeds sown in potting soil, potting soil incorporated with biochar, and biochar on top of potting soil. Our procedure is based on protocols developed by the Colorado State Forest Service nursery, the Native Plant Network, U.S. Forest Service, and other academic studies. In our observations 3 months following germination, soil plots with biochar amendments were more successful in promoting plant mass growth of lodgepole pine. After the full 6-month growing period concluded, we found that soil plots with biochar amendments were more successful in promoting shoot height growth of lodgepole pine. These results hold potentially valuable implications on revegetation efforts for an ecosystem increasingly challenged by a changing climate.

TRADE, GROWTH, AND INEQUALITY IN THE UNITED STATES

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This study focuses on evaluating trade policy for the United States. Its goal is to evaluate the effectiveness of neoliberal, free trade policy on the economic situation of the United States. The prevailing defense behind this neoliberal, free trade policy is centered around the idea that free trade will always benefit countries and its potential damaging effects are very minimal and countries are very likely to quickly readjust and bounce back from any disadvantage caused by the effects of free trade policies. This paper will challenge this assumption. It will do so by focusing on economic indicators like GDP growth along with other factors like the GINI index, as I am to measure neoliberal trade policies effects on growth along with income inequality. It aims to also find the very best way to evaluate trade in the United States. Initially, it will detail and lay out a statistical analysis of the United States economic situation before the North American Free Trade Agreement (NAFTA) which was a massive milestone involving the liberalization of trade in the United States. It will discuss the results of this study but ultimately conclude that this simple statistical study cannot accurately capture and represent the complexity of this situation. This paper will therefore lay out the roadmap for a much more, detailed and specific study that can be explored in the future.

PREVALENCE INDUCED CONCEPT CHANGE IN GENDER PERCEPTIONS

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Feminist theories assert that societal norms and social contexts shape our understanding of gender. We suggest that prevalence-induced concept change (Levari et al., 2018) may explain why gender identity concepts vary based on context. To examine this, participants (N=300) in the current study evaluated faces or objects for their masculinity and femininity. Some participants viewed only masculine stimuli, some viewed only feminine stimuli, and some viewed both. Participants then completed a separate task in which they rated neutral behaviors for dominance (a stereotype associated with men) and warmth (a stereotype associated with women). As expected, when participants saw a higher prevalence of masculine stimuli or feminine stimuli, faces and objects were evaluated as less gender stereotypical than when participants saw an equal prevalence of masculine and feminine stimuli. Furthermore, participants who only saw masculine stimuli rated neutral behaviors as warmer and less dominant, indicating a potential mechanism by which people are evaluated in contexts with a disparate representation of men and women.

INVESTIGATION OF SEPTIN PROTEINS IN DROSOPHILA MELANOGASTER

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Septin proteins are guanosine triphosphate (GTP)–binding proteins that play important roles in the development and physiology of some tissues and interact with the cell membrane and cytoskeleton. In humans, the septin cytoskeleton has been found to assist in many cellular functions, including regulation of cell shape and polarity, cytokinesis, cell migration, vesicle trafficking, and receptor signaling. This thesis aims to examine the location and function of specific septin proteins in the embryo of the common fruit fly, Drosophila melanogaster. The experimentation was performed on the embryos of Drosophila melanogaster flies during the process of germ band extension, a period of rapid cell division where the body segments of the fly begin to form. In the experiment, Septin 2 was labeled to determine its location within Drosophila embryo cells, while Septin 4 was genetically knocked down and its relationship with the developmental protein Rab35 was explored. Through this experiment, the organization and location of Septin 2 was determined, being punctate in pattern and generally widespread, though highly concentrated near the membrane of each cell. It was also discovered that cells lacking Septin 4 also have a greatly decreased amount of Rab35 puncta, a grouping of the developmental protein found near the cellular surface. This lead to the conclusion that septin proteins play an important role in maintaining the structural integrity during the development of Rab35 puncta.

EMOTIONAL WELL-BEING OF GROUP FITNESS INSTRUCTORS

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Emotional well-being is an essential component of health overlooked in research on group fitness instructors, who are crucial to the fitness industry. Understanding emotional well-being and job-related outcomes will support them and their work. The study uses a questionnaire that measures whether emotion contagion and emotion labor (surface acting and deep acting) predict emotional exhaustion, job satisfaction, and turnover intention. Group fitness instructors hiding expressions of their true feelings (surface acting) reported more emotional exhaustion, more intent to leave their job, and less satisfaction with their job. Group fitness instructors trying to feel their displayed emotions (deep acting) reported less intent to leave their job, more satisfaction with their job, and more emotional exhaustion. related to more emotional exhaustion, more turnover intention, and less job satisfaction. Exploratory statistics are in the process of being analyzed further. Future interpretive studies are needed to gather more information about group fitness instructors' training on emotional well-being to better understand what instructors need to improve/maintain their emotional well-being, and thus the fitness industry.

INVESTIGATING THE REGULATION OF THE HYPOTHALAMIC-PITUITARY-INTERRENAL AXIS IN ATLANTIC STURGEON (ACIPENSER OXYRINCHUS) FOLLOWING AN ACUTE STRESSOR

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This study investigated the response to acute stress in Atlantic sturgeon (Acipenser oxyrinchus) and HPI axis regulation of glucocorticoid production during stress by examining the expression of key genes— corticotropin-releasing hormone (crh), corticotropin-releasing hormone receptor (crhr), proopiomelanocortin (pomca/pomcb), melanocortin 2 receptor (mc2r), and steroidogenic acute regulatory protein (star)—that are associated with hypothalamus/pituitary/interrenal (HPI) axis of bony fishes. Additionally, tyrosine hydrogenase (th1 and th2) and phosphoenolpyruvate carboxykinase (pepck), found in catecholamine-producing cells in the head kidney of the sturgeon, were investigated as alternative pathways of stress regulation outside of the HPI axis. We sought to test the hypothesis that there is an upregulation of one or several components of the HPI axis in A. oxyrinchus to produce a corticosteroidogenic response to acute stress. Atlantic sturgeons were exposed to an acute stressor and were sampled at 1, 6, and 24 h during recovery, whilst maintaining an unstressed control. The fish were examined for plasma cortisol, plasma glucose, and the relative abundance of crh, crhr, pomca, pomcb, mc2r, star, th1, th2, and pepck. Our investigations demonstrated a significant elevation in plasma glucose and cortisol in response to stress, however, there was no significant transcriptional upregulation of the expected corticosteroidogenic HPI axis components crh, crhr, pomca, pomcb, mc2r, and star. However, the investigation revealed significant upregulation of th2 and pepck in response to stress, which provides a possible explanation for elevated plasma glucose levels that were observed. These findings indicate that there may be alternative pathways for stress-regulation of plasma glucose in A. oxyrinchus and further investigation is necessary for a more comprehensive understanding. Future studies directed at the stress-responsive regulation of cortisol and catecholamines may offer a greater understanding of the neuroendocrine pathways regulating steroidogenesis and gluconeogenesis during stress in A. oxyrinchus as well as basal vertebrates in general.

CHARACTERIZATION OF ZINC HOMEOSTASIS IN MLIV FIBROBLASTS

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Mucolipidosis type IV (MLIV) is a neurological disorder characterized by corneal clouding, abnormalities in eye movement, reduced psychomotor abilities, and moderate to severe intellectual disability. While there is no cure for MLIV, it is known to be caused by a mutation of the MCOLN1 gene, which encodes for TRPML1, a non-selective cation channel in lysosomes. Previous research has found that TRPML1 is permeable to Zn^{2+}. Furthermore, we have discovered that there is a correlation between Zn^{2+} permeability and the severity of symptoms in MLIV mutations. My research goal is to study whether Zn^{2+} homeostasis is disrupted in MLIV cells. We first investigated optimal fibroblast transfection conditions. Ultimately, certain conditions of electroporation yielded the highest density of successfully transfected fibroblasts. Using this transfection method, primary human fibroblast cell lines were utilized to examine the differences in cytosolic and mitochondrial Zn^{2+} concentrations between healthy human fibroblasts (wildtype) and MLIV patient fibroblasts ranging from mild to severe phenotypes through the use of a genetically-encoded zinc sensor. My results revealed that there is a significant variation in cytosolic and mitochondrial Zn^{2+} among patient samples, but no significant differences were detected between the wildtype and MLIV cells. These findings indicate that mutations in TRPML1 may not affect the steady-state cytosolic and mitochondrial Zn^{2+} concentrations because of the compensatory effects of other Zn^{2+} transporters. MLIV phenotypes may be caused by the disruptions of transient and localized Zn^{2+} signals released via the TRPML1 channel. Therefore, future research will investigate TRPML1-mediated Zn^{2+} release in wildtype and MLIV cells.

MUTUAL BENEFITS OF NEAR-PEER MENTORING IN STEM POSTSECONDARY AND CAREER DEVELOPMENT

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This study investigates the effectiveness of near-peer mentoring in promoting STEM career aspirations, particularly for underrepresented students. Focusing on the STEM mentor internship course, led by the biology department at a private university in collaboration with a local public school, the research examines the experiences of undergraduate mentors and high school senior mentees, and the benefits and challenges to both participant groups. Key questions addressed include the influence of near-peer mentoring on career choices and personal development for both mentors and mentees, its impact on high school seniors' STEM post-secondary decisions, and post-high school transition considerations. The study also assesses how the program enhances undergraduate mentors' cultural responsiveness, leadership skills, and equity-promoting roles in STEM. Drawing from three years of qualitative data, including surveys, exit tickets, curricula, newsletters, and assignments, the findings provide insights into the significance of near-peer mentoring for shaping STEM education and career pathways. This study employed a qualitative method followed by a sentiment analysis in natural language processing to comprehensively capture the multifaceted outcomes of near-peer mentoring. The results show that most responses from high school mentees and undergraduate mentors are overwhelmingly positive. Program materials effectively align with and address mentees' post-secondary career planning needs, dispelling common myths about studying and working in STEM fields and empowering individuals from traditionally marginalized backgrounds to pursue STEM careers. Undergraduate mentors develop social justice-oriented leadership, agency, and mindsets through newsletter drafting, mentoring sessions, and self-reflection. This holistic STEM mentoring program adds value to a holistic STEM education by engaging diverse communities. Further efforts need to focus on further strengthening virtual mentor-mentee collaboration and communication, specified mentoring for different sectors of STEM field, and collaboration with career centers and STEM professionals to provide more resources and practical experiences for both mentors and mentees.

INFLAMMATION IN PRIMARY HUMAN ASTROCYTES IS DEPENDENT ON TOLL-LIKE RECEPTOR 3 WHEN EXPOSED TO ASTROCYTE-DERIVED EXOSOMES ISOLATED FROM PATIENTS WITH COVID-19 AND TBI

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There have been 775 million confirmed cases of SARS-CoV-2 infections worldwide. With each SARS-CoV-2 infection the patient has a chance of developing an array of chronic symptoms referred to as Long-COVID. These symptoms including fatigue, brain fog, anxiety, and depression, could be the result of chronic inflammation of glial brain cells caused by Blood-Brain-Barrier disruption. Astrocytes are one of these glial cells involved in maintaining the Blood-Brain-Barrier. We hypothesize that the Astrocyte cells are packaging up and sending out pro-inflammatory "cargo" via exosomes that can then be taken up by other cells, inducing an inflammation phenotype. We believe that participants who have a combined history of COVID-19 and mTBI will produce more pro-inflammatory "cargo" and better be able to transmit an inflammatory phenotype. In order to determine through which receptor this neuroinflammatory phenotype is being transmitted, we selected 5 Toll-Like Receptors on Primary Human Astrocyte cells to treat with drug inhibitors. We found that inhibition of Toll-Like Receptor 3 blocked the transmission of an inflamed phenotype to the astrocyte cell. This finding will open the possibility of future studies into the use of current Toll-Like Receptor 3 inhibitory drugs for the prevention of glial cell inflammation.

IDENTIFICATION OF POTENTIAL THERAPEUTICS FOR PARKINSON'S DISEASE

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Our lab has successfully identified the aggregation-prone amino acid sequence that is important for the aggregation of α-Synuclein protein (αS), which is the process responsible for production of Parkinson's Disease (PD) phenotypes, with symptoms such as impaired motor functions. My goal is to further confirm the role of these sequences in aggregation and identify individual amino acid(s) within that sequence that are important for αS aggregation. This will be accomplished using design of αS variants with point mutations, created by substituting alanine for amino acids within the aggregation-prone sequence. Thioflavin T (ThT) fluorescence assays, transmission electron microscopy (TEM), cellular assays, and confocal microscopy will then be performed on the purified αS variants. This study will further develop understanding of the role of individual amino acid(s) in facilitating αS aggregation. In addition, this will advance identification of potential therapeutic targets for the treatment of PD. With this amino acid sequence identified, synthetic molecules can be synthesized to bind and potentially inhibit aggregation of αS.

COLLECTION AND ANALYSIS OF CHEMICAL REACTION PRODUCTS WHEN PROTEIN SAMPLES ARE EXPOSED TO DENVER URBAN AIR

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An increase in seasonal allergies has been observed over the years affecting human health. Environmental factors and atmospheric pollutants can induce chemical modifications of airborne allergens, increase oxidative stress in the human body, and skew the immune system toward allergic reactions [2]. Laboratory studies exposing certain allergenic proteins to simulated gas-phase air pollution have shown that the proteins undergo chemical modifications that make them even more allergenic. In continuation of work done by former student Dr. Rachel Davey, my project has been to collect and analyze protein samples exposed to ambient Denver air at two field-site locations. The goal of the study has been to further understand the types of processes that occur during the nitration of exposed tyrosine amino acid residues when exposed to ozone (O3) and nitrogen dioxide (NO2). Specifically, the work set out to extend the previous results by comparing the extent of both the nitration and oligomerization reactions to explore a hypothesis that Dr. Davey proposed. Two samples per field site were collected at the two sites over 9 months and analyzed in the lab. Through the experimental process, significant effort was needed to verify experimental steps, including the filter extraction efficiency and aspects of the analysis process. Furthermore, the project involved maintenance tasks, including the calibration of scientific instruments such as the ultraviolet spectroscopy and Gast pump. These activities were crucial to ensure the accuracy and reliability of the data collected throughout the experimental process. More recently, the first field samples were analyzed using high performance liquid chromatography. My work has been an important component of a multi-year experimental project that will help provide better understanding of the role that these reactions play on the surfaces of protein-containing airborne bioaerosols in inducing health effects in urban areas.

DESIGNING AN INTRODUCTORY COURSE ON COMPUTATIONAL SOCIOLOGY

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This project explores the beginning stages of planning an introductory course in computational sociology for undergraduate students. Computational sociology is a field that combines computer science and sociology through the creation of computer simulations. These simulations are based on theories and frameworks from sociology and are modeled using coding languages such as Python. This course is geared towards students majoring in computer science or in sociology to encourage an interdisciplinary approach from each respective field to the other. This project looks at utilizing agent-based models for instructive purposes. Agent-based models are computer models that focus on how interactions between agents create larger patterns within the model. The agents are given simple rules and the resulting patterns that arise from the interactions between the agents is called emergent phenomena. The goal of this course is to show how the concept of emergence may tie the two fields together and encourage students to create their own models using Python.

PRESERVING PARADISE: INVESTIGATING BEACH LITERARY BEHAVIORS AND DEVELOPING SUSTAINABLE SOLUTIONS IN COASTAL NICARAGUA

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Every year, billions of pounds of trash are littered on beaches all over the world, especially in developing countries. In Nicaragua, there has been little research conducted to understand the trash problem that coastal communities are afflicted by. Discovering why people litter regardless of waste bin accessibility and who may be the primary culprit is vital in creating sustainable solutions. This research was conducted through observation of beach behavior and cleanup efforts and informal community member interviews. Results suggest that due to poor access to proper education and waste management, recreational beachgoers abandon trash, and the local fishing economy traditionally does not prioritize beach health. This new understanding of the underlying causes of beach pollution in coastal Nicaragua allows sustainable solutions to be created and implemented with cultural sensitivity.

STEM NEAR-PEER MENTORING

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This year, our group engaged in near-peer mentoring with seniors at Westminster High School (WHS) regarding the transition to college and STEM specific fields. WHS has a program geared towards preparing students interested in STEM fields for the transition to those fields. Our near-peer mentoring (which involves mentoring between individuals close in age) group partnered with this program in order to conduct weekly Zoom meetings between one undergraduate or graduate student and 4-5 high school students. Some of the major goals of the partnership are to: 1) build upon evidence of near peer mentoring in improving STEM interest, readiness and success in STEM college majors for high school students, particularly those from historically underrepresented backgrounds; 2) provide DU STEM undergraduates a mentoring learning and leadership opportunity such that they could share their experiences in a low-stakes, constructive, curated environment; 3) provide the WHS biomedical sciences students a low stakes learning and engagement mentorship opportunity that integrates with their coursework and career development discussions; and 4) an opportunity for both the DU and WHS students to learn from each other. This year specifically, our group worked to increase participation and interaction between the mentor and mentees in the Zoom environment in order to maximize the success of the previously mentioned goals.

COMPARING THE US RESPONSE TO THE SOVIET INVASION OF AFGHANISTAN AND THE RUSSIAN INVASION OF UKRAINE: LEARNING FROM THE PAST AND PLANNING FOR THE FUTURE

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As the Russo-Ukranian war continues to rage, the decisions of the present are of paramount importance. In order to make the most positive and well-supported decisions in this ongoing conflict, it would be wise to look to past instances of similar situations. The Soviet invasion of Afghanistan is such an instance. The parallels between the ongoing conflict in Ukraine and the past Soviet invasion of Afghanistan are extensive and, more importantly, informative for U.S. foreign policy. It is with this lens that this paper will pursue a historical foreign policy analysis of the Soviet invasion of Afghanistan, its circumstances and consequences, and suggest that based on these understandings, the U.S. ought to make it a top priority to avoid repeating the Afghanistan situation. The rise of the Taliban was fueled by U.S. involvement in Afghanistan, and as extremist movements in Ukraine become ever more threatening, the U.S. would do well to avoid the mistakes made in Afghanistan should it hope to avoid another war on terror.

RECORDING VETERAN'S HISTORY

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For many years, I've worked with the University of Denver's Department of History recording and recovering oral histories from Colorado veterans of many eras. In particular, this project, Recording Veteran's History, focused on recording the history of the rapidly aging Vietnam veterans community, especially those individuals involved in veterans advocacy through groups like the United Veterans Coalition. My research focused on recording oral histories, focusing not only on service-based oral histories but also the recording of memory post-conflict. My results found a wide array of veterans experiences, but also highlighted the difficulties of working with an aging population, especially on a project which relied on memory. It is my hope that my part in this work will help continue the process of recording veteran's experiences, an endeavor which must be completed quickly as the target population ages.

ATMOSPHERIC PARTICULATE MATTER (PM) TRENDS OF THE FRONT RANGE OF COLORADO VIA PURPLEAIR SENSORS

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Atmospheric particulate matter (PM) contributes to a variety of individual health effects and public health challenges. PM data were collected and analyzed as a part of this thesis in an effort to contribute to broad efforts of collecting atmospheric measurements to help better understand their impacts on human health, social justice, and environmental causes. PurpleAir sensors were used in the data collection due to their accessibility and community engagement capabilities. Seven PurpleAir units were deployed at a suburban site in Denver for a four-month period (September 2023 – January 2024), during which sensor accuracy and confidence was assessed. Statistical analysis of the data provided a detailed technical intercomparison between sensor types and an overview of the multi-month PM trend in suburban Denver. A thesis project by another graduating student will explore the intercomparison period (ICP) in more detail. Following the ICP, a small network of six sensors was deployed in pairs at three sites at the Kennedy Mountain Campus (KMC) to begin initial data acquisition and analysis of the PM trends in order to lay preliminary work toward an atmospheric research station proposed for later development at the site. The deployment of the sensors and the acquisition and preliminary analysis of the PM data achieved the primary project goal of establishing real-time environmental research efforts at the KMC. These efforts and data will provide the beginning infrastructure and momentum used by students working with a future KMC research station. The research station is envisioned to be used not only by University of Denver students, but as a collaborative space among researchers within Colorado to investigate issues relating to PM and other atmospheric and environmental sciences.

A MIDSUMMER NIGHTS DREAM SPECIALTY PROPS

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A Midsummer Night's Dream is one of Shakespeare's most renowned plays steeped in a world of dreams and magic and will be the second show in DU Departments of Theatre's winter quarter season. After the Covid-19 pandemic, live theatre felt a heavy effect in loss of attendance. Even now, it is still very difficult to fill productions to full capacity. This show has the goal of bringing in college audiences that have not had the full experience of witnessing live theatre, and who may have previous, negative notions about Shakespearean plays. The goal was to transform our audience for the two hours they witnessed this play into people that can enter a world of magic, try something new, appreciate it, challenge their own thinking, and revitalize an art that took a heavy blow in recent years. In order to achieve this fantastical reality onstage, I worked closely with the costume designer (Janice Lacek) and director (Sabin Epstein) to research, design, prototype, and fabricate specialty props and costumes to create the multiple distinct worlds present in A Midsummer Night's Dream. One of the distinct worlds was created with a black and white newspaper theme to tie those characters together and create a handmade look but with an extremely durable structure that had the ability to last three and a half weeks of dress rehearsals and performances. By the end of the project, I designed, prototyped, and fabricated 5 large scale specialty props sporting at least 50 separate pieces each using advanced painting and texturing methods, LEDs lights and wiring techniques, foam molding, paper mache, and wig making techniques. We were successful in creating a fantastical world for about 700 people and allowed them to experience the magic of live theatre as we move out of the Covid-19 era."

MEASURES OF EFFECTIVENESS ON THE PARENT PROJECT CLASS

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Parenting is an inherently challenging journey, more so when faced with children exhibiting destructive behaviors like truancy, substance abuse, and violence. The absence of a definitive guide leaves parents feeling overwhelmed and unequipped to manage such extreme situations. The Parent Project, developed by a dedicated team, aims to empower parents of difficult adolescents through a structured curriculum. This study evaluates the effectiveness of the Parent Project Course, focusing on the enhancement of parenting skills and confidence. In collaboration with the non-profit organization One More Moment, a longitudinal study was conducted involving 25 parents enrolled in the Parent Project Course. Utilizing Qualtrics, weekly surveys assessed various aspects of the course's impact, including session usefulness, strategy application, parental self-efficacy, support group attendance, and therapy engagement. Preliminary findings indicate a significant uptake of positive parenting strategies, notably the daily affirmation of love, which saw an increase from 42% to 75% usage over nine weeks. All participants reported finding the course beneficial, with 62% feeling substantially more effective as parents, and 38% noting a slight improvement. The consistent positive feedback and strategy adoption underscore the course's potential in transforming parenting practices. The data collected offers valuable insights for refining the curriculum, ensuring that future iterations of the Parent Project Course are even more impactful.

CLINICAL IMPLICATIONS OF GENDER DIFFERENCES IN ADHD SYMPTOMATOLOGY

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Attention Deficit Hyperactivity Disorder (ADHD) is one of the most prevalent neuropsychiatric disorders, characterized by hyperactivity, inattention, and/or impulsivity. However, much of the knowledge of the disorder is based off of research on a homogenous Caucasian male sample, and a growing body of research reveals disparities between genders in regards to ADHD symptomatology, diagnosis, and treatment. Thus, there is a need for a focus on analyzing gender differences in ADHD symptomatology, and the present paper aims to highlight the known research. Gathering data from 12 studies on ADHD and gender differences, the present meta-analysis aims to answer: What are the known gender differences in ADHD symptomatology, and how can the processes of diagnosis and treatment be improved by understanding these gender differences? The studies revealed that there are numerous known gender differences in ADHD symptomatology: females with ADHD had more internalizing symptoms, were more likely to have comorbid diagnoses of anxiety and depression, had more social and emotional impairment rather than behavioral, and were heavily influenced by hormonal factors. Understanding such gender differences urges parents, teachers, and clinicians to be more educated on recognizing ADHD symptoms in both males and females. Education of different presentations can address numerous of the flaws in the diagnostic process. Diagnosing clinicians should more carefully look at females' social relationships and self-report and can encourage treatment plans to focus more on their internalizing symptoms and their hormonal cycles. Clinicians and the general public must expand ideas of not only ADHD but other mental health conditions beyond a single presentation.

LAB EXPERIMENTS TO OPTIMIZE A NEWLY DEVELOPED ULTRAFINE PARTICLE COUNTER

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Ultrafine particles (< 0.1 μm in size) are much smaller than the EPA-regulated PM2.5 (< 2.5 μm) and pose even stronger health risks because they are small enough to penetrate deep into the lungs. Ultrafine particles are challenging to measure. Currently available condensation particle counters (CPCs) capable of detecting them are expensive (>$25,000), which limits the extent of further research. Collaborators at the University of Arizona developed a new style of ultrafine particle counter which utilizes inexpensive components. The Arizona ultrafine particle counter (AUPC) uses an expansion-based approach for forced condensation of water vapor onto condensation nuclei, which scatter light from a green diode laser as they fall and are recorded by the instrument's camera. The thesis project involved laboratory experiments comparing number concentrations measured by both a commercial CPC and the AUPC. Experiments focused on changing particle size and particle composition. Particle size experiments compared counting efficiency of each instrument by aerosolizing sizing standard polystyrene latex beads to verify the AUPC counting capability over a range of particle diameters. The AUPC matched the relative trend of the commercial CPC, but with a lower counting efficiency over particle sizes 25 - 345 nm. The composition-based experiments included aerosolizing a solution with particles of differing chemical properties. Particles composed of either pure ammonium sulfate (more polar and hygroscopic) or oleic acid (less polar, more hydrophobic) were chosen to represent materials with opposite water adsorbing properties. Results again showed the AUPC can reproduce the behavior of the CPC, but at lower count efficiency. The AUPC may represent a useful approach toward providing information about ultrafine particles in a variety of indoor and outdoor environments at dramatically lower cost (est. <$2,000), but the instrument will require further improvements to more closely compete with commercial CPCs.

SAME PLAY, DIFFERENT WAY: RECURRENT LOSS OF SEXUAL SIGNALS IN A FIELD CRICKET

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Evolution has often shown an ability to solve the same problem in seemingly endless creative ways. Here we present an unusually rapid example of this phenomenon, documenting the recurrent loss of sexual signals in populations of Hawaiian crickets (Teleogryllus oceanicus) in real time. Males of this species produce a conspicuous song using specialized wing structures to attract potential mates. However, in Hawaii, this song also attracts a deadly parasitoid fly (Ormia ochracea). In response to this strong natural selection pressure, a new type of male, known as “flatwing,” arose ~20 years ago. These males adaptively lost many sound-producing structures on their wings, leaving them unable to produce songs but ensuring their protection from the eavesdropping parasitoid. More recently, during field sampling, we found males in two different populations that were also unable to produce song, but unlike flatwings, they surprisingly appeared to have intact wing structures. To understand why these males were unable to sing, we investigated their wing morphology using microscopy, hypothesizing that their loss of song was due to a loss of microstructures that contribute to sound production. We found that in both populations, these males indeed had a highly altered and reduced important microscopic wing structure called the “file.” To determine whether this mechanism differed from that of the silent flatwings that arose two decades ago, we next compared the wings of these new males to old flatwing specimens and found broad morphological differences between the two, confirming that this new male type lost their ability to sing in a novel way. Our findings highlight evolution’s remarkable ability to reach similar outcomes through unique pathways when faced with a common ecological challenge."

SHAMING WOMEN TO SHAME MEN: A CASE STUDY OF THE HOUTHIS AND THE RELATIONSHIP BETWEEN HONOR CULTURE IN YEMEN AND THE USE OF SEXUAL VIOLENCE IN THE YEMENI CIVIL WAR

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The factors that influence an armed group’s use of sexual violence against women during times of conflict is a much studied area due to the prevalence of the phenomenon, and the significant implications it has for human rights. Studies on the subject have generally contended that cultural attributes and practices present during peacetime play a significant role in determining whether or not an armed group will incorporate sexual violence as a part of their strategy. A relatively under researched cultural practice that could influence the use of conflict related sexual violence (CRSV) is the presence of and importance of honor culture in a society experiencing conflict. This article seeks to expand on the understanding of its influence by analyzing the relationship between honor culture in a society and how its characteristics influence the groups operating within it to use sexual violence against women as part of their strategy. It uses examples of female victims of CRSV carried out by the Houthis in Yemen. It concludes that the honor culture of the society the group operates within influenced them to use more CRSV. This understanding has significant implications for policymakers and academics in predicting the severity of sexual violence that might occur in a given conflict happening in an honor based culture.

DETERMINING THE DIFFERENCE BETWEEN HISTORY OF DEPRESSION ON FAMILY HEALTH HISTORY FORM AND SCID USING SOCIOECONOMIC STANDARD MEASURES

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This project was completed as a part of earning my Micro-credential in Psychology in Data-Informed Decisions. With this project, I wanted to learn how to analyze data using RStudio to contribute research to Dr. Pilyoung Kim's study on prenatal pathways for poverty's influence on the brains of two generations that explores the relationships of parent-infant social, emotional, and brain development. Using data from this study, I formulated the research question: What is the difference between the self-reported history of depression on the family health history (FHH) form and history of depression assessed via the Structured Clinical Interview for DSM (SCID) and can the discrepancies be predicted by socioeconomic standard measures? I found discrepancies in the FHH form and SCID and used the income to needs ratio (INR) data to determine if the existence of a discrepancy was due to this variable. I also determined whether the type of discrepancy (on the SCID and not on FHH form or on the FHH form and not the SCID) was correlated with INR data. I used INR because the differences in reports could be related to disparities in health care access and mental health education, which can likely be shown through INR data. I ran t-tests to determine if there was a correlation between the variables and created violin plots to display the data. The p-values were 0.2334 and 0.8516, respectively, so there does not appear to be a correlation between discrepancy in the two forms and INR. Based on the fact that I did not find any correlation between discrepancy and INR, it is clear that this problem is much more complex than income. I would like to look at other variables that may have an influence on SES such as education level, race/ethnicity, and living conditions.

UNDERDIAGNOSED & OVER-PUNISHED

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The school-to-prison targets vulnerable populations and exacerbates preexisting racial and ethnic disparities in the justice system. Harsh disciplinary practices at school coupled with inequitable and discriminatory treatment of minority students, and an underdiagnosis and lack of treatment of disabilities such as ADHD, place children of color and children with disabilities at an academic disadvantage and increase their chances of contact with the criminal justice system. The current priority of punishment rather than education in the United States is problematic. By addressing and bringing awareness to the school-to-prison pipeline, conversations can be opened about the importance of equity and inclusion in the classroom, and the harm that is created by the current use of harsh school practices. In addition to this, educating individuals about the ways in which the school-to-prison pipeline can be brought to a halt and why change needs to happen is important. With this purpose, a ten-week project was created. It consisted of hours spent on researching and using thematic coding and analysis to breakdown the school-to-prison pipeline and how it affects vulnerable students. The result was two products; an infographic poster which exposes research on the school-to-prison pipeline, and an informational sheet which provides some steps that can be taken to put an end to the school-to-prison pipeline. Students with disabilities account for a quarter of all children arrested in schools despite making up only twelve percent of school populations in the U.S. In particular ADHD is present in forty-six percent of juvenile offenders. At risk children are slipping between the cracks without adequate support. Therefore, creating a shift from punishment into reformation and education can protect and provide support to our most vulnerable children. It starts with improving student-to-teacher relationships and student-to-school bond building.

USING BIO INDICATOR SPECIES TO VISUALIZE GROUND-LEVEL OZONE POLLUTION IN DENVER

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Bioindicator plants are species that are more sensitive to ground level (tropospheric) ozone, and show identifiable damage when exposed to high ozone concentrations. It is important to monitor ground level ozone, as it is extremely toxic to plants and decreases the amount of carbon storage and the amount of carbon dioxide (CO2) that can be pulled from the air, decreases crop production, and weakens the plants- making them more susceptible to other issues. Bioindicator plants are so valuable because they provide visible measurements of ozone concentrations, showing the first hand effects of pollutants on the air chemistry and in turn the effects on plants. Ground level ozone is created through the reaction of sunlight, nitrogen oxides and volatile organic compounds produced from the fuel combustion of driving cars. To understand the damage ozone is having on plants in Denver, I used two varieties of beans: a common variety that is sensitive to ozone, and a modified variety that is tolerant to ozone damage. The tolerant bean variety acted as a control group to compare the damage of the sensitive group to. These plants were cared for and their leaves were monitored for ozone damage every other day from July to October. This project shows evidence that ozone pollution is both increasing damage to the plants' leaves and decreasing the crop production of the sensitive (common) bean varieties as compared to the tolerant varieties. It also shows that high temperature and ozone concentrations are correlated with more damage to the sensitive varieties. This data was added to a nationwide database of ozone gardens, to answer the questions of what concentration causes damage, how severe the damage can become, and how damage differs across location.

POLICY AND PUBLIC OPINION: THE RELATIONSHIP BETWEEN THE PHILOSOPHY OF BUEN VIVIR AND ENVIRONMENTAL PERSPECTIVES IN ECUADOR

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Through the question, how has environmental awareness changed in Ecuador and Peru following the inclusion of the philosophy of Buen Vivir in Ecuador's 2008 Constitution? I explore whether the philosophy of Buen Vivir was simply a political campaign strategy executed by Ecuadorian president at the time, Rafael Correa, or if it exacted tangible change among the Ecuadorian public. Peru is included as a control variable, as it displays similar foundations of Buen Vivir, though did not grow to national recognition as it did in Ecuador. The concept originated among Quechua communities in South America, contrasting from the mainstream model of economic development, instead focusing on human and environmental well-being. As the threat of climate change grows, Buen Vivir offers a potential solution. I first analyzed Ecuador's 2008 Constitution and Peru's 1993 Constitution for articles related to Buen Vivir. Then, utilizing the Latin American public opinion survey Latinobarómetro, I analyzed survey responses regarding environmental awareness in the two countries. I considered responses between the years of 2002 and 2016. I analyzed the questions "In your opinion, what is the most important problem in the country?" "How much have you heard about global warming or climate change?" "To what extent do the following freedoms, rights, life-chances and guarantees apply in [country]?" and "What it takes to be a good citizen." Each contained responses related to the environment. I predicted that there would be an increase in environmental awareness in Ecuador, but not in Peru following 2008, due to the mainstream nature of Buen Vivir in Ecuador as opposed to Peru. My results revealed increases in both countries, which ultimately did not align with my hypothesis. There are a variety of explanations as to why this may have been the case, including that perhaps Buen Vivir was not as successful as anticipated.

DEVELOPMENTAL AND ADHD SYMPTOM-RELATED CHANGES IN MOTIVATED COGNITIVE CONTROL

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ADHD, Attention-Deficit-Hyperactivity disorder is a frequently diagnosed childhood disorder. Variations in cognitive control may be a vital factor in ADHD. The present, ongoing study's goal is to understand how reward modulation modulates the temporal dynamics of cognitive control in children (ages 8-16) with and without ADHD with an AX continuous performance task (AX-CPT). This task is a reward incentivized cognitive control task. In addition to AX-CPT, high-resolution pupillometry is used as another measure of cognitive effort. Upon preliminary analysis of results, there are potential differences in cognitive and motivational processes in children with ADHD compared to those without it.

EXTREMOPHILES MAY HELP MITIGATE TDP43 AGGREGATION IN ALS

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Amyotrophic Lateral Sclerosis (ALS) is a rare but devastating neurodegenerative disease. While there are no known cures for the disease, one of the most reliable causes of the disease is the aggregation of a protein called TDP43 in the brain. Although the reason for this aggregation is still under investigation, treatments which aim to inhibit the aggregation of these proteins seem promising in slowing down the disease's progression. Seeing as the brain undergoes extreme stress during ALS, I was interested in seeing if Ectoine, an extremophile stress solute which helps reduce cellular stress for organisms living in extreme environments, could provide similar protective properties for cells under stress from ALS. By exposing human embryonic kidney (HEK) cells overexpressing TDP43 to various levels of ectoine, I was able to determine that it does have neuroprotective qualities as it successfully reduced the amount of TDP43 protein aggregation. The protective nature of extremolytes provides an interesting avenue for future neurodegenerative research, suggesting the possibility of further uses and investigation into the supportive properties these unique organisms can provide.

CREATING AN ADAPTIVE AND INTUITIVE SINGLE-OPERATOR MULTI-MAV INTERFACE USING AUGMENTED REALITY

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The goal of this research is to achieve safe and effective singular operator supervision and control of multi-micro aerial vehicle (MAV) swarms with an intuitive and easy-to-use Augmented Reality interface. Singular-operator swarm control is applicable to multiple industries and scenarios [2].MAVs currently navigate pre-defined paths and accomplish given tasks [1]. However, there is a loss of efficiency, as a single operator must have programming knowledge & manage multiple systems. Achieving singular operator control software would allow for users to spatially task the swarm within various environments, preventing conflicts due to errors in other operators/software. The design of the augmented reality interface was done using 3D interactable objects that are mapped to the positions of the MAVs in the 3D-space. Path-planning and execution is done within an AR headset by moving 3D objects to draw the desired path each drone should follow. This is accompanied by a user interface (UI) orbiting the user with options to delete paths, upload the paths to the swarm, emergency shutoff and to execute/stop. This project will be accomplished by integrating existing software and hardware, such as the Robot Operating System (ROS), Crazyswarm [1], Optitrack motion-capture, HoloLens 2[5] as well as the crazyflie's Micro-Aerial-Vehicle (MAV) [6] and creating new software with the above capabilities. Control of the swarm through this augmented reality interface has been achieved through the above method using HoloLens 2 and the execution of software on a ROS-receiving PC. Further improvements in terms of safety features such as environmental obstacle avoidance, better safety features, accessibility, and integrating more of Crazyswarm's controls, are in progress. My findings show that AR as a means of controlling MAV swarms is viable in an intuitive manner that is easy to utilize for novice users. Additionally, this project allows for further studies into human-robot interaction with MAV swarms & augmented reality.

QUESTIONING THE EFFECTIVENESS OF THE OLYMPIC TRUCE

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A modern model for peace is the "Olympic Truce," a United Nations General Assembly resolution that calls for the pausing and prevention of new conflicts from one week before the Olympic Games through one week after the Paralympic Games. Olympic Truce scholars have focused on identifying cases that demonstrate effective implementation of the Olympic Truce and have come up with mixed results. Some argue that the symbolic nature of the Truce allows it to create moments of peace in conflicts, while others argue that it is nothing more than a gesture of goodwill that has not actually been used for peace. This study will aim to bridge the gap by determining if there are any cases of conflict in which the Olympic Truce has made a difference for peace. My research question is: Has the Olympic Truce ever been successfully implemented to prevent the onset of new conflict or in creating a ceasefire during an ongoing conflict? I use conflict data and case studies to determine the prevalence of conflict during Olympic Truce periods and four case studies to analyze attempts to use the Olympic Truce and some of the challenges faced. It is found that across the four cases (Yugoslav Wars, India-Pakistan, Cyprus, and Russia) the Olympic Truce has not been effectively used to prevent or end the conflict because of the overwhelming motivations of religion, ethnicity, and territory present in wars, and the non-binding nature of the Olympic Truce as a UN General Assembly recommendation.

EVALUATING MICROGLIA & ASTROCYTE 'CROSS-TALK' IN SUSTAINED NEUROINFLAMMATION SECONDARY TO COVID-19 & TBI

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The long-term neurological impacts of COVID-19 reflect an emerging field of research, and the need to appreciate their physiology as it relates to biochemical and molecular pathways proves understudied. Independent of one another, traumatic brain injury (TBI) and COVID-19 can lead to increased risk for neurodegenerative diseases, yet this phenomenon and their combined impacts remain largely unknown. This novel research study investigates the combined impacts of COVID-19 infection and TBI on sustained neuroinflammation, a possible mechanism for underlying and prolonged neurological symptoms. In particular, this research evaluates the extent of microglia and astrocyte "cross-talk," given their known individual roles in neuroinflammatory processes, and their communication facilitated by exosomes. It was hypothesized that patients with a history of both COVID-19 and TBI may exhibit sustained neuroinflammation due to the combined interaction of these conditions, which reflects the combined response of microglial and astrocytic activation secondary to the neuroinflammatory responses initiated by injury and viral illness - like those of COVID-19 and TBI - transmitted through the contents of exosomes that induce a neuroinflammatory or CNS immune response. To evaluate this, BV2 microglial cells were treated with human patient astrocyte-derived exosomes to appreciate the "cross-talk" between the microglia and astrocytes that may be facilitated by exosomes. Understanding the interplay between COVID-19 and TBI in sustaining neuroinflammation proves crucial for developing targeted therapeutic interventions. By bridging the gap between symptomatology and pathology, this research lays the foundation for potential therapeutic strategies to alleviate neurological symptoms in patients with histories of COVID-19 and TBI, addressing an emerging and pressing need in post-COVID-19 pandemic global health.

TECHNOLOGY AND HOMELESSNESS: HOW ACCESSIBILITY AND BLOCKCHAIN TECHNOLOGY COULD IMPACT THE UNHOUSED

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Although technology could be used to combat inequality, it is instead increasing it. This paper discusses how the unhoused population suffers at the hand of technological inequality despite being relatively offline. It presents theories on how this would change if we reapproached how technology is used to assist the unhoused. It suggests implementing blockchain as a resource as well as modifying the websites built for the unhoused. Employees at shelters are interviewed for this paper about their experiences with using digital resources to rehouse and restabilize the vulnerable. They are asked how the sites can be improved for more optimized use. The sites are also tested against current UX standards for accessibility. Currently, they are extremely outdated and difficult to navigate. It also suggests that blockchain would assist the unhoused population in their ability to get the government assistance that they are entitled to in the U.S. Blockchain is, put simply, a network of distributed and encrypted pieces of data, which is already frequently used by the government to store sensitive data. It has been suggested in prior research papers about the unhoused population that blockchain could be used to store identification data, such as a copy of a birth certificate, drivers license, or other vital documents, which can be easily lost when one is living transiently. This impacts someone's ability to get food stamps, get a job, remain a legal citizen, and receive healthcare, among other things. Blockchain could assist this population, but there are barriers that might make that difficult to implement, specifically when it comes to potential concerns from participants about personal security.

ASSESSING CHATGPT'S EFFICACY IN INTERPRETING PRIVACY POLICIES

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In the contemporary digital landscape, the intricacy of privacy policies poses a considerable challenge, often leaving users confused and at risk of compromising their privacy. This study explores the capabilities of generative AI, with a particular focus on ChatGPT-4, to aid users in deciphering, summarizing, and interpreting an array of 102 privacy policies. Utilizing the Flesch-Caid readability score as a benchmark, our findings reveal that ChatGPT enhanced the readability of 56 out of the 102 policies evaluated. However, in certain instances, the interpretations by ChatGPT resulted in reduced readability (such as–), highlighting potential limitations of the current state of AI in processing complex legal text. Despite this, the application of ChatGPT's capabilities is seen as a pivotal step towards distilling complex legal verbiage into explanations that are accessible with lesser complex jargon, thereby enabling users to make well-informed decisions.

LA VIRGEN REINVENTED: POLITICAL ACTIVISM, IDENTITY, AND TRANSNATIONAL USES OF AN ICON

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La Virgen de Guadalupe is a complex figure in religion and history. She is considered to be the Mexican iteration of the Virgin Mary, known by many names in both Spanish and English. Her image is one that is well-known, particularly in Catholic Mexican communities as well as Mexican-American and Chicano[a] communities. Since Her initial appearance in 1531, Her image has undergone changes, largely throughout the 1960s to the present day. She has become significant and changed in significant ways for Mexican, Mexican-American, Chicano[a], and Catholic communities within religious contexts and outside of religious contexts too. This sparked a great deal of interest in how exactly the image of La Virgen changed over time and across the Mexico-United States border as well. In order to gain a sharpened understanding of the differences in images, interpretations and uses of La Virgen de Guadalupe in Mexico, it was crucial to go and observe the many presentations of Her image in Mexico, specifically Mexico City. Her original image is present in La Basílica de Nuestra Señora de Guadalupe along with other traditionally Catholic renditions. Museums display Her image of course but She can also be found on t-shirts, jewelry, murals, and other less traditional forms of art. These observations while in Mexico City provided unique insights regarding how people in Mexico interact with her image in a social, cultural, political, and religious way in daily life rather than as some sort of unique phenomenon. The information gained from this exploration of La Virgen de Guadalupe's image in Mexico City, Her place of origin, resulted in an enriched understanding and enhanced perspective of how La Virgen plays a role in Mexican, Mexican-American or Chicano[a] and Catholic communities and how Her role has changed drastically over the past sixty years.

INVESTIGATING THE INVITRO PRO-INFLAMMATORY EFFECTS OF ASTROCYTE-DERIVED EXOSOMES FROM PATIENTS WITH A HISTORY OF COVID-19 AND MILD TRAUMATIC BRAIN INJURY

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Traumatic Brain Injuries (TBIs) and COVID-19 infections are both linked to heightened inflammatory responses within the central nervous system, which leads to cell death, increased release of pro-inflammatory cytokines, deregulation of the blood-brain barrier (BBB), and other harmful effects. The compounded impacts of inflammation phenotypes from COVID-19 and mild TBIs have not been previously researched. Covid and TBI have both been found to lead to similar immune responses that increase inflammation in the brain by inflammatory pathways potentially mediated through exosomes. This study will evaluate if a history of TBI and COVID-19 infection in a patient's isolated exosomes from astrocytes induces higher inflammation responses in cultured-rat-astrocytes, compared to a patient with either TBI history only, COVID-19 infection only, or a healthy control. Significantly increased cellular area and fluorescence from COVID-19 and m TBI group demonstrate heightened inflammation phenotype compared to any other group. Currently, data is still being quantified, however, the qualitative analyses support these claims. Implications of this novel research establish a mechanism for neuroinflammation increase which can be used for pharmaceuticals and therapies targeting inflammation reduction.

THE EFFECTS OF ARTIFICIAL LIGHT AT NIGHT ON NOCTURNAL INSECT IMMUNITY

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Exposure to artificial light at night (ALAN) has negative impacts on endogenous circadian rhythms in animals, which has known negative endocrinological effects on immune functioning. While this is well studied in vertebrates, there is less research on immunological impacts for invertebrates. To address this research gap, we assessed the impact of ALAN over the course of a biologically relevant timescale in the Pacific field cricket, Teleogryllus oceanicus, a model invertebrate species. We reared crickets under a 12 hr daylight (2600 lx) 12 hr dark (0 lx) or relevant ALAN (50 lx & 100 lx) cycle for their entire adult life (28 +/- 3 days) then took hemolymph samples and performed an encapsulation assay, which are two established measures of insect immune function. We found that crickets reared under the 50 lx treatment had an upregulated encapsulation response compared to the control and 100 lx crickets and that male crickets reared under the 100 lx ALAN had the highest mortality rate. Our data suggests that contrary to previous studies, the emergent process of mounting an encapsulation response may be more susceptible to the effects of ALAN than circulating immune cell number. Additionally, it appears that there are sex based differences in mortality effects of intense levels of ALAN which could have significant impact on population demographics.

JAYCE RUMSEY'S SENIOR CAPSTONE: THE DOOR BY PAUL ELLIOTT

Jayce Rumsey[1]
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Jayce Rumsey, a third-year senior, participated in the University of Denver's theatre department's senior capstone cycle this year, where he directed the play, "The Door." The play is a compelling story that revolves around a grandmother in her late 50s who isolates herself after her grandson's brutal murder due to suspected homosexuality. Her teenage grandson, Justin, attempts to help her re-engage with the world. Through their interactions, the play emphasizes the importance of family support during difficult times and sheds light on the issue of violence against LGBTQ+ individuals. It aims to raise awareness and advocate for societal change to create a more inclusive and accepting community. Why this show? Jayce is a member of the LGBTQ+ community and he believes it is important to bring queer voices to the theatre on and off stage. Another reason he picked this show for his capstone is because at the end of the show there is a slideshow of hate crime victims. It brings attention to the fact that hate crimes against the LGBTQ+ community are still a present-day issue. This grant allowed him to put on a wonderful production of "The Door."

ANALYSIS OF THE EFFECTS OF ALCOHOL ABLATION ON THE MECHANICAL PROPERTIES OF HEART TISSUE

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Heart diseases are the leading cause of death and many techniques have been developed to treat them. One such disease affecting the heart's mitral valve, severe mitral regurgitation, affects over five million adults in the US and can be fatal. To combat diseases like this, transcatheter mitral valve replacement (TMVR) emerged as a less invasive alternative to surgical mitral valve repair or replacement. However, TMVR can cause life-threatening complications such as the obstruction of blood flow in the aorta, the main artery in the human body that is responsible for carrying oxygen-rich blood from the heart to the rest of the body. To reduce risk and prevent this obstruction from occurring, alcohol septal ablation (ASA) is often performed on TMVR patients, though the effects of ASA on the performance of the heart have not been studied. Therefore, the goal of this project was to analyze the effects of ASA on the mechanical properties of the septal region of the heart. To achieve this, square samples of tissue from the septal region of swine hearts were stretched to 20% displacement on a biaxial stretcher before and after experiencing either a three- or five-minute period of ASA. Data indicated that the mean force required to achieve this displacement in the tissue increased significantly after ASA, with the percent differences in the mean forces required in pre- and post-ASA being 62.45% and 87.12% in the main fiber direction and 49.47% and 75.42% in the cross-fiber direction for three-minute ASA and five-minute ASA, respectively. This suggests that tissue stiffens following ASA, with the amount of stiffness increasing with increasing periods of ASA. The degree of stiffness found indicates that regions of the heart affected by ASA will not contract normally, which can lead to patients experiencing a reduced cardiac output following the ASA procedure.

THE EFFECT OF FIRE SEVERITY ON BEE NESTING HABITATS

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Increased fire severity in western United States forests due to climate change and accumulation of fuels can have lasting impacts on vegetation structure that especially impact pollinators. Fire severity has been found to strongly influence bee abundance, with increasing fire severity often correlated with increasing bee abundance. One mechanism for this relationship is altered nesting habitat due to the effects of fire on forest vegetation. The availability of nesting resources varies with burn severity as well as time post-burn. Previous research has mainly been conducted within 5 years post-burn, but here we examine sites more than 20 years post-burn to test if burn severity affects bee nesting resources longer term. We quantified the habitat available to ground-nesting bees at 18 sites located in 2 different burn areas (Buffalo Creek and High Meadow). Within each of these 2 fires, we studied 3 burn severities (low burn, high burn, and unburned) with 3 replicate sites for a total of 18 sites. We recorded groundcover using Fire Effects Monitoring and Inventory System groundcover codes. We also recorded the diameter at breast height of snags (standing dead trees) in every site and percent canopy cover surrounding focal trees. We found fire severity significantly affected percent canopy cover and the frequency of groundcover types. Fire severity did not significantly affect mean snag basal area (a measurement of forest density), but higher severity fire sites did have a higher snag basal area. Our research aids in understanding the long-term effects of fire on native bees and ecosystem function.

INVESTIGATING THE ROLE OF EBF3A IN CRANIOFACIAL DEVELOPMENT

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Proper craniofacial development requires many genes. Single-cell RNA sequencing (scRNA-seq) allows us to identify genes expressed in precursor cells for craniofacial structures, but the function of many of these genes in craniofacial development has yet to be characterized. In our scRNA-seq of cranial neural crest cells (NCCs), which are precursor cells for the craniofacial skeleton, we found a gene called early B-cell factor 3 (*ebf3a*) that may be involved in craniofacial development. In our scRNA-seq data, *ebf3a* expression is restricted to cranial NCCs of the dorsal and ventral domains of pharyngeal arches 1 and 2. In humans, damaging variants in EBF3 are associated with facial dysmorphism. Based on these observations, we hypothesize that *ebf3a* is an important gene in craniofacial development. In this study, we begin to test this hypothesis by characterizing the expression pattern of *ebf3a* in cranial NCCs in zebrafish. Through fluorescence in situ hybridization, we confirmed that *ebf3a* is expressed in the cranial NCCs of the dorsal and ventral patterning domains of pharyngeal arches 1 and 2. This result will be a starting point for future experiments that will investigate the function of *ebf3a* in craniofacial development.

DEVELOPMENT OF NON-ENZYMATIC GLUCOSE SENSORS USING COPPER ELECTRODES & NANOPARTICLES

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Glucose sensing plays a vital role in various fields, including medical diagnostics, biotechnology, and diabetes management. Traditionally glucose sensing is done using enzymatic sensors, which are susceptible to a variety of changes that can manipulate the effectiveness or reliability of the sensors. Therefore, the increase of demand for developing non-enzymatic sensors that meet or exceed its counterpart. Copper has shown itself to be a suitable and promising material to develop these non-enzymatic sensors. Copper contains this catalytic property when it come into contact with glucose creating a oxidation reduction reaction. Adding in copper nanoparticles can further help improve the sensitivity of the sensors by promoting more of the electrochemical reaction. The overall objective of this study is to explore and hopefully develop a suitable way of creating these non-enzymatic sensors using Copper nanoparticles and substrate. Investigating the electrochemical performance and comparing the results with other forms of glucose detection. In addition, this study aims to use Copper availability, and "multiple manufacturing techniques" to create a cost-effective sensor that can enhance its feasibility of large-scale production. The study is currently in its first round of iterations for these sensors, testing different variations and individual components to determine the optimal setup that yields the best results in terms of detection limits, sensitivity, and sensor durability.

PATTERNS IN MOTIVATING FACTORS IN PRENUP NEGOTIATIONS: A QUALITATIVE CASE STUDY

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Prenuptial agreements (prenups) are similar to traditional long-term financial contracts between two entities. However, there are some key differences between prenups and other kinds of contracts, particularly in the social and relational factors that can influence people's decision-making in the negotiation process. So, in this project, I interviewed seven lawyers in the Denver area with significant experience negotiating prenuptial agreements about how social factors influence the prenup negotiation process. Through thematic analysis of transcripts of these semi-structured interviews, several themes emerged from the data ranging from "power imbalances" and "familial pressure" to "lawyer intervention" and "the law itself." This study found that factors like familial pressure and significant wealth gaps can alter negotiation dynamics and occasionally create power imbalances, but the representation lawyers provide helps counteract those imbalances. This project and further research examining these themes can help inform policy and jurisprudence surrounding the formation/enforcement of prenuptial agreements.

NITRIC OXIDE SYNTHASE PATHWAYS AFTER MTBIS

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The inflammatory response in concussions is not completely understood. Secondary concussions can occur as part of the inflammatory response which needs to be further researched. Different molecular pathways can be affected after a concussion. The purpose of this study is to be able to identify concussion associated blood biomarkers, specifically the role of endothelial nitric oxide synthase (eNOS) in concussions, as well as be able to identify the main polyamines involved with the inflammatory response in concussions. We hypothesized that eNOS will increase at 3 days post-concussion then decrease over time. The first step of this project was the collection of blood samples from athletes. There were three samples taken from each athlete: a baseline blood draw, 72 hours after the concussion, 1 week, 1 month and finally 6 months post-concussion. The data processing used plasma from the athlete's blood. Samples were processed using a previously reported protocol 6. In brief, the sample is filtered, and large molecules (proteins) eliminated. Next, these samples were prepared using a Nitric Oxide Synthase Eliza Kit and then put on a plate reader. The results showed that eNOS did increase at the 72-hour mark. At the 1 week and 1 month mark, the eNOS levels had slightly decreased but stayed elevated relative to baseline. At 6 months there was a decrease in eNOS below baseline levels. The impact of this project will help explain how cerebral blood flow is a part of secondary concussions and the role of eNOS in blood flow and concussions.

THE ROLE OF AUTONOMIC AROUSAL IN ANXIETY'S EFFECT ON COGNITIVE CONTROL

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Anxiety can impact a host of cognitive functions from learning to attention (Roy, 2013; Bar-Haim et al., 2007). Cognitive control is an important collection of cognitive functions central to goal pursuit, and can vary with psychopathology (Mueller, 2001; Hallion et al., 2017). The impact of anxiety on cognitive function may be particularly pronounced under threatening contexts (Chand & Marwaha, 2023). However, cognitive control performance in threatening contexts, and how it might vary with anxiety, has been sparsely studied. To examine this relationship, performance on the AX Continuous Performance Task (a well-known cognitive control measure) was examined under threat of performance-contingent punishment relative to a no-threat condition, and related to trait anxiety, measured with the State-Trait Anxiety Inventory (Spielberger et al., 1983). We hypothesized that high-anxiety individuals would engage in lower and/or more reactive cognitive control relative to low-anxiety individuals, especially under the possibility of punishment.

MULTIVOCALITY OF THE CALIFORNIA GOLD RUSH: THE INTER-OCEANIC ROUTE VIA NICARAGUA

Christine Stadnik-Poteroba[1]
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The California Gold Rush played a central role in shaping American history. However, descriptions of this event often overlook its reach within international territory. Exposing this interconnectedness addresses the lack of diversity in historical archives. Through cartography and first hand accounts, this project unpacks the various narratives and discourses of the journey from the U.S. Eastern Seaboard to the West Coast via the Nicaragua interoceanic route during the mid 19th century. By illustrating how this pivotal time drew thousands of Americans in their quest to explore California's gold fields, this project shows how and why many opted to embark on the passage via Nicaragua. While representations of historical events cannot always capture every experience, highlighting the various voices often absent in past accounts provides a fuller and more nuanced picture of this journey.

SAINT BRIGIT AND HER HABITS: EXPLORING QUEERNESS IN EARLY MEDIEVAL IRELAND

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Saint Brigit's behavior in Cogitosus's *Life of Saint Brigit* and her reception by society highlight an avenue by which women in the early medieval period could escape societal strictures, exercising agency over their bodies and their romantic choices, and carve out a distinct and unexpected place for themselves in a Christian patriarchal society. Saint Brigit's position, actions, and depiction by Cogitosus can be interpreted through the lens of queer theory in order to ask key questions regarding attitudes towards queerness in early medieval Ireland. To render the queerness of female sanctity acceptable in a patriarchal system, there were significant elements of compensation for the deviance from these societal norms in the depictions of female saints, such as hyperfemininity contrasting with contemporary masculine traits. This balance of deviance and compensation is most clear in hagiographies, texts where the saints and their actions were recorded and mediated for the explicit purpose of demonstrating sanctity. As Cogitosus's *Life of Saint Brigit* depicted a woman who not only stepped out of one social structure, that being secular, but also monastic ones, his portrayal of Saint Brigit demonstrates that within female sainthood, queerness was not only accepted, but a prerequisite and inherent feature worthy of veneration. By examining how scholars have used a lens of queerness and mediation to analyze key hagiographies first of saints more broadly, and then of female saints, and using these approaches to examine the inherently queer actions, positions, and roles found in Saint Brigit's *First Life*, we can gain a clearer view of societal views towards queerness during the early medieval period, and in early medieval Ireland in particular. In doing so, this thesis will help chip away at the monolithic view of the period, as well as the queer erasure within, demonstrating that queerness has always been a fundamental part of human society.

THE SECULARIZATION OF RELIGIOUS STUDIES

Evelyn Stovin[1]
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My research focuses on the secularization of religion within Religious Studies and other academic fields. Throughout my time as a Religious Studies student I have observed religion being compared to secular activities such as football both in classroom discussion and in scholarly research. This leaves students with the impression that religion is not a tool which shapes society, but rather that religion is an obsolete human habit which a progressive society no longer needs. Research, such as that of Jonathan Haidt, which claims secular activities are a form of religion, positions religion's functionality as more important than its spirituality. By treating religion as purely functional and excluding the spiritual as primitive we are saying that spirituality is archaic and not conducive to modern societies. Upholding secular logic as the key to understanding religion is a modern continuation of the linear evolution of religion in accordance with the, "natural evolution," of society as outlined by George Galloway and J.Z. Smith. I approach the topic of religion as an anthropological category, and secularization as a cultural mindset rooted in the colonial ideal of logical reasoning. My research will be based on the analysis of how the definition of religion within the field of Religious Studies has changed over the years as described by J.Z. Smith. Throughout my essay I will relate my findings to the process of Settler Memory, which is defined by Kevin Bruyneel, as the way in which settler societies reproduce settler and indigenous history in order to maintain settler colonialism as the social norm. The purpose of my research is to shed light on a pervasive issue within the field of Religious Studies and persuade scholars to rethink how religions are studied in order to abolish the modern-primitive dichotomy which erases Indigenous religions from our field of study.

THE ACCUMULATION OF ANTHROPOGENIC DEBRIS ON BEACHES IN NICARAGUA

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Anthropogenic debris poses a significant threat to coastal ecosystems globally, yet comprehensive studies on accumulation patterns and impacts are lacking, particularly in continental coastal areas. This research investigates the accumulation of anthropogenic debris on beaches along Nicaragua's Pacific coast, shedding light on distribution patterns, types of debris, and potential impacts on wildlife. Data collected from five beaches near Gigante, Nicaragua, reveal high concentrations of debris, predominantly consisting of plastics and, styrofoam. Analysis of color distribution shows a prevalence of white, blue, and clear items, with implications for wildlife ingestion, particularly among sea turtles. Microplastic analysis further underscores the pervasive nature of pollution in this region. The study discusses historical trends, community engagement initiatives, and challenges in cleanup efforts, highlighting the complex socio-environmental dynamics influencing waste management practices. Findings emphasize the need for holistic approaches integrating education, community engagement, and improved infrastructure to address marine pollution effectively. This research contributes essential insights for targeted conservation strategies and underscores the urgency of addressing anthropogenic debris accumulation in coastal regions worldwide.

HAWAI'I UNCOVERED

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While the Hawaiian Islands are undeniably beautiful, the state is not the paradise it is often stereotypically perceived to be. Through photography, Hawai'i Uncovered aims to explore the conflicting aspects of identity in Hawai'i, reveal the true characteristics of the state, and separate its perception by tourists from the reality that locals know all too well. Photos were taken at popular tourist and lesser known "locals-only" destinations on multiple of the Hawaiian Islands. The photos focused mostly on the way that people interact and exist within these places and amongst each other through a candid and observational lens. Hawai'i's identity is deeply rooted in its diverse array of cultures and backgrounds. And yet, most tourists never get the opportunity to see Hawai'i for more than just a tropical playground. The idea of community and belonging are both the saving grace and downfall of these islands, allowing many to be proud and excited about who they are while also leaving some cast out and forgotten. Both the romanticized and ignored aspects of these islands are what make the state unlike anywhere else in the world and are essential in defining Hawai'i in an honest fashion.

EXPLORING SUBSTRATES FOR RING CLOSING METATHESIS BASED ETHYLENE DETECTION

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Recently, ruthenium-mediated olefin metathesis has been employed for the detection of the small alkene, ethylene. An approach currently being developed in our lab utilizes ring closing metathesis of profluorescent substrates to study the amplification of signal transduction in sensing ethylene. Upon relay ring closing metathesis of these substrates, an increase in fluorescence is observed. Our group is interested in synthesizing and evaluating new substrates to improve signal output in the detection of ethylene and other analytes. By altering the structure and functional groups tethered to the substrates, the amount by which the signal is generated upon ring closing metathesis can be increased. To improve the photophysical properties and increase signal output, we have synthesized and evaluated a number of new substrates. Synthetic efforts, substrate-product properties, and application in sensing assays will be presented.

COMPARISON OF THE FUNCTIONAL COMPOSITION OF THE OVERSTORY AND UNDERSTORY IN DISTURBED RIPARIAN FOREST COMMUNITIES

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Plant functional traits (e.g., seed weight) have been shown to provide a mechanistic understanding of how communities respond to disturbance. Historically, riparian ecosystems have experienced flooding as their dominant disturbance regime, however, human occupation of the floodplain has introduced new types of disturbances. This has resulted in altered trait composition, however, no research has compared the functional trait composition of the overstory and understory against different disturbance types (natural and anthropogenic). Therefore, it is unclear if these vegetation layers are responding similarly or differently to a variety of disturbances within riparian ecosystems. Functional trait theory suggests that certain traits are associated with environmental conditions, like those created by disturbance, regardless of species region or growth form. My research project aims to test this hypothesis by comparing the functional composition of the overstory and understory vegetation in disturbed riparian ecosystems. At the Ebro River Basin in Spain and along the Garonne River in France, restoration and management efforts have resulted in a variety of natural and anthropogenic disturbances, including sites with cleared overstory, overbank flooding, cleared understory, and undisturbed sites. Seven reproductive functional traits (chosen because reproductive strategies influence a species' ability to respond to disturbance) were collected for 250 species sampled from 99 sites along the Ebro River Basin and Garonne River. Trait composition was quantified by calculating community-weighted means (CWMs) for overstory and understory species at each site. Preliminary data analysis has revealed that across all sites, the understory has significantly heavier seeds on average when compared to the overstory. Additionally, the difference in CWM seed weight between overstory and understory vegetation varies depending on disturbance type. This indicates that the overstory and understory of riparian communities respond differently to disturbance, and the difference is influenced by the type of disturbance at each site.

LONG-TERM IMPACTS OF FIRE SEVERITY ON THE DIVERSITY OF CAVITY-NESTING BEES AND WASPS

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Bees are essential pollinators and vital to ecosystem function, and thus it is important to understand how fire impacts bee communities and diversity. Human activities are changing fire regimes, which impact the resources upon which bees depend, such as nesting material and floral resources. Fire's impacts on bee communities vary depending on the time since the fire and fire severity. However, the majority of previous research has examined the impact of relatively recent fires on bee diversity (<5 years post-burn). We addressed this gap in research by examining the impacts of fire on bee diversity over 20 years post-burn. We selected 18 sites, which varied in burn severity (high burn, low burn, and no burn). We used trap nests to test if fire severity affected cavity nesting bees' abundance and diversity. We made trap nests using bamboo reeds of varying sizes and installed them at two different heights at each of the 18 sites. Cavity nesting bees and wasps used caps to plug the reeds in the trap nests, which we used to identify the occupants. We assessed the effects of burn severity on cavity-nesting bee and wasp diversity by comparing the richness and abundance. Our initial findings did not show any statistically significant results, but we will overwinter the nests in the lab and identify the species as they emerge, which may impact our results. Our study will help us to improve our understanding of the long-term impacts of fire severity on pollinator diversity.

TOWARDS NOVEL GENERATION OF CLASSICALLY ENTANGLED VECTOR BEAMS

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In physics, entanglement was first described as a purely quantum phenomenon in which two systems are non-separable, where measuring one system affects the outcome of the measurement of the other. However, it is possible to produce such a result in a purely classical environment (i.e. with locality of the systems), which is classical entanglement. One way this can be done is by considering entanglement of internal degrees of freedom of vector vortex beams in coherent light rather than quantum objects such as two entangled photons. This method allows for classical entanglement between the orbital and spin angular momenta of a vector vortex beam. We present progress towards a new method to produce these inequality-violating beams experimentally using two overlapped beams with spatial and polarization modes from a single laser. This method is inherently phase-stable because it uses common-path optics, which removes the need for active stabilization, which is expensive and complicated. This will also allow for further analogues to quantum measurements to be applied to classically entangled light and will provide easier access to making these measurements. Thus, this novel method of generation will provide a simpler method for studying quantum phenomena mimicked in a classical setting.

SYSTEMATIC REVIEW OF PARENTING AND FAMILY MEASURES USED TO STUDY OF FAMILY FACTORS AND ADOLESCENT ANXIETY

Hunter Whitehouse[1]
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This poster provides a systematic review of extant youth self- and caregiver-reports used in the examination of family factors linked to youth anxiety. Following PRISMA guidelines, data was extracted to examine measure features and content, as well as strength of associations with youth anxiety symptoms and diagnoses. The review results in a decision tree that aids researchers and clinicians in making informed decisions about which parenting and/or family questionnaires might suit their needs when studying or conducting clinical work in the context of adolescent anxiety.

WRITERS IN THE SCHOOLS

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Writers In The Schools is a project meant to provide students an opportunity to express themselves through creative writing, with the ultimate goal of producing an anthology of their work to celebrate their artistic achievements. In order to achieve this goal, guest teachers create a series of lesson plans meant to encourage students' writing, then teach students at Ricks Center, collecting the writing they're most proud of for the anthology at the end of the project. Thus far, this project has already spurred the creation of a poetry anthology, and an anthology of students' poetry, short stories, and plays is forthcoming. It is often a great sense of pride for students to see their writing published.

EVALUATING THE EFFICIENCY OF LOW-COST AIR QUALITY SENSORS TO SIZE PARTICULATE MATTER AT A SUBURBAN FIELD SITE

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Science surrounding the use of low-cost sensors (LCS) to monitor air quality is rapidly expanding to satisfy the desire to fill in regional air quality data gaps. This project evaluates the suitability of two types of LCS: Modulair-PM and PurpleAir (SD and flex models) as efficient means to measure airborne particulate matter. The study involved physical installation of sensors at a suburban site in Denver, connectivity troubleshooting as necessary, and data analysis/modeling of data over multiple months. PM data was compared between individual sensors of the same type as well as across the two different sensor models and used to draw conclusions about air quality trends at the field site. Comparisons between sensors were generally in good agreement, but an additive bias was observed for several sensors, highlighting the importance of calibration of these types of units. The project concluded with aiding in a recent installation of PurpleAir units at a field site at the Kennedy Mountain Campus. Results from the project create a base level of understanding of LCS functionality to be expanded upon in future project applications.

EDITOR'S NOTES

These abstracts have not been peer-reviewed.