

13th Annual

UNDERGRADUATE RESEARCH CONFERENCE

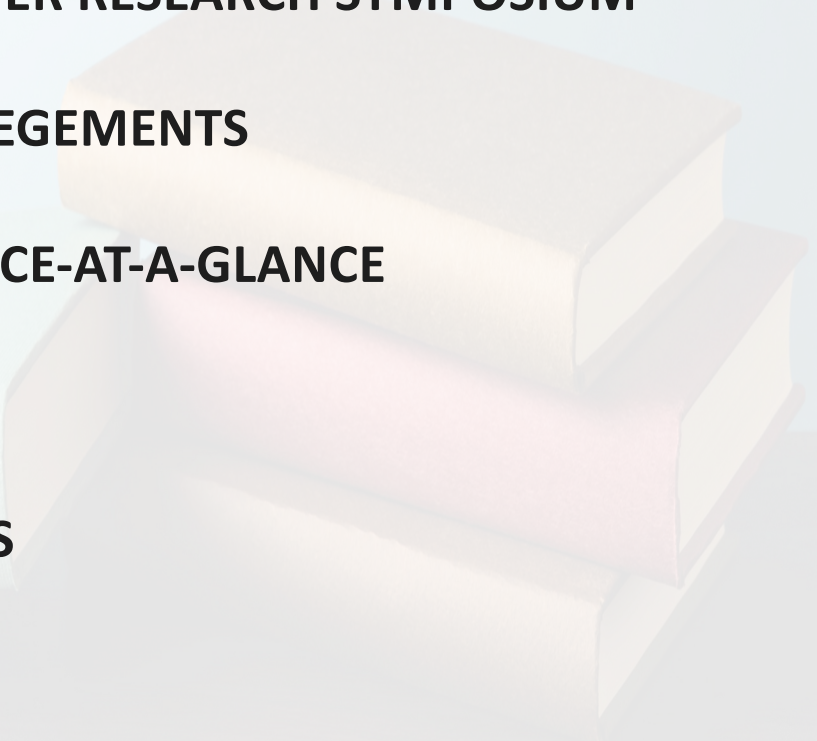
A Symposium of Scholarly Works
& Creative Projects



April 26th, 2024

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WELCOME

Welcome to the 13th Annual Undergraduate Research Conference! This Symposium of Scholarly Works & Creative Projects celebrates the hard work and dedication by our students and mentors over the past year. The Council on Undergraduate Research defines undergraduate research as “a mentored investigation or creative inquiry conducted by and undergraduate student that seeks to make a scholarly or artistic contribution to knowledge”. This is no small undertaking by the student or the mentor. This effort takes many additional hours outside of the classroom, it allows students to synthesize information while developing their critical thinking and analytical skills along with discipline specific skills. Being involved in undergraduate research builds resilience, fosters creativity, and develops self-efficacy. This research conference is a culmination and celebration of undergraduate research and the students and mentors involved.

To me, the most exciting thing about research is discovering or creating something new – being the first person to stumble upon an interesting data point or being the first person to assemble music notes in a particular way. That is what today is all about – new scholarly and artistic contributions to knowledge made by our amazing students. As I read through the abstracts of this year’s presentations, I am incredibly impressed by the body of knowledge produced by our students from a diversity of disciplines across campus.

I would also like to acknowledge and thank the mentors. Seventy faculty mentored 140 students in almost 100 projects presented today. These mentors work tirelessly to provide research opportunities for students. Without them, this conference would not be possible.

Finally, I’d like to thank the volunteers. They have taken time out of the schedules to make today possible. Welcome! Thank you for helping celebrate our undergraduate students!

Kristy L. Duran, PhD
Faculty Director for Undergraduate Research
Professor of Biology
MSU Denver



KEYNOTE

Gregg Deal

“Art is Medicine: Contemporary Art through Indigenous Eyes”

Gregg Deal (Pyramid Lake Paiute Tribe) is a nationally and internationally recognized multi-disciplinary artist, activist, and "disruptor." His work is informed by his Native identity and includes exhaustive critiques of American society, politics, popular culture and history. Through paintings, murals, performance work, filmmaking, spoken word, and more, Deal invites the viewer to confront these issues both in the present and the past tense.

Deal has lectured in multiple institutions, with two TEDx talks, often challenging stereotypes, pushing for accurate representation, and honest looks at history of the United States as it relates to this country's First Peoples. It is in these "disruptions" of stereotypes and ahistorical representations which Deal uses the term to describe his work. Deal has exhibited his work at notable institutions both locally, nationally, and internationally including the Denver Art Museum, RedLine Gallery, and The Smithsonian Institution. Deal currently lives with his wife and five children along the Front Range of Colorado.



OUTSTANDING MENTOR FOR UNDERGRADUATE RESEARCH

Dr. Uwe Richard Kackstaetter

Uwe Richard Kackstaetter (Dr. K) provided exemplary direction in isolating, understanding, creating and constructing my Undergraduate thesis. His methods in both the start of the investigation, to the methods and equipment used to analyze my samples are extremely important not only for the Undergraduate level, but can easily be applied to the Masters and possibly Doctoral levels. Dr. K's background and education shows that he is vastly passionate about his subject and has the knowledge and professional expertise. A true Diamond for the MSU EAS Department. The use of XRF technology has varied applications, anywhere from currently being used by the Mars surface probes to identify elemental compositions, to being used to identify elements in ancient artifacts and in criminal investigations.



Dr. K has an academic evaluation system that is firm, but fair. He teaches the value of deadlines and how to deliver a final product. Undergraduate students may want to complain, but he demands far less than my direct Principal Engineer is asking of me right now. His methods of locating research material and how to construct proper thesis positions, and the sources of research material that should be evaluated. His undergraduate class is a good starting point on what to expect if a student decides to proceed to the graduate level.

During my Spring 2023 semester, Dr K was mentoring approximately a class of 16 students. Some dropped out, or had to stop, but we still had around 10 left at the end of the semester. Dr K was always available to speak, and had an easy, open schedule to contact him. We had a variation of research topics, and the majority of the course was based on the student's responsibility to provide the required material by the deadline. All students were required to present at the end of the semester.

For summation: I would very strongly recommend Dr K as a Undergraduate advisor for any student who is serious not only about approaching graduate school, but any form of professional EAS career field. His undergraduate research class has assisted me in moving into a Geologist/Project Manager role for a very well-established Geotechnical firm.

*Byron Clayton
Staff Geologist / Project Manager
Ninyo and Moore, Phoenix AZ*

To nominate an Outstanding Mentor for Undergraduate Research, please submit a nomination letter to undergradresearch@msudenver.edu

UNDERGRADUATE RESEARCH GRANT RECIPIENTS

Meet this year's Undergraduate Research Mini-Grant Recipients! Students have to opportunities to apply for a mini-grant, in October or February. Congratulations go out to the Grant Recipients and their mentors!

Kevin Balbuena Trujillo, BFA Art Education

Mentor: Leslie D. Boyd

Project Title: *En Otras Palabras* (In Other Words)

Benjamin Bird, English

Mentor: Elizabeth Kleinfeld

Project Title: Research into Writing Center Accessibility Communication

Crystal Bridgers, Psychology

Mentor: Pamela Ansborg

Project Title: Navigating Parenting Advice in the Age of AI

Haley Cooling, Biochemistry

Mentor: Andrew Bonham

Project Title: Mycoplasma Detection via Lipoprotein Specific Electrochemical Biosensor

Gabrielle Federico, Communication Design

Mentor: Kelly Monico

Project Title: Dreamscape

Adam Gordon, Biology and Biochemistry

Mentor: Vida Melvin

Project Title: Identification and Characterization of *ndnf* mutations generated by CRISPR-Cas9

Sophia Gordon, Anthropology

Mentor: Richard Sandoval

Project Title: Photo Documentation for Ch'orti' Project Research and Website Development

Maria Green, Biology

Mentor: Maria Cattell

Project Title: Optimization of degenerate PCR to identify a coral gene sequence

Andrew Green, Applied Geology

Mentor: Barbara EchoHawk

Project Title: Investigation into tubular rock formations found on the Weber sandstone formation in Dinosaur National Monument

Lillie Geiersbach, Biology

Mentor: Shailesh Ambre

Project Title: Synthesis of a CPP bioconjugate with the ability to improve bioavailability of water-insoluble medications

Hannah Hamid, Communication Design

Mentor: Kelly Monico

Project Title: Clarity Sans

Lucien Herzog, Linguistics

Mentor: Richard Sandoval

Project Title: Evaluation of the Ch'orti' Project Website: Community Feedback

Gage Leach, Biochemistry

Mentor: Shailesh Ambre

Project Title: Reactivity of "EDC" Thioesters with Nucleotides

Jalen Lomax, Art

Mentor: Matthew Jenkins

Project Title: So You Wanna Make Music?

Haley Nicole Longcrier, Communication Studies & English

Mentor: Christina Foust

Project Title: Rocky Flats: At What Cost?

GRANT RECIPIENTS (Continued)

Adam Nicks and Whit Oyler, Biochemistry

Mentor: April Hill

Project Title: A preliminary investigation into the physiological and psychological effects of cupping massage

Brooke Paslay, Biology

Mentor: Maria Cattell

Project Title: Sequencing the GFP Gene in *Acropora millepora*

Alicia Phinnella, Psychology

Mentor: Chad Mortensen

Project Title: Students' Evaluation of Teachers

Grace Servia, Theoretical Math

Mentor: Shailesh Ambre

Project Title: Utilizing Simple Technology to Create and Instrument for Accessibility-Friendly pH Measurements

Julia Sickrey and Madison Barber, Psychology

Mentor: Jovan Hernandez

Project Title: The Role of Personality, Mental Health, Perceived Discrimination, Activism, and Resiliency in LGBTQIA+ Individuals

Anna Juliano, Communication Design

Mentor: Kelly Monico

Project Title: Maps as Utopia

Brianna Winkler, Music & Biology

Mentor: Maria Cattell

Project Title: Isolation, Sequencing, and Modification of the *Acropora millepora* Coral GFP Gene

Zuniga Tierra, Psychology

Mentor: Cynthia Erickson, Arijana Barun, and Shalini Srinivasan

Project Title: Assessing Effective Teaching in Biology & Statistics through Student Interviews

Christopher Wicker, Biology

Mentor: Jennifer Gagliardi-Seely

Project Title: Effect of Sex Ratio on Pair-Bond Behavior in Convict Cichlids

Luis Delgado-Garcia, Biochemistry

Mentor: Shailesh Ambre

Project Title: Optimizing the procedure for Synthesis of SHAPE Probe 2-methylnicotinic acid imidazolide (NAI)

Darian Chavez-Matsunaga, Biology

Mentor: Jennifer Gagliardi-Seely

Project Title: Sex Ratio Effects on Pair Bond Formation in Convict Cichlids

Katarzina Tetamore, Chemistry

Mentor: Shailesh Ambre

Project Title: Synthesis of SHAPE reagent belonging to the novel class of thioesters

Want to earn
money while
working on
your research?

Apply for the Research Scholars Program

Deadline: June 1st

Accepting 20 students representing a diversity of majors
and backgrounds

Program Requirements

- Commit a minimum of 4 research hours a week but not to exceed 15 hours a week (\$18.50/hour) or 225 hours a semester
- Submit a report on their progress each semester
- Attend at least 2 (per semester) of the 1-hour workshops presented by the Undergraduate Research & Creative Scholarship Program
- Present at MSU Denver's Undergraduate Research Conference in April 2025
- Must have a faculty or staff mentor to apply



MSU Denver Research Symposium

Learn about the research of faculty at MSU Denver in a lightning talk format (7 min presentations)



October 18th, 2024

Contact Megan Hughes or Kristy Duran for more information

mhughe47@msudenver

kduran16@msudenver

We would like to extend our thanks and appreciation to the following offices and individuals for their contributions to the success of the Undergraduate Research & Creative Scholarship Program and annual conference:

Undergraduate Research Grant Reviewers

Pamela Ansborg
Rebecca Canges
Maria Cattell
Megan Filbin
Megan Hughes
Andrew Holt
Deborah Horan
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Kim Klimek
Hsiu-Ping Liu
Vida Melvin
Bridget Murphy-Kelsey
Jeffry Parker
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Provost & Executive
Vice President
Academic Affairs



Elizabeth Parmelee,
Ph.D.
*Associate Vice President
for Undergraduate
Studies*



Marie Mora, Ph.D.
Deputy Provost

Thank you to our Keynote Speaker Gregg Deal, our Session Moderators, and all Volunteers!

A special thank you to all undergraduate research mentors who devote their time and expertise to provide research opportunities and excellent mentorship to students. This program and conference would not be possible without their dedication.

Conference Program / Scheduling: Kristy L Duran, Ph.D.
Moderator Coordinator: Sarah Schliemann, Ph.D.
Budget Coordinator: Shayla Bischoff

CONFERENCE-AT-A-GLANCE

8:30-3:30 pm: Conference presenters and all guests sign-in
Jordan Student Success Building (JSSB)

9:00 – 10:30 am: **CONFERENCE SESSION I**
Oral Presentations – JSSSB
Room 200 Room 203
Room 202 Room 204

10:45 am - 12:00 pm: **CONFERENCE SESSION II**
Oral Presentations – JSSB
Room 200 Room 203
Room 202 Room 204

Poster Presentations (10:30-12:00) – JSSB
Mezzanine / 1st Floor

12:15 pm: Lunch in Tivoli Turnehall

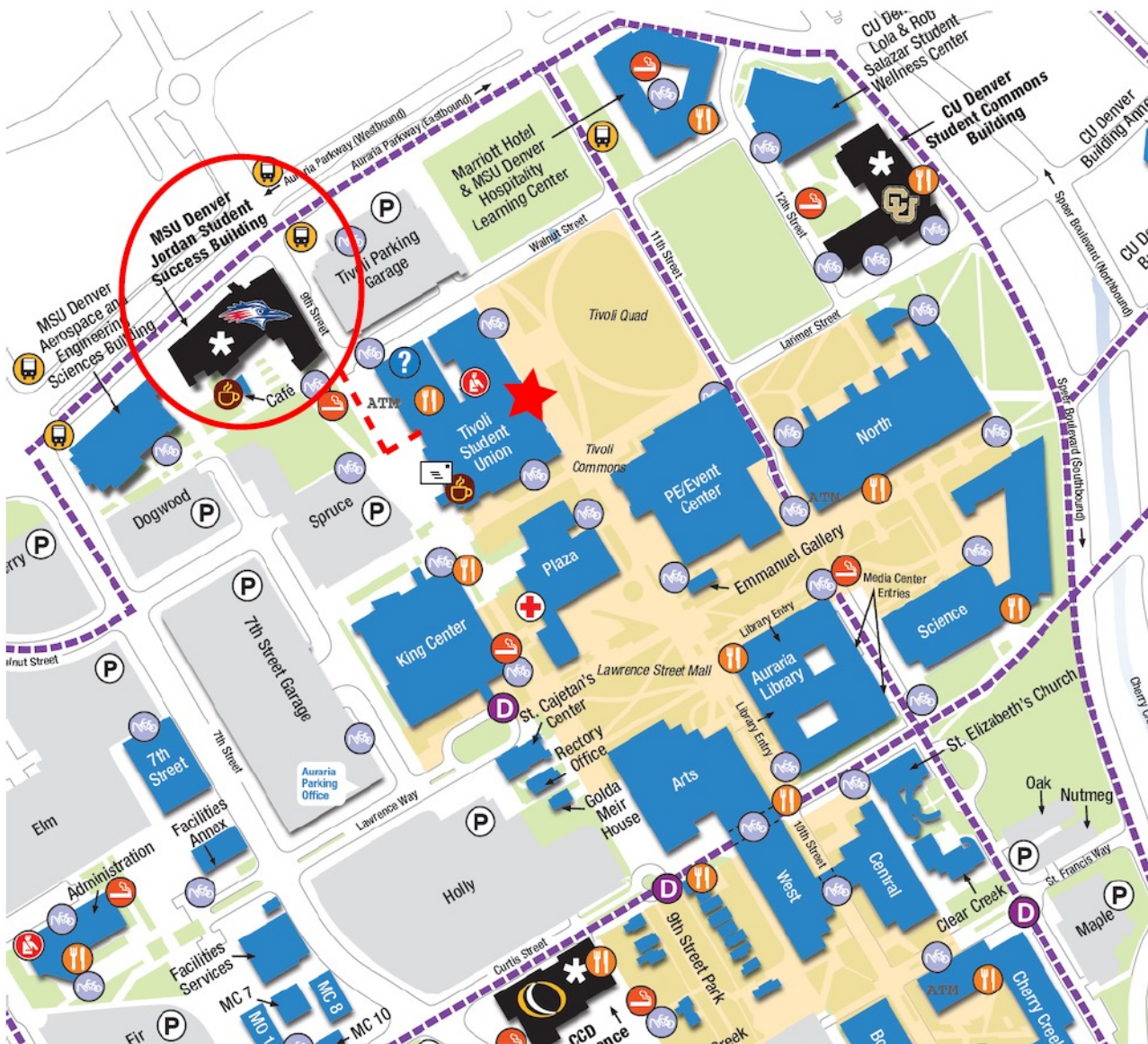
12:45 pm: Keynote: Gregg Deal

2:00 – 3:20 pm: **CONFERENCE SESSION III**
Oral Presentations – JSSB
Room 200 Room 203
Room 202 Room 204

Poster Presentations (2:00-3:20) – JSSB
Mezzanine / 1st Floor

3:30 – 4:45 pm: **CONFERENCE SESSION IV**
Poster Presentations (3:30-4:45) – JSSB
Mezzanine / 1st Floor

MAP



Jordan Student Success Building (JSSB): Presentations

Tivoli Student Union: Lunch

Parking is available at any lots including the 7th "Street Garage

Oral Presentations will be held in upstairs classrooms 200, 202 ,203, and 204, and Poster Presentations will be held on the 1st floor and Mezzanine. Enter the building using the doors under the Student Success sign and the staircase to the left will lead to the Mezzanine, walking further past that to the right will be the classrooms.



ABSTRACTS

ABSTRACTS

(listed alphabetically by submitting presenter's last name)

Health Benefits Caused by Garden Design Choices at the House of the Vettii in Pompeii

Krista Allen – Art History and Theory & Criticism
Faculty Mentor: Summer Trentin

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 204

Historians and archeologists, past and present, have attempted to uncover the mysteries behind the lives of the ancient Romans. The most informative pieces of evidence that provide information on their ways of life comes from the ancient city of Pompeii, specifically from the houses that were preserved by the volcanic debris. Countless studies have investigated how social hierarchy and identity were promoted through the style and decoration of these homes, but few have explored how the design elements of Roman gardens positively influenced mental and bodily health. Thus, this paper uses ancient Roman literature, ecopsychology, and the biophilia hypothesis to explain how the designed environment in the garden at the House of the Vettii promoted a sense of well-being, helped with recoveries from illnesses, improved cognitive functioning, and reduced stress and anxiety.

Unlocking Social Connection: Exploring the Impact of Group Outings on Social Communication and Anxiety in Autism

Elizabeth Almaraz – Speech, Language, Hearing Sciences
Co-Authors: Lara Dunn, Ilana Oliff
Faculty Mentor: Jessica Rossi Katz

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 202

This study explores the potential advantages of everyday environments and group outings for adults diagnosed with autism spectrum disorder (ASD). Recent research indicates that individuals with autism often experience heightened social anxiety, stemming from challenges in social communication. We survey existing research on the effects of public outings in enhancing social communication skills across various populations, including those with ASD and individuals facing acquired language impairments. Additionally, we draw upon insights gained from our involvement in the Integrating Supports for Students with Autism in College (ISSAC) program at the Bookhardt Family Speech-Language Clinic, located at MSU Denver.

The ISSAC program places particular emphasis on creating opportunities for peer engagement and fostering communication skills. In recent program iterations, we have extended ISSAC sessions beyond traditional clinical or classroom settings to include outings to campus locales such as restaurants and

performance venues on campus. We discuss both the advantages and challenges associated with these public outings, taking into account factors such as sensory overload in natural environments. Ultimately, we aim to provide recommendations for better-supporting individuals with social communication difficulties, whether in personal or professional contexts.

Caught in the Crisis: An Analysis of Opioid Arrests in Different Communities in Denver, 2019-2023

Jessica Almeraz – Criminal Justice & Criminology
Faculty Mentor: Hyon Namgung

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 200

The opioid epidemic is a complex issue that affects different ethnic groups differently. Thus, addressing underlying causes requires a thorough understanding of the issue. In addition, comprehending the differences in opioid possession arrest rates in different places will be informative for developing focused interventions, advocating for fair law enforcement procedures, and tackling the intricate interplay between public health and social justice within the framework of the opioid crisis. Using publicly available crime data from the Denver Open Data Catalog, this study explores the complex terrain of opioid possession arrests in diverse areas in the city and county of Denver over the past five years through spatial analysis on ArcGIS Online, a cloud-based geographic information system. By shedding light on potential causes and disparities in this drug issue, this research aims to identify patterns and trends in opioid possession/selling arrests through spatial analysis. The objective is to offer insight into the complex dynamics of opioid-related law enforcement practices and their consequences for public health interventions and social justice initiatives in these communities by analyzing the demographic and geographic distribution of these arrests. Therefore, this study will be an important addition to promoting evidence-based approaches for fair intervention and assistance, as well as fostering a better-informed conversation on the opioid epidemic.

Fungus sonus: Development of Sound Absorbing Mycelium-Based Composites using *P. ostreatus* Grown on Various Lignocellulosic Substrates.

Reece Baily – Biology
Faculty Mentors: Megan Filbin, Megan Lazorski, Catherine Musselman (CU Anschutz), Anil Rao, and John Rinn (CU Boulder)

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #14

Over the past decade, there have been increasing concerns over the long-term sustainability of many common insulating materials used for acoustic and thermal regulation. Current methods of insulation manufacturing require environmentally damaging practices for resource acquisition, high petroleum dependence, and often produce dangerous waste. These concerns have caused researchers to begin searching for alternative insulators. Recent advances in bio-manufacturing and biotechnology have enabled researchers to develop novel bio-materials that seek to replace existing insulators. One such material that has shown great promise is mycelium-based composites. This type of composite uses mycelium, as a natural adhesive to bind together various types of lignocellulosic substrate mixtures. Mycelium-based composites have been shown to have excellent compressive strength and acoustic

values which are comparable to commonly used insulation foams found today. Research conducted in this study focused on the development of novel, sound absorbing mycelium-based composites using the fungal species *Pleurotus ostreatus* (*P. ostreatus*), and three varying mixes of lignocellulosic substrates. The three mixes used were composed of corn cob and wheat bran (CW), Oak Saw Dust and soya hulls (SS), and coffee grounds with coco coir (CC). Once inoculated, each substrate mixture was then placed into molds for 5,10, or 15 days. At the end of each period the mycelium-based composites were baked in an oven to render their growth inert. Standard density calculations were performed. It was determined that the mycelium-based composites containing oak saw dust and soy hulls had the highest average density at 0.32 g/cm³, and the highest overall density at 0.33 g/cm³. These results supported the hypothesis that mycelium-based composites grown on various lignocellulosic substrates are potentially viable alternatives to standard sound absorbing materials.

En otras Palabras (In Other Words)

Kevin Balbuena Trujillo – Art Education
Faculty Mentors: Rachael Delanay, Matt Jenkins

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 200

Language defines the boundaries of our world. In our daily lives, we have difficulty registering and making sense of things we cannot name. Language undergoes its challenges, values, and beliefs, often generating beguiling words. Such words have a corresponding reality. In certain languages, it is easier to convey concepts or ideas than in others. Limiting what we can and cannot experience.

En Otras Palabras (In Other Words) is a mixed media installation based on untranslatable words that emerge from my native tongue (Mexican Spanish). These words encapsulate the complexity and ambiguity of a situation one experiences in day-to-day life. The artworks possess a syntax aesthetic style that can be acknowledged in two ways, either verbally or visually. The portrayal was created to cause linguistic discomfort, uncertainty, and puzzlement for the reader, portraying the frustration of my experience as I went through the stages of English language acquisition. As I was striving to retain my Mexican roots while learning English, I realized that each language has a corresponding reality where idiosyncratic perspectives and interpretations are adjacent. This reality challenged my existing values and shaped my personality as I traversed cultural untranslatability.

Language is not an exact representation of reality; it is an instrument through which the soul of each culture comes into the material world. I got consumed by the desire to comprehend how the untranslatable has the capability to unfold itself, to wonder about itself, to scrutinize itself, to praise and deplore itself. My installation conveys how the untranslatable portrays the full spectrum of feelings that intersect between language and well-being.

Darger Mythology & Trans Denial

Shady Balcom – English
Faculty Mentor: Sonny Dhoot

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 204

This paper addresses the absence of transgender readings of Henry Darger and his art, and explores underlying motivations behind the language used in the scholarship to avoid applying a sincere transgender reading to his depictions of children as well as to himself. Since gender nonconformity is socially, politically, and historically constructed, “transgender” in this case refers not to our contemporary definition but also encompasses all those marked as other-gendered by their mainstream culture and period, an identity produced from outside the individual and projected inward. Regardless of whether Darger harbored trans desire or not, once this lens is applied to his life and work, prior explanations of the genital appearance of the Vivian Girls as well as the narrative of Sweetie-Pie present in his memoir seem much more far-fetched than the idea of Darger being trans. The content, quantity and intensity of Darger’s work suggest that his gravitation toward depicting young girls was more autobiographical than voyeuristic. Darger’s work projects the real violence routinely suffered by the unchild (racialized, poor, disabled, or otherwise marginalized child who faces extreme and routine violence as well as population-level extermination projects) onto the abstract, idolatrous figure of the Child (the blonde, healthy, clean, middle-class child) as depicted in media, producing a feeling of secular blasphemy which many who view Darger’s work project onto him in the form of perversion. This paper explores the intersecting nature of discourses surrounding Darger’s madness and queerness – in his own life as well as postmortem – as a means of both propping up his artistic genius into a well-known framework as well as diminishing his achievements as “outside” the realm of mainstream artistic practice.

Investigating The Developmental Role of *macc1* in Zebrafish

Raelyn Begay – Biology
Co-Author: Eric Reeve
Faculty Mentor: Vida Melvin

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 200

The Metastasis Associated in Colon Cancer-1 (*MACC1*) gene, initially discovered in human colon cancers, is now a biomarker for various metastatic cancers. In cancer, *MACC1* acts as a transcriptional regulator, influencing pathways commonly associated with cancer, such as HGF/MET, *nanog*, PI3K-Akt, and MAPK. These pathways facilitate processes like proliferation, metastasis, epithelial-to-mesenchymal transition, angiogenesis, and invasive growth. However, the normal function of *MACC1* remains unclear. *MACC1* has orthologs in various vertebrates, including zebrafish, and the molecular pathways found in development are also conserved. Previously, *macc1* expression was identified during zebrafish craniofacial development, with morpholino knockdown experiments resulting in craniofacial defects. Additionally, *macc1* regulates the expression of the genes *met* and *nanog* during development, which are crucial for oogenesis, spermatogenesis, and embryogenesis in zebrafish. To understand the role of *MACC1* in embryonic and craniofacial development, we used the CRISPR-Cas9 genome editing system to induce a stable loss-of-function mutation in the *macc1* locus. Dual guide ribonucleoprotein complexes were injected into zebrafish single cell embryos, generating the F0 founder generation. PCR and genotyping using ABI 3500 genetic analyzer software demonstrated high mosaicism, expressing multiple genotypes within a single individual. Upon reaching adulthood, F0 fish were mated against wildtype fish to produce F1 heterozygous offspring carrying single *macc1* mutations. Our genotype analysis identified three distinct mutant lines in the F1 generation, each with different mutations – a 6-base pair (bp) deletion, a 5

bp deletion, and a 10 to 11 bp insertion. In the future, mating F1 generations together will yield the F2 generation, where 25% of the offspring are expected to be homozygous for *macc1* loss-of-function mutations. Future investigations will focus on characterizing the developmental phenotypes associated with these mutations, shedding light on the role *MACC1* has in development.

Negative attitudes towards menstruation and gynecological visit avoidance: The role of self-compassion as a moderator

Kiarra Berry – Psychology
Faculty Mentor: Maureen Flynn

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #3

Approximately 50% of women reported having avoided healthcare in their lifetime (Uchibori et al., 2023). Holding negative attitudes towards menstruation is negatively correlated with seeking out preventative healthcare (Holland, 2020). There must be moderators involved in this harmful relationship, however. The current study examined whether self-compassion moderates the relationship between attitudes towards menstruation and gynecological visit avoidance. Female college students (n = 262), who were at least 21 years old were recruited from SONA and completed a series of questionnaires online. Results showed that viewing menstruation as disgusting or shameful was correlated with gynecological visit avoidance. Self-compassion and aspects of self-compassion (e.g., self-kindness) did not moderate the relationship between attitudes towards menstruation and gynecological visit avoidance. Future studies could examine these variables in other populations as well as investigating other possible moderators involved in this deleterious relationship.

Access and Accessibility, Models to a more inclusive Writing Center

Benjamin Bird – English
Faculty Mentor: Elizabeth Kleinfeld

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 203

Universally accessible student support services such as writing centers play a key role in the persistence rates of students with disabilities in higher education; the majority of whom will never disclose their disability to the college. This project will be a series of interviews and focus groups discussing the ways students understand and react to communication from the MSU Denver Writing Center on accessibility and accommodation. This research will help gauge the ways in which internal and external communication on access can be improved to make sure all students are able to fully access the writing center.

Through a mixture of scholarly research, interviews, focus groups, as well as community outreach we have looked at our existing models for access communication, as well as a number of alternative models and systems that can be implemented to make the writing center a more accessible service.

The funding from this grant contributed to the interview stage of this research, funding 10\$ rewards for interview participants. These interviews and focus groups would consist of having participants review different wordings of potential intake forms for the MSU Denver Writing Center, and assess their responses to these forms in terms of understanding, comfort, and any other reactions they considered relevant. Through this research we found that alternate models of our intake form could increase client comfort when asking for an accommodation as needed on first visits.

The Effect of Emerald Ash Borer on Ambient and Ground Temperatures

Brittany Brown – Biology

Co-Author: Magee Headley

Faculty Mentors: Erin Bissell and Jennifer Gagliardi-Seeley

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #1

Emerald Ash Borer (*Agrilus planipennis*) is an invasive wood-boring jewel beetle that has decimated Ash tree species in North America since its detection in 2002. It has been in Colorado since 2013 and has spread across the Denver metro area over 10 years. A symptom of Emerald Ash Borer (EAB) infection is rapid canopy die-off. Since ash trees account for a high percentage of urban plantings loss of canopy shade is alarming. Parasites can impact tree ecology (Page, 2012), such as been seen with mountain pine beetle (*Dendroctonus ponderosae*), and invasive species change the way humans and wildlife perceive and interact with their environments. Urban environments trap heat due to increased albedo and can be ~10° hotter than their rural counterparts. This sequence is known as the Urban Heat Island Effect (UHI). We were interested in understanding how the infestation of EAB and subsequent loss of Ash tree canopy cover influences the UHI, and hypothesized that EAB is contributing to increased temperatures. We predicted there would be a significant decrease in canopy coverage based on age of exposure, as well as a significant difference in ground and ambient temperatures between areas with EAB exposure, and areas without. While we did find significant differences in ground and ambient temperatures, the difference of canopy coverage was not significant. Our study was limited to late October 2023 when leaf drop was beginning, therefore further research should be conducted during spring and summer to complete our understanding of how EAB affects tree canopy during the highest times of shade coverage, and during higher overall temperatures. Ash trees are valuable environmentally and culturally and have been referred to as important keystone species Better understanding of ecological changes resulting from EAB exposure are critical to enhance current protection and prevention of further damage

Feeding Innovation in the Bare-throated Tiger-Heron (*Tigrisoma mexicanum*)

Brittany Brown – Biology

Co-Author: Rimley Bauer

Faculty Mentor: Christy Carello

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #2

Little is known about the population dynamics and feeding behavior of the Bare-throated Tiger-Heron (BTTH; *Tigrisoma mexicanum*) because it is mostly solitary and often found in remote habitats in Central

America. Here we report the first documented observation of a BTTH using bait to obtain fish in the Tortuguero region of Costa Rica. Using bait to fish, where a bird places an object in water to attract fish to facilitate capture, is a complex behavior that has only been observed in 12 species of birds, 7 of which belong to the heron family, Ardeidae. We documented the behavior using video capture and camera footage. Four direct observations were made of an individual BTTH using bait to fish, three of which were successful. We also noted that several Black River Turtles (*Rhinoclemmys funerea*) appeared to benefit from the heron's feeding behavior. We conducted interviews with local people to develop a history of the behavior and learned that this individual has been using this method to obtain food for 19 years. While this is the first account of bait-fishing in BTTH, this behavior might exist in other members of this species. Just one account of feeding innovation behavior in birds has been correlated to lower extinction risk. Although this species is not currently on the IUCN Red List as an at-risk species, they are decreasing in the southern part of their range due to habitat augmentation from wetland drainage. Thus, this observation of bait-fishing in a BTTH may demonstrate that other types of feeding innovation exist in this species and could provide a buffer against extinction.

Food Source Availability as an Influence for Winter Foraging Site Selection in Northern Shovelers

Katherine Cambier – Biology
Faculty Mentor: Christy Carello

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #2

Colorado waterbody complexes represent important year-round habitat for the Northern Shoveler (*Spatula clypeata*). During the winter, Northern Shovelers display a distinctive large group feeding behavior that potentially stirs up the epibenthic zone, granting them access to overwintering invertebrates. It is unclear why Northern Shovelers only feed at specific waterbodies while other duck species display a broader distribution in their feeding habits. We hypothesize that if food availability dictates site selection in Northern Shovelers, then food sources present within the preferred waterbodies will differ from those found in waterbodies that are not preferred. We also hypothesize that additional waterbody parameters will differ between preferred and non-preferred waterbodies, such as aquatic plants, algae, fish stock, and abiotic properties. Our approach concentrated on surveying invertebrates present in four preferred feeding waterbodies, and five waterbodies that are overlooked by the species. At each waterbody, water column sweep netting was performed five times during the summer months at randomly selected points to sample aquatic invertebrates. Invertebrate species were then isolated, identified, dried, and weighed to determine invertebrate species diversity, abundance, and biomass. At each waterbody, aquatic plants were surveyed via observation, and water quality data including pH, dissolved oxygen, salinity, conductivity, nitrates, and phosphates were measured. We found that biomass was significantly greater in the preferred waterbodies. Our findings suggest that Northern Shoveler winter foraging site selection may be influenced by the abundance of invertebrate biomass. Additionally, our findings suggest that Northern Shovelers may access food sources that are normally only available to diving ducks, and that winter foraging site selection might be predicted based on invertebrate biomass present in summer.

Biochemical characterization of *Escherichia coli* bacteria from Canada geese (*Branta canadensis*)

Charlotte Campbell – Biology
Faculty Mentor: Rebecca Ferrell

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #5

Escherichia coli bacteria are often used as indicators of fecal contamination in drinking and recreational water quality monitoring to safeguard public health. *E. coli* is a gut bacterium in many vertebrate species, not just humans. This makes it complex to detect human sewage, and while efforts to find ways to differentiate *E. coli* strains of human origin from those found in the gut of other vertebrates, these efforts have generally not been very successful. Despite this limitation, *E. coli* quantification is widely used for public health and regulatory purposes. Our laboratory has collected an *E. coli* strain library from Canada geese (*Branta canadensis*) fecal pellets after observed defecation. These pure cultures were previously verified as *E. coli* based on fluorescence in Colilert medium and IMViC +/+/--/- results. The current project is further investigating these isolated strains, beginning with verification of their *E. coli* identity using EnteroPluri test tubes (Liofilchem). The test format includes 12 sectors, each with a different medium, allowing for a total of 15 biochemical tests to be performed on the sample, and then results are encoded and used to identify the species. Over 90% of isolates yielded the typical *E. coli* ID code, and nearly all have ultimately been classified as *E. coli* on the basis of this test battery. Chromosome extraction is underway from all confirmed strains, and preliminary results suggest that isolated DNA shows expected reactions in quantitative polymerase chain reaction (Q-PCR) tests with specific primer sets. The *E. coli* are also being tested for antibiotic resistance and the possibility of plasmids being present within the colonies

Valence-Dependent Dopamine Release in the Nucleus Accumbens: Unraveling the Biological Differentiation of Social Reward

Zachary Childs – Biology
Faculty Mentor: Cynthia Erickson

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #4

Social rewards play an essential role in the formation and maintenance of social bonds in monogamous species. The perceived valence of a social reward has an influential role in directing the behaviors a social species makes during the anticipation, acquisition, and consumption of said reward. Dopamine in the nucleus accumbens is known to be influenced by social rewards, and is thought to influence behavior in the presence of rewarding stimuli. For monogamous species, like prairie voles, unique behaviors and physiological changes are observed when in the presence of their pair-bonded partner, differing from interactions with potentially threatening novel individuals. By using the fluorescent biosensor GRABDA, along with fiber photometry examining the fluorescent changes over time, we investigated the in vivo dopamine dynamics within the nucleus accumbens of prairie voles as they underwent a social reward Pavlovian conditioning task. Distinct dopamine dynamics were shown in the nucleus accumbens of prairie voles during the seeking, anticipation, and consumption of partner-elicited social rewards, novel-elicited social rewards, and non-social intervals. Nucleus accumbens dopamine response significantly increased in magnitude across successive days during the initial anticipatory-period for social interaction with either stimulus, suggesting a strengthening of cue-reward association over time. Individual

differences were seen for partner, novel, and neutral rewards during the anticipation, acquisition, and consumption of rewards. These differences in dopamine, dependent on the perceived-valence of a social interaction, suggests that dopamine in the nucleus accumbens plays a role as a physiological source distinguishing between distinct types of social bonds, along with influencing the behaviors surrounding the formation and maintenance of those bonds.

Pyllelic: Software for the Read-Level analysis of DNA Methylation Sequencing Data

Victoria Colling – Biochemistry
Faculty Mentor: Andrew Bonham

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #12

DNA methylation is an epigenetic modification that can regulate gene expression. Hypermethylation occurring at promoter regions has been correlated with cancer-associated gene expression. In particular, recent evidence has shown a role for allele-specific methylation in the progression of several cancers. Advancements in sequencing technologies have facilitated the generation of genomic datasets detailing such DNA methylation, particularly in a cytosine-phosphate-guanine (CpG) context. However, existing software tools for analyzing these datasets often lack the means to explore base-level specificity, averaging methylation levels across multiple regions of the genome or sequencing reads, hindering the identification of allele-specific methylation patterns. Here, we introduce Pyllelic, a novel software package implemented in Python, designed for high-resolution analysis of bisulfite conversion sequencing genomic data at the individual read and position level. Pyllelic supports the rapid identification of potentially allele-specific methylation and utilizes an accessible, object-oriented interface with visualization and analysis tools, allowing for straightforward access to methylation results and statistical analyses. We demonstrate how this approach can replicate experimental insight from studies of the promoter region of the telomerase reverse transcriptase (TERT) gene. Pyllelic thus provides a useful tool for identifying allele-specific methylation patterns and associated gene expression in cancers and diseases.

The Capabilities, Limitations, and Integrity Related to AI Technology

Diona Comery – Cybersecurity
Faculty Mentor: Ranjidha Rajan

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #10

This study investigates and challenges the negative theories associated with AI technology and explores the capabilities, integrity, and limitations. Proving that with regulations, proper oversight, explain-ability, and interpretability from government officials the concerns of the public can be addressed, and public fear of AI can subside. Analyzing the contributions made within the educational system, healthcare sector and new processes created by machine learning, autonomous systems, and natural language systems in many other industries. Exploring those different industries AI has influenced unbeknownst to the average person and acknowledging the concerns associated with the integrity and societal implications. The analysis encompasses studies from the National Library of Medicine, reputable universities such as Harvard, Georgetown, and Cambridge, collecting data from social media polls to give

perspective to the average person, also collecting evidence of regulations from the United States Government and United Nations. Also acquiring data from international research outlets such as ResearchGate and UNESCO. An interview from the founder and CEO of AccuCode, an award-winning technology solutions company whose main headquarters resides in Colorado is also included to give a personal perspective from a business that will be affected by AI's automation process. There are also contributions from top technological companies such as Microsoft, IBM, IEEE Robotics, and EPIC. The result of this research is to give a positive insight to a world surrounded by technology to understand that with regulation, appropriate government oversight, and a focus on creating systems that emulate nonbiased and fair qualities the collaboration between human and AI can revolutionize the world.

Keywords: AI technology, machine learning, education, society, integrity, healthcare, natural language systems, autonomous systems, humans, capabilities, integrity, limitations, explain-ability, interpretability.

Raspberry Pi Cluster Performance: Scalability and Core Configuration Analysis

Vincent Cordova – Computer Science
Faculty Mentor: Ranjidha Rajan

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 203

The Raspberry Pi serves as a testament to the true advances in computing power and accessibility; however, its true potential lies in its ability to easily and affordably assemble a computer cluster. This ability transforms the Raspberry Pi from a single-board computer into a gateway to exploring distributed computing, parallel processing, and the scalability challenges faced by larger industry standard systems. A cluster of Raspberry Pis, also known as a “bramble”, pushes the capabilities of what you can do with such small and accessible computers by utilization of multiple cores through distribution between each “node” or CPU. While such clusters offer a unique avenue for exploring the scalability of computational performance, they also aren't immune to the complexities of workload distribution—specifically, the diminishing returns introduced by the simple message passing model used for inter-node communication. This study investigates these tradeoffs, offering insights in the scalability within computer clusters, and finding the boundaries of what small, accessible computers can achieve in a distributed computing landscape. We used a Raspberry Pi cluster consisting of 2 Raspberry Pi 4Bs totaling our resources to 8 CPU cores and 8GB of RAM. We made two test programs to gather performance data from the cluster, using program completion time as the main metric recorded and analyzed. This research goes to show that the limitations of distributed computing come from the programming design, and the nature of message passing producing a large amount of overhead between computers. So, the question of whether or not a computer cluster would be worth using or not ends up highly dependent on what you'd be using it for. While they serve as exceptional tools for working through large amounts of calculations, adding more computers to a cluster doesn't necessarily equate to faster program completion times, and can even slow programs down.

Water Quality on Campus

Kayli Cottonwood – Bachelor of Fine Arts
Faculty Mentor: Tsehai Johnson

Presentation Cancelled

Hearing discussions of worsening water quality in Denver heightened my curiosity, I questioned the water quality of the drinking fountains on our shared campus. Everyone has their favorite fill-up stations that they prefer over others and I wanted to seek out if there was any tangible difference between these fill-up stations and ensure the safety of drinking water on campus. My preliminary research's goal was to validate my concern of drinking water and determine if there was a difference between water bottle fill-up stations and water from restroom sinks. Collecting data from five buildings (Tivoli, King Center, Central Classroom, Arts Building and the Rectory Building), we measured the contaminants ppm (parts per million) and found that all drinking water was between 120 ppm and 155 ppm and restroom water was between 147 ppm and 223 ppm. Denver public water considers any water 400 ppm or less as safe for drinking. Water between 100 ppm and 200 ppm is considered 'hard water', defined by the U.S Geological Survey as water that is high in dissolved minerals which may leave residue on dishes and causes scale build-up over time. While hard water is safe to drink and can provide needed minerals in human diet, ideal drinking water is measured at less than 100 ppm. I am currently moving to the second phase of data collection which will begin with locating all water bottle fill-up stations on campus, measuring contaminants ppm and using a contaminant test strip to identify the contaminants within the water. By narrowing my focus to water bottle fill-up stations, removing restroom water testing, I will be able to provide complete data for the objectively best water bottle fill-up station in each building and on campus as a whole.

Development and testing of an Underwater camera system to Measure the Health of Corals by recording Fluorescence from Algal Coral Symbionts

Nicolette Couture – Biology
Faculty Mentor: Robert Hancock

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #3

Corals are colony organisms found all over the ocean with many growing together to form the reefs we have today. Corals host intracellular photosynthetic algae which provide energy for coral growth and well-being. This ecosystem production is important as it builds reef structure and provides for many fish and other marine organisms. Corals also protect those on land as they act as a buffer against erosion and intense storms. Unfortunately, many coral reefs have been subjected to pollution and disease due to climate change causing coral bleaching, a condition when corals purge their symbiotic algae and are left defenseless against disease as the corals would not have the required nutrition to survive. Symbiodinium algae are intracellular mutualists found in healthy corals. These algae contain the photosynthetic pigment Chlorophyll A. The fluorescence of this pigment can be observed in the near IR spectrum. I propose that coral health can be assessed through the intensity of near IR fluorescence captured using a modified underwater camera with specific filters that are designed to see the fluorescence produced in the near IR spectrum.

My study consisted of three phases: 1) camera modification and rig assembly including filterers, lighting, camera housing, and tray; 2) Laboratory testing using selected freshwater algae that contain Chlorophyll A as well as various Chlorophyll isolates; and 3) SCUBA diving field tests on the Florida Reef Tract.

Preliminary Findings on *Sabethes* Tree-hole Dwelling Larvae and their Cryptobiotic Behaviors

Haddel Dahabreh – Biology
Faculty Mentor: Robert Hancock

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 200

Thus far, there has been no research on cryptobiotic behaviors of the larvae of *Sabethes cyaneus* and *Sabethes chloropterus* mosquitos. Both species are native to the tropical, humid environments of South America. Information on how well these mosquitos can withstand extreme environments is something that could help with vector control, as both species are vectors for diseases that are deadly to humans. We hypothesize that neither species' larvae will be able to withstand dryer conditions. 40, 4th instar larvae from either species were collected from the MSU Denver Entomology lab and placed in 2x2 cm² containers individually: 20 were used as controls while the remaining 20 were put in more dry conditions. The controls were in 10ml of aged water while the others were set on top of two layers of seed germ paper, hydrated with only 0.5ml of aged water. Four of each experimental group were rehydrated with 2ml of aged water each day for five days. The results of this preliminary experiment suggest that neither species' larvae can withstand dryer conditions very well, as approximately 50% of the experimental larvae did not survive. Further analysis is ongoing, but this experiment suggests that *Sa. cyaneus* and *Sa. chloropterus* mosquitos are not good survivors in cryptobiotic conditions.

Optimizing the Procedure for Synthesis of SHAPE Probe 2-methylnicotinic acid imidazolide (NAI)

Luis Delgado-Garcia – Biochemistry
Co-Authors: Gage Leach, Andrew Schlink, Zach Zimmerman
Faculty Mentors: Shailesh Ambre and Megan Filbin

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #7

RNA research has become a staple in medical advancements. A greater understanding of RNA structure is crucial to revealing the currently unknown functions of the transcriptome. There are multiple methods for analyzing RNA secondary structures but because of the complexity of these sequences, new methods of analyzing are continuously being introduced. Selective 2'-Hydroxyl Acylation analyzed by Primer Extension (SHAPE) is a method in which the ribose sugar is modified using a chemical probe and analyzed by primer extension for RNA secondary structure mapping. These reagents are highly reactive electrophiles with very short half-lives which has limited their commercial availability, are often synthesized right before the probing experiment, and used with limited purification. This leads to several assumptions and the need for additional control experiments because the implications or the presence of byproducts has not been explored in literature. Hence, we are creating a new robust synthetic protocol for an existing SHAPE reagent, 2-methylnicotinic acid imidazolide (NAI) with the intention to isolate high-purity imidazolide probes for SHAPE analysis. This is being done by optimizing the synthetic steps to remove any byproducts by simple washes with solvent, and filtration. Although we are

developing the synthesis for NAI, our methods are extendable to other imidazolidine probes and we believe our work will make these SHAPE reagents widely available for investigators with limited access to synthetic expertise and enable them to explore RNA structure using SHAPE technology. This work has been funded through Metropolitan State University of Denver through the Undergraduate Research and Creative Scholarship Program grant awarded to Luis Delgado-Garcia for spring 2024.

How to uncouple scarcity from caring: Can MMT lead to social change?

Artemis T. Douglas – English and Gender, Women's & Sexualities Studies
Faculty Mentor: Jessica Parker

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #13

This study will use surveys to establish baseline data regarding general and specific support for federal policy programs. Through education, it will attempt to change political opinion baselines through the introduction of Modern Monetary Theory. Modern Monetary Theory (MMT) is a hyper-accurate, science-based description of how currency, especially free-floating fiat currency, and government funding work, including in the United States. MMT illustrates the reality that any monetarily sovereign government can never run out of its own currency.

Through three stages of research, this study will allow for the projection of how much general population opinions in the context of public investments in projects would shift if MMT was commonly understood. It will also specifically measure whether the learning of MMT affects support for publicly funded provisioning of universal basic services. As defined by the non-profit national media and advocacy organization, Real Progressives, “universal basic services” refers to the federal government providing all the means of a dignified quality of life to everyone, from birth to grave. MMT demonstrates that the federal government could provide these things if the real resources, such as- infrastructure, materials, and labor- are sufficient to organize the relevant mobilization.

I believe results of this study will show that learning MMT noticeably shifts perception of the role of the federal government vs the role of the private sector. I expect this shift in perspective will lead to a measurable change in support for universal basic services. In other words, if people understood that the federal government doesn't require tax revenues to spend, would they change their minds? I believe they would. This study intends to find out.

Studying the Testing Effect in Undergraduate Psychology Students

Megan Dragani – Psychology
Co-Authors: Vilma Moreno, Nana Akua Adu Owusu
Faculty Mentors: Cynthia Erickson, Arijana Barun, and Shalini Srinivasan

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 203

Known as the testing effect, psychologists have long been looking to practice by retrieval as an efficient way to establish effective learning. The testing effect proposes the idea that recalling information from memory strengthens one's ability to retain that information long term. The testing effect was recognized by Edwina Abbott in 1909. This project is part of a larger study looking for effective ways to lower drop,

fail, and withdrawal rates in the statistically difficult STEM courses at Metropolitan State University of Denver. Our research question is, “Is there a positive correlation between how many times a student takes the low-stakes quizzes and their score on the final exam?” To study this question, we chose to explore the efficacy of the testing effect by examining the number of quiz attempts made by individual students and their final exam scores. In the classes that we have observed, students are given the opportunity to take the quizzes repeatedly until they master the course content. We examined grades from several different undergraduate STEM courses after obtaining permission from the students enrolled in the courses. We are looking at correlations to find the best predictor of final exam scores in de-identified data. With a group of 22 participants that we have been able to analyze so far, we have not found a significant correlation between attempts on low-stakes quizzes and the final exam score. We did, however, find a significant correlation between average quiz attempts made ($M = 3.63$, $SD = 1.66$) and grades on active lectures ($M = 95.11$, $SD = 7.20$), as well as average quiz attempts made ($M = 3.63$, $SD = 1.66$) and assignment grades ($M = 87.10$, $SD = 14.66$). We hope that by analyzing these data we will determine the factors that predict student success on final exams.

Experimental Design

Isabella Eaton – Mathematics, Probability & Statistics Concentration
Faculty Mentor: Benjamin Dyhr

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 202

In statistics, we make inferences based on analysis of observed data. Here, we discuss the importance of understanding what prior steps must be taken before any data collection or analysis begins. These include the experimental design, sampling methodology, and, if human subjects are involved, required legal permissions for collecting the data. After reviewing experimental design principles and terminology, we propose a hypothetical experiment designed to determine the efficacy of coteaching in secondary mathematics classes. We discuss issues both practical and theoretical that inform this hypothetical design.

Discovery

Teddy Espinosa – Anthropology
Faculty Mentor: Jade Luiz

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 204

The Doctrine of Discovery is a historic document that is still in use in US politics and Indian Law as of today. It was created in the 15th century by the Popes, and was first used in the Americas in 1493 when Columbus stumbled across what is now known as the Americas. The Doctrine, often referred to as, “Discovery,” gives authority to anyone who discovers new land that is uninhabited by Christians to assume sovereignty over that land. This Doctrine has been used for hundreds of years as a means to undermine Native American/Indigenous Tribes of North America, and justify colonization as a whole. ‘Discovery’, has been used in court cases such as the Marshall Trilogy from 1823-1831 and City of Sherrill v. Oneida Nation of Indians in 2005. The purpose of this presentation is to provide insight onto how the

Doctrine of Discovery still effects Native American/Indigenous people today, and why it should be removed, but unfortunately probably never will be.

Managing Children's Behaviors in Speech-Language Therapy

Nafetaline Estime – Speech Language, Hearing Sciences
Faculty Mentors: Jessica Rossi Katz and Sarah Gyory

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 202

In this project, I explore different behavior management strategies and the impact of factors like creativity, following a child's lead and types of reinforcement, when it comes to engaging and motivating children. One source of evidence I use is findings from scholarly literature. I also draw upon my own experience collaborating with graduate student clinicians and speech-language pathologists at the Auraria Early Learning Center. Through weekly sessions supporting small-groups of young children with speech-language needs, our team considers how to encourage desired behaviors, manage challenging behaviors, and adapt techniques to meet the unique needs of children. Taken together, I show how behavior management needs to be developmentally appropriate, aligned with clients' goals and appropriate for play-based therapy approaches. This information will benefit individuals who provide educational and therapeutic support to children.

Contesting the Political Child: Queering Education, Politics, and Power in the Greeley Evans School District

Jody Evans – Critical Approach to Social Science (Individualized Degree Plan)
Faculty Mentor: Sonny Dhoot

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 204

The intersection of politics, education, and parental concerns has become increasingly contentious, as evidenced by the heated debates surrounding curriculum content in public schools. A notable instance occurred in February 2023, during a Greeley Evans School District 6 board meeting, where a community member expressed anxieties about what they perceived as liberal agendas infiltrating educational materials.

This paper examines the politicization of education surrounding the protection of children as it intersects with broader socio-political ideologies through a critical lens. The discursive analysis of the Greeley Evans School District 2023 election campaigns builds from Lee Edelmans' 'Reproductive futurities and the political figure of the child' and Jasbir Puar's 'homonationalism and queer exceptionalism' in theoretical basis. This thesis analyzes how the child is utilized in political discourse to advocate for white neoliberal futurities regardless of political binarism.

By highlighting the implications of the political binarism in local school districts, this study contributes to a deeper understanding of how educational policies reflect and perpetuate neoliberal ideologies, ultimately shaping the lived experiences of students and communities queer and non-queer alike.

Empowering Colorado: Revolutionizing Sustainability Through Data Democracy with Colorado's Sustainability Hub

Luke Farchione – Computer Science
Co-Authors; Noah Pearson and Eddie Savelson
Faculty Mentor: Daniel Pittman and Alyssa Williams

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 203

The Sustainability Hub is a pioneering initiative to democratize access to sustainability data across Colorado. Our aim is to empower communities, policymakers, and stakeholders to make informed decisions for a sustainable future. The heart of our project is a cutting-edge Retrieval Augmented Generation (RAG) system, which utilizes advanced Large Language Models (LLMs) to foster guided, impactful conversations about sustainability. This technology enables us to deliver customized insights into the challenges of environmental, economic, and social sustainability, particularly within Colorado's unique context. Our approach has been to create a central platform where everyone – from community members to scientists – can easily access credible data and resources through simple dialogue. A significant part of our work has been to identify and analyze local data sources in diverse formats, ensuring the Hub becomes a comprehensive, accessible repository for all. This commitment to maintaining and updating relevant data sources guarantees the long-term utility and reliability of our platform. Moreover, we've embraced innovative techniques to fine-tune our LLMs with foundational data about Colorado's varied geographies, enhancing the system's understanding of our state's distinct environmental and community landscapes. This groundwork has been pivotal in enabling rapid, context-aware interactions with users, promoting the principle of data democracy. Our efforts signal a revolution in how sustainability data is accessed and utilized in Colorado, promising accessible, actionable insights for sustainable outcomes across communities. Through the Sustainability Hub, we are not just sharing data; we are building bridges between information and action, fostering a more informed, engaged, and sustainable Colorado.

Understanding Northern Shoveler Feeding Behavior and its Implications for Waterfowl Conservation in the Denver Metro Area

Laura Farnsworth – Biology
Co-Author: Drew Bender
Faculty Mentor: Christy Carello

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 200

Northern Shovelers (*Spatula clypeata*, hereon: Shoveler) are a dabbling duck found throughout the Northern Hemisphere. These ducks have been observed performing a type of group aggregate feeding behavior in the winter where large numbers of ducks move in a circular pattern to concentrate food. Our objectives were to determine if Shovelers show site fidelity for winter group feeding in the Denver Metro Area and if there is an association with Shoveler feeding and other waterfowl. We hypothesize that Shovelers will consistently feed in large groups at preferred sites throughout the winter and that we will find greater species diversity of other waterbirds at these preferred habitats. We collected bird count data for 65 waterbodies in the Denver Metro Area twice monthly from October 2022 through April 2023. We compared Shoveler preferred and non-preferred feeding habitat for waterfowl abundance, species

richness and species diversity (Simpson's Diversity Index). Statistical significance was determined using an unpaired Student's t-test. Of the 65 waterbodies, 17% had consistent Shoveler group feeding. Overall, we found statistically higher abundance ($\bar{x}=427.95\pm678.99$, $t=4.40$, $p<0.01$, $df=128$), species richness ($\bar{x}=5.04\pm3.50$, $t=3.98$, $p<0.01$, $df=132$), and diversity ($\bar{x}=0.41\pm0.26$, $t=2.29$, $p=0.02$, $df=127$) of avian species at preferred waterbodies compared to non-preferred waterbodies (respectively: $\bar{x}=72.51\pm227.73$, $\bar{x}=2.46\pm2.72$, $\bar{x}=0.25\pm0.31$). Furthermore, we noted in our observations that diving ducks (81.25%) interacted more with Shoveler feeding groups than dabbling ducks (18.75%). The diving duck association with Shoveler feeding circles possibly suggests that large feeding circles may create a vortex under the water, giving Shovelers access to the same resources as diving ducks. Shoveler preferred feeding habitat is indicative of important habitat for other waterfowl and understanding this preference will help guide future management decisions in a changing landscape.

Dreamscape

Gabrielle Federico – Communication Design
Faculty Mentor: Kelly Monico

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 200

In the quiet hours of slumber, our minds unfold a tapestry of images, emotions, and narratives that are often surreal and seem distant from our waking reality. However, within these fleeting moments of our subconscious lies a profound message yearning to be deciphered. Dreamscape embarks on a journey into the world of dream symbolism and interpretation, aiming to reveal the ways in which dreams act as catalysts for individual growth, self-realization, and personal transformation. At the heart of this exploration are four distinctive flipbook machines, each serving as a unique facet of dream investigation. To complement the installation, a zine was created to encourage users to embark on an immersive journey of self-discovery.

I've drawn inspiration from Patricia Garfield's enlightening book "The Universal Dream Key: The 12 Most Common Dream Themes Around the World," which offers extensive research and a global perspective on the significance of dreams. Using flipbook animations, the visual content portrays four out of the twelve archetypal dream themes and the contrast between positive and negative dream symbols. Whether it's dreams of flying or falling, these experiences can be analyzed to gain a deeper understanding of our minds, allowing us to process complex emotions and unresolved conflicts. Simultaneously, the accompanying journal highlights the transformative potential of dreams, serving as a persuasive medium that encourages readers to embark on dream journaling. It illustrates how this simple yet profound habit can lead to personal growth and emotional healing, aiming to convey that dreams are not fleeting experiences but rather keys to unlocking a profound understanding of the self.

Dreamscape extends beyond stimulating introspection; it creates a space where viewers can intimately connect with their inner world. I strive to capture the very essence of dreams and their capacity to trigger personal growth, beckoning others to embark on an exploration of observation and evolution.

Synthesis and Characterization of Novel SARS-CoV-2 Derived Cell-Penetrating Peptides for Enhanced Drug Delivery

Lillie Faith Geiersbach – Biology
Faculty Mentor: Shailesh Ambre

Poster Presentation

Cell-penetrating peptides (CPPs), ranging from 5 to 30 amino acids, enhance cell permeability and facilitate the transport of biomolecules and small therapeutics. The CPP (Cell Penetrating Peptides) database has identified over 1700 sequences, yet these peptides suffer from serious drawbacks including non-specificity, low stability, and suboptimal pharmacokinetics which prevents their approval by the Food and Drug Administration (FDA). Understanding the significance of CPPs in enhancing drug bioavailability by navigating the challenge of limited cellular uptake is crucial in advancing drug delivery strategies. Viruses are master intracellular parasites and viral-origin CPPs have been investigated *in silico* for their potential as effective shuttling vectors for enhancing the bioavailability of hydrophobic therapeutics. However, it is necessary to verify the *in silico* data and generate the pharmacokinetic profiles based on toxicity, tissue distribution, cell selectivity, solubility, stability, immunogenicity, and degradation using *in vitro* and *in vivo* studies. We are investigating sequences derived from the SARS-CoV-2 proteome that was recently mined for CPPs *in silico*. The performance of these peptide sequences will be compared to HIV-Tat 1, which is the current benchmark in CPP evaluation. This extensively studied peptide is also of viral origin. Our efforts are focused on the chemical synthesis of selected peptides from the *in silico* study using solid phase peptide synthesis (SPPS) and their orthogonal bioconjugation to fluorescent probes for the purpose of generating *in vitro* and *in vivo* pharmacokinetic data.

Generation of a Heritable Loss of Function Mutation in the *ndnf* Gene

Frost Gordon – Biology and Biochemistry
Faculty Mentor: Vida Melvin

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #4

Congenital hypogonadotropic hypogonadism (CHH) is a disease that leads to a lack of puberty, infertility, and in some cases associated cleft lip and cleft palate. Loss of function (LOF) in the *NDNF* gene has been shown to cause CHH in one family of genes. Interestingly, knock down of *ndnf* in zebrafish is also associated with deformation of the ethmoid plate, which is homologous to the palate in humans. To examine the link between *ndnf* and palatogenesis, we are utilizing the CRISPR-Cas9 genome editing system to produce heritable, LOF mutations in *ndnf*. The CRISPR system uses a guide RNA to selectively bind to a location within the genome, recruit the Cas9 enzyme, and induce a double stranded break. This break is then repaired by the cellular machinery, which in rare cases causes an insertion or deletion (INDEL) mutation. Guides specific to *ndnf* were injected into 1-cell stage zebrafish embryos to generate the founding (F0) generation. PCR and fragment analysis were used to identify injected embryos that harbor *ndnf* mutations. Based on our data, F0 fish are mosaic, which means that the cells in a F0 embryo can have different mutations. The F0 fish were mated to wild type producing the F1 generation. We have identified F1 generation fish that are heterozygous for at least three different mutations, a 3 base pair

(bp) deletion, 11 bp deletion, and a 14 bp deletion. F1 mutations in *ndnf* will be sequenced and characterized to make predictions about the effect of the mutation on protein function. These mutant fish will allow us to understand the function of *ndnf* in zebrafish craniofacial development.

Photo Documentation of the Ch'orti' Project

Sophia Gordon – Anthropology
Faculty Mentor: Richard Sandoval

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #7

The Ch'orti' Project, housed in the SOAN department's Ethnography Lab, is a project that is dedicated to the language documentation of the Ch'orti' (Maya) language. The project has been working on a website to provide access to language resources to the community. Dr. Robin Quizar, Emeritus Professor of Linguistics, worked extensively with the Ch'orti' community in Guatemala to produce language materials, and since the founding of the project, students have traveled to Guatemala to cultivate the relationships formed by Dr. Quizar.

In March of 2024, I will accompany Dr. Sandoval, Dr. Quizar, and other project members to Guatemala. During this trip I will serve as a research photographer and document our travels so that we may highlight this trip on our website. I will also be tasked with photographing the ancient Copán Ruinas, a classical Mayan period site. We would like to capture high-resolution photographs of particular monument details to further Dr. Richard Sandoval's current research regarding the site, and to showcase in later publications. These photographs will also be posted on our website, as many individuals have expressed interest in learning more about Ch'orti' and Mayan art and culture.

I will discuss my role as a research photographer during the trip and share the photos I captured. I also plan to discuss how the photos produced on the trip will highlight the research process and give contributors and users of the website insight on the methods of the project and its goals, as well as how they could be used to analyze and better understand the Copán Ruinas themselves, and its importance to the study of Maya language.

Investigation into tubular rock formations found on the Weber Formation in Dinosaur National Monument

Andrew Green – Geology
Faculty Mentor: Barbara EchoHawk

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 204

Abstract: During a permitted excursion in the Outlaw Park area of Dinosaur National Monument, in September 2021, my climbing partner and I discovered some peculiar sedimentary structures in the eolian Pennsylvanian Weber Formation. For my undergraduate research, I am trying to determine what these unusual rock formations are and how they formed. The structures I am studying are atypical in distribution and form. They are branched, tubular structures with sedimentary layering in them. Structures like these are uncommon in eolian cross-bedded sandstones such as the Weber Formation, and their well-defined cores make them even more unusual.

Method of Inquiry: For examining the samples, I would utilize the laboratory equipment at MSU Denver under my professors' guidance. MSU Denver is equipped with XRF (X-ray fluorescence), XRD (X-ray diffraction), and (ICP-MS Inductively coupled plasma mass spectrometry) instrumentation that analyzes the elemental makeup and mineralogy of these structures. We would also make a petrographic thin-sections in our lab and examine them using polarized light microscopy.

Impact: I believe that this study will expand our knowledge of prehistoric Colorado and give a better understanding of what Colorado looked like during the Pennsylvanian Period, about 300 million years ago. During our last excursion to Dinosaur National Monument to gather the samples, we also found evidence of Iron-rich deposits that were perpendicular to the cross-bedded sandstone. This could also be evidence of prehistoric iron-rich bacteria living near the shorelines. The formations we found could be but not limited to trace fossils (paleoburrow casts), Fossils (casts of tree or plant branches), or non-fossil fluid-induced structures.

Advancements in the quest to identify a coral gene sequence

Maria Green – Biology
Co-Author: Brooke Paslay
Faculty Mentor Maria Cattell

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #5

Coral have been observed to increase the expression of the green fluorescent protein (GFP) gene during symbiont recruitment after bleaching events. This upregulated expression can be manually induced using gene editing tools, such as CRISPR/Cas9, but in order to do so, the entire sequence of the target gene must be known. The complete GFP sequences of many coral species have not yet been documented, which creates limitations for these genetic-based conservation efforts. *Echinopora lamellosa* is a coral species that's commonly used in reef-restoration projects due to its high adaptability and growth rate, also making it a promising candidate for successful transgenic propagation. While the complete *E. lamellosa* GFP sequence is not known, it has been documented for closely related coral genera. By aligning and comparing these GFP sequences, our lab previously designed degenerate primers to target the expectedly similar sequence in *E. lamellosa*. When used to amplify off genomic DNA template, some primer pairs successfully produced small segments of coral GFP sequence, but others have produced inconsistent results. Specific primers were designed for the new sequence segments and were paired with degenerate primers to expand amplification into surrounding unknown sequence. A cDNA template was used instead of genomic DNA to increase the potential for the degenerate primers to target GFP and reduce inadvertent PCR amplification. The new PCR products are currently being prepared to be sequenced. These results will establish more sequence data for the *E. lamellosa* GFP gene, advancing its prospects for CRISPR/Cas9 based genome modification.

Flight (Patterns) of the Bumblebee: Effects of Color and Motion

Kristen Gustafson – Biology
Co-Authors: Sarah Broadwell and Thomas Chandler
Faculty Mentor: Jonathon Dyhr

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #6

Animals make constant life and death decisions based on sensory information collected from their environment. The brain integrates and assesses the reliability of sensory information to make decisions, resulting in adaptive behaviors. We can use an animal's movements to understand how the brain is processing information from the environment. Bumblebees are good model organisms because they rely heavily on vision, an easy sense to experimentally manipulate, and have predictable, goal-oriented behaviors such as foraging. Bumblebees possess sophisticated trichromatic visual systems that are sensitive enough to detect the flicker of projected images, but it is unclear if that sensitivity at the early sensory levels translates to differences in behavior. One of our experiments will test the bees' response to projected images as compared to printed images. Projected images make it easier to manipulate the visual environment during flight, but if the bees respond to the flickering of the image rather than the image itself, the projected image will not be useful. We know that the bees' brains are physiologically capable of detecting the flicker, but this experiment will help us evaluate whether this capability is behaviorally important. We have set up a flight tunnel with a projected image on one side and a printed image on the other side. If the bees fly down the center of the tunnel rather than one side or the other, then this will demonstrate how flicker detection is behaviorally unimportant. Alternatively, if the bees do respond to the flicker, the way in which they respond may give us insight into the processing of information from sensing to behavior. The ultimate goal is to understand how the brain processes and combines different information streams to create a unified "picture" of the environment and how bees use that picture to make navigational decisions.

Clarity Sans

Hannah Hamid – Communication Design
Faculty Mentor: Kelly Monico

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 204

We often overlook some of the more banal applications of design, even in something as seemingly mundane as the fonts we encounter. But what about those elderly couples leaning in together over their phones in dimly lit restaurants around the globe? If the text on the phone is illegible, suddenly the debate about inclusion and ableism takes a new form. Are the most common fonts we use prohibitive for those with difficulty reading? Do they prevent different types of people from using their phones in a meaningful way? For instance, HOW DOES IT FEEL WHEN YOU READ TEXT IN CAPITAL LETTERS? Most can agree that a simple shift in the letters can entirely change the meaning.

Designer Hannah Hamid has always had a recurring desire to use design as a tool for positive change in communication. She decided to address the root problems with typeface legibility through Clarity Sans.

Clarity Sans offers a solution for the lack of accessibility in mobile devices for individuals with cataracts. According to the CDC, 4.2 million Americans 40 years or older are legally blind or have low vision. As people age, they will almost certainly develop cataracts — a vision impairment that causes the eye's lens to become cloudy, resulting in blurred vision. It is a challenge for those affected by visual impairments to navigate their devices and read information, especially when the text size is small. This is a concern for all of us as we grow older. Clarity Sans is an effective solution because it has distinguishable letters, including extra space in and around the shapes. By enhancing the characteristics of each letter to differentiate them from one another, Clarity Sans is legible for users with cataracts.

Love the Sinner, Hate the Sin: Investigating the Religious Trauma imposed on Queer People through Abrahamic Religions

Kye Hearn – Psychology
Faculty Mentor: Sonny Dhoot

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 204

Religion has long been seen as a shield against mental health issues; however, there is a trend showing up for queer individuals who have grown up in religion. Many LGBTQ+ individuals are experiencing religious trauma from those same religions that are supposed to lessen mental illness. This paper asks, how does religious trauma impact the mental health of queer individuals and how can mental health professionals better help LGBTQ+ individuals to heal from that trauma. Using interviews, this research examined the experiences of LGBTQ+ individuals who grew up in religion and believed they had suffered religious trauma. The qualitative data was analyzed through an interdisciplinary frameworks of childism, feminist affect theory, trauma theory, and religion as a happiness project. This research points out the particular needs of LGBTQ+ individuals who have been failed by religion, and how mental health professionals might be able to better assist them in healing and learning.

Radical Healing: Sound healing and Mental Reprogramming for Women Veterans

Kelly Hein – Psychology
Faculty Mentors: Jovan Hernandez and Randi Smith

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 203

In the realm of healing, we embark on an unprecedented journey, charting a path that transcends conventional approaches. Our mission goes beyond a standardized solution; it is an innovative and revolutionary endeavor that seeks to reshape the future.

This pioneering program is tailored explicitly for Women Veterans, a demographic deserving of unique care and consideration. Rooted in a commitment to holistic well-being, we combine the ancient practice of sound healing with state-of-the-art mental reprogramming techniques. Our objective is to guide these resilient women from the shadows of their past toward a future radiant with possibility and tranquility.

The strength of our program emanates from a symphony of healing, resonating at the core of our being. By employing crystal singing bowls, Tibetan sound bowls, and multi-instrumental soundscapes, we

orchestrate a transformative experience that nurtures the soul, reconstructs the spirit, and empowers these remarkable individuals to reclaim their life narratives.

What sets our initiative apart is its pioneering nature. We tread uncharted waters, devoid of established evidence or precedents, blazing a trail that represents an innovative paradigm shift. This approach aims not only to validate our methods but also to pave the way for future explorations within the field.

Our vision is to seamlessly merge ancient wisdom with contemporary understanding, emotional Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 203 evidence, thus crafting a holistic healing experience of unparalleled depth. We aspire to be architects of a new era, one in which every woman veteran steps into a life defined not by adversity endured, but by resilience revealed.

Bridging Disciplines and Communities: A User-Centered Approach to Designing the Sustainability Hub Interface for Enhanced Interactivity

Jacqueline Hernandez – Computer Science
Co-Authors: Cece Housh and Cuong Dinh
Faculty Mentors: Daniel Pittman and Alyssa Williams

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 203

The Sustainability Hub serves as an innovative platform for integrating and making sustainability data widely accessible to diverse users across Colorado, with a primary research focus on developing a user interface that addresses the community's unique needs. Our work focuses on the user-centered design of the Sustainability Hub interface, aiming to create an inclusive and accessible interface that incorporates functionality deemed most critical by expected user groups within the state. Through an interdisciplinary collaboration, this initiative combines expertise in data management and user-centric design to craft a design that responds to the direct input from community stakeholders. This collaborative approach ensures the development of a responsive and intuitive platform, facilitating data-driven decision-making and enhancing sustainability awareness among a broad spectrum of users. A key aspect of this approach is the use of prototyping in the Sustainability Hub's design, which enables early user testing and collaborative feedback, ensuring the interface is both functional and user-friendly across devices. By adhering to Human-Computer Interaction practices, the team iteratively refines prototypes, enhancing usability and meeting community expectations efficiently. We have measured success based on the prototype's effectiveness in user task completion, inclusivity, and user satisfaction, with long-term engagement measured through user retention and activity. This research underscores the critical role of user-centered design in developing a sustainable, community-focused platform for the Sustainability Hub, providing a strategic framework for integrating diverse requirements across several different disciplines.

Evaluation of the Ch'orti' Project Website: Community Feedback

Lucien Herzog – Linguistics
Faculty Mentor: Richard Sandoval

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 204

I would like to present on the results of the Ch'orti' Project's most recent trip to Guatemala. The Ch'orti' Project is a project housed in the Ethnography Lab that is dedicated to the language documentation of the Ch'orti' (Mayan) language. Since the founding of the project, students have traveled to Guatemala to cultivate relationships with the Ch'orti' community and language organizations. However, due to the COVID-19 pandemic, the Ethnography Lab has not been able to contact these communities for several years.

In March of this year, we will be traveling to Guatemala to rebuild our connections with these language organizations and community. Since the pandemic, we have also been working on a website to provide access the community with language resources. We plan to show them the work that we have done on our website, which began in the first year of the pandemic. Given that our goal is to provide access of resources to the community, their input is crucial to the development and success of our website. We will be asking leaders of these community-led organizations if the information on our website is useful, what else they may need, and other ways we can best support them (such as the promotion of the Ch'orti' community's projects).

During my presentation, I will talk about the Ch'orti' Project, our website, and what we accomplished on our trip in respect to connecting with community members and eliciting feedback. I will also discuss the next steps that the Project can take in the development of our website based upon the feedback received. I plan to use photos and other visuals to describe our website and the context of our trip.

Threading the Mediterranean: Silk in Norman Sicily

Amy Hollingsworth – History
Faculty Mentor: Kim Klimek

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 202

This presentation focuses on the production and trade of silk in the Norman Kingdom of Sicily, offering a broad examination of the role of Sicily within the wider medieval Mediterranean textile trade. Silk, the costliest and most valuable textile in the Middle Ages, played an important diplomatic, economic, and cultural role in the Mediterranean. From Byzantine emperors to Umayyad caliphs, silk garments were a signal of wealth, authority, and sophistication. Christian churches used silk to drape cathedrals, cover altars, and wrap the relics of saints. Sicily's central location in the Mediterranean made it a natural nexus for trade in this valuable commodity, but the story of silk in Sicily, like the story of medieval Sicily itself, is a complicated one. Contested between a series of powerful religiopolitical centers, Sicily passed from Goths to Byzantines to Fatimids between 500-1000 CE, each leaving a mark on the population, culture, and technology of the island. When the Normans conquered Sicily in the eleventh century, they proceeded with a syncretic approach to integrate the diverse economic, religious, and cultural endemic practices with their own. Silk was an important component in the rule of Roger II, the first Norman King of Sicily.

This presentation examines the policies of Roger II on silk production and trade in Sicily, the role of sericulture in the Sicilian economy, and the organization of silk workshops and the royal tiraz in Palermo. Additionally, this presentation seeks to contextualize Norman Sicily's silk economy within the existing

commercial and cultural networks of the Mediterranean. Finally, King Roger II's use of silk as a cultural signifier will be explored as part of his larger strategy of creating a "Mediterranean" kingdom.

Performative Arts and the Art of Communication

Joe Hoover – Speech, Language, Hearing Sciences
Faculty Mentor: Jessica Rossi Katz

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 202

This project explores the impact of performative arts on social communication, adaptability, teamwork and creativity in adults with autism spectrum disorder. Many participants in the ISSAC program (Integrated Supports for Students with Autism in College) - offered through the Bookhardt Family Speech-Language Clinic - have goals that include being more outgoing in social settings, decreasing feelings of awkwardness and improving communication skills. We are interested in how the nature of performative arts may affect cooperation among ISSAC group members who have had little-to-no prior experience in elements such as character development, improvisation, collaboration and adaptability on stage. We share findings from the literature on the use of drama techniques with traditional communication interventions. Then, we describe how we incorporated a basic short-form improvisation class that mixed performance techniques with the ISSAC group and offer our observations as to how improv influences participants' goal attainment. We also consider how incorporating creative methods may help build rapport and social skills when engaging with diverse individuals in different academic and clinical contexts.

Distinguishing between the top-down and bottom-up effects of invasive crayfish on community structure using stable isotope analysis

Zainab Hussain – Biology
Co-Author: Amy Nash
Faculty Mentor: Jason Koltz

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #7

Crayfish are common inhabitants of rivers and lakes in Colorado. They are omnivorous and consume a wide variety of plants and animals. Crayfish are also an important food source for native fishes. Rusty crayfish, native to the Ohio River Basin, were first detected in Colorado in 2009 and have joined native and established non-nuisance crayfish populations in a handful of Colorado lakes. They are a concerning invasive species as they tend to be larger, more aggressive, and more voracious predators than native crayfish, which they displace from their burrows. Because of their size and behavior, they are also often avoided as potential prey. As omnivores, they can affect community structure from the bottom up by eating aquatic macrophytes, or from the top down by consuming predatory invertebrates and fish eggs. In this study, we will evaluate the impacts of invasive crayfish of varying sizes through stable isotope analysis. As consumers tend to resemble the $\delta^{13}\text{C}$ of their food sources, and different plant species vary in $\delta^{13}\text{C}$, analysis of $\delta^{13}\text{C}$ may allow us to ascertain important plant foods for crayfish. As incorporation of ^{15}N in animal tissues correlates positively with trophic level, analysis of $\delta^{15}\text{N}$ will allow us to better understand whether distinct size classes of invasive crayfish are feeding at higher or lower trophic levels,

and thus conclude whether they are having greater bottom-up or top-down effects on community structure.

Macbeth

Cecilia Jones – Theater

Mentors: Alyssa Ridder and Carrie Colten

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 204

As the dramaturg for MSU Denver's production of Macbeth, my role has been to understand the play from both a world-building and textual perspective then present my findings to my production team and cast engagingly. I started by providing resource images and research on horror science to our production team due to the show's focus on horror. This included focusing on mask work in horror movies and how they give us the heebie-jeebies. The director wanted tattoos to be part of this world's culture without setting this production of Macbeth in any particular place or time so I researched the history of tattoos to use as inspiration for our styles. The director also asked me to create my very own language for the witches to cast curses in. It was never something I thought I would add to my resume but it was a fun experience.

Once, pre-production began I was tasked with preparing actor packets for the cast. These are packets with all the “given circumstances” of the person they are playing (who they were, when they lived, how similar Shakespeare’s portrayal to the real person, etc) as well as containing a history of the character. Over the years, Shakespeare’s plays have been performed by the most famous actors of their time again and again, but rarely are they played the same. I studied past productions with a focus on queer and gender-bent productions to best represent our cast. It has been a joy and an honor to be the dramaturg for Metropolitan State University's production of Macbeth.

The Great Mahele: Racial Inequality in Land Reallotment on Maui

Katherine Kolkmeier – Anthropology

Faculty Mentor: Sylvia Brady

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 204

Before 1848, the land we now know as Hawaii was not owned by the people who lived there. Parcels of land (ahupu’a, ’ili) were divided into small units (kuleana) cultivated by families and larger units used in common. The people were sustained by a tradition of sharing and common use. That changed in 1848. King Kamehameha III and 245 ali’i and konohiki, Hawaiian nobility, decided to distribute the land. This event became known as The Great Mahele. In theory everyone from the lowest peasant to the nobility to foreigners were allowed to petition to own land in Hawaii. This was not the case. There were several factors that determined whether someone received the land that they petitioned for. How did race, gender, and crop type affect the chances that someone would receive the land they petitioned for? The Great Mahele happened over 176 years ago, but its effects are still being felt in Hawaii today. I will be comparing land distribution maps detailing which plots were awarded and which were not. I also have historic records that list every person who petitioned for land, and whether they were successful. I

believe that race and gender played a big role in who successfully received land during The Great Mahele. Men were more likely than women, and foreigners were more likely than locals. With more research I will be able to better explain what truly occurred in 1848 and how it still impacts which people are able to live in Hawaii today.

New Class of SHAPE Probes known as Thioester Electrophiles

Gage Leach – Biochemistry

Co-Author: Drew Schlink

Mentor: Shailesh Ambre and Megan Filbin

Poster Presentation, Session IV (3:30 pm – 4:45 pm), Poster #10

Amid the urgency to combat the COVID-19 pandemic, the quest for an effective vaccine prompted a renewed focus on understanding RNA structures. This renewed the interest to explore the intricate relationship between RNA structure and function. Over the last few decades, development of new technologies has enabled structural biologists (and even non-structural biologists) to determine RNA structures with improved efficiency and accuracy. Selective 2'-Hydroxyl Acylation analyzed by Primer Extension (SHAPE) is a technique that emerged similarly with great potential to decipher RNA structure. It employs chemical probes to modify unpaired nucleotides, providing insights into the loop formation of RNA in both secondary and tertiary structures. Various probes demonstrate effectiveness in both in vitro and in vivo profiling of RNA with varying efficiency. Most traditional molecules such as 1H-Imidazol-1-yl(2-methyl-3-pyridinyl)methanone (NAI) and N-methylisatoic anhydride (NMIA), though effective, are short-lived electrophiles that are highly reactive, and necessitate synthetic expertise. There is also evidence of existing probes favoring the modification of specific nucleotides over others. This necessitates exploration of new probe chemistries that enable broader coverage and require minimum synthetic expertise for wider participation from RNA community. We are investigating thioester electrophiles as a new class of SHAPE probes. In this work we present our progress in the direction of building water-soluble thioester SHAPE probes and their kinetics using high performance liquid chromatography (HPLC). We are investigating nucleotide preference and its ability to label RNA in vitro and in vivo. Our work adds a new class of electrophiles to the SHAPE toolkit with improved water solubility and potential to explore in vivo SHAPE probing.

Demystifying the Magic of Python: CPython Internals

David Lee – Computer Information Systems

Faculty Mentor: Daniel Haupt

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 203

Python, renowned for its simplicity and elegance, often appears as a language of 'magic' to its vast community of users. This illusion of simplicity is masterfully upheld by CPython, the predominant Python interpreter. Written in a blend of human-readable C and Python code, CPython stands as a testament to the art of software abstraction, effectively bridging the gap between user-level Python scripting and the intricate realms of system-level programming. This research delves into the internal mechanisms of

CPython, shedding light on how it simplifies complex tasks and masks the underlying technicalities of the C platform and the operating system.

At the heart of this exploration is an examination of CPython's approach to threading. Python, often criticized for its Global Interpreter Lock (GIL), nonetheless offers a straightforward and cross-platform threading experience. This study investigates how CPython manages this feat, balancing ease-of-use with the inherent limitations of its threading model. Moreover, it dissects how CPython handles memory management, a task notoriously difficult in C, through reference counting and garbage collection, thus saving Python developers from the intricacies and pitfalls of manual memory management.

Additionally, this research provides insights into CPython's bytecode interpretation, its method of converting high-level Python code into a format that can be executed by the interpreter. By dissecting the bytecode execution model, we unveil the seamless interaction between Python code and the lower-level operations that empower it.

In conclusion, this research not only demystifies the 'magic' behind Python's ease of use but also provides a comprehensive understanding of CPython's internal structure. It aims to bridge the knowledge gap for Python enthusiasts, offering a clearer view of the inner workings of one of the most popular programming languages, thereby enhancing their appreciation and mastery of Python.

Expression Pattern of the *ndnf* Gene in Zebrafish Craniofacial Development

Jessica Lee – Biology
Faculty Mentor: Vida Melvin

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #8

Neuron-derived neurotrophic factor, also known as *Ndnf* is a secreted protein that regulates migration, growth, survival, and differentiation of neurons. *Ndnf* is conserved in many animals including zebrafish ortholog that has about 78% amino acid identity to the human protein. Zebrafish are vertebrate animals that are good models to study development as gene expression and development are easy to observe in nearly transparent embryos. Previously, *ndnf* was identified as a novel gene that could have a role in craniofacial development. Knockdown of *ndnf* in zebrafish embryos caused reduction of ethmoid plate and cartilage deformity in the viscerocranium and neurocranium. Interestingly, NDNF was also identified as one of many causative genes for congenital hypogonadotropic hypogonadism (CHH) which has low penetrance of associated oral facial clefting. To further study the specific function of *ndnf* in craniofacial development, we used in situ hybridization which allowed us to examine spatiotemporal gene expression of *ndnf*. Based on our data, *ndnf* is expressed in the developing cartilages as the embryonic skeleton forms between 36 and 72hpf. To confirm our data, we will be using fluorescent in situ hybridization with fli-gfp fish which expresses the GFP reporter in the cells that will become the cartilage. These data will support our studies of the phenotype associated with loss of *ndnf* function zebrafish embryos.

Spatial and Temporal Analysis of Drug Possession in Denver, 2019-2023

Kyra Liberski – Criminal Justice & Criminology
Faculty Mentor: Hyon Namgung

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 200

Drug use is one of the most preventable causes of death and illness, yet it has been a persistent issue in Denver over the past five years. Conducting a spatial and temporal analysis of drug possession is crucial to locating areas that require enhanced security measures and allocating resources for those who seek help overcoming addiction. By comparing the data from 2019 to 2023 in Denver, Colorado, researchers can identify patterns and determine the optimal areas for increasing aid to resources. This analysis will distinguish correlations between demographic factors and areas with a high density of drug possession. The drugs examined in this study included cocaine, heroin, methamphetamines, hallucinogens, marijuana, paraphernalia, opium, narcotics, and barbiturates. This analysis utilizes ArcGIS, a cloud-based geographic information system, and secondary data from Denver Open Data Catalog regarding drug possession. After identifying hot spots, data consisting of race, age, income, and education level of the residents in the area will be analyzed to find patterns of high-risk potentiality. Additionally, the research will look for connections between the time of day, month/season, and location of each drug possession charge within Denver. The goal of this research is to raise awareness, point out the need for drug policies, and advocate for policymakers to enact changes that would help populations who struggle with drug abuse in Denver, Colorado.

wassilykandeez.: A Creative Journey through Hip Hop, Hardcore, and Electronic Fusion.

Jalen Lomax – Art
Faculty Mentor: Matthew Jenkins

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 200

wassilykandeez./kandeez. is an eclectic musical project by Jalen D. Lomax that blends influences from hip hop, hardcore, and electronic music in order to create captivating sonic experiences. With a focus on authenticity and creative expression, wassilykandeez. is an outlet for Jalen to explore instrumental performance, beat production, and video.

At its core, Kandeez., embraces melodic freedom and rhythmic intricacy by exploring the limits of harmonic complexity and rhythmic diversity. In practice, this leads to compositional choices that feature an interplay of octaves, pitch-shifted chords, and syncopated drum patterns with the goal of creating dynamic songs that get the listeners head nodding and feet tapping.

But this project isn't just an exploration of theory – it's also about the journey of learning how to apply musical concepts in reality and including the listener in that practice regardless of skill level. Music, is an auditory experience that everyone should feel welcomed to participate in and communicate about. This belief can be seen in the content produced for kandeez. both on social media and in a real life setting. As ear and eye candy is prioritized just as much as content communicating and demonstrating how musical ideas for kandeez. come to life.

Whether enjoying kandeaz. from the comfort of your own bedroom or in public setting with a group of friends the goal of this project is to show just how fun arranging sound and time can be.

Rocky Flats: At What Cost?

Haley Nicole Longcrier – Communications and English
Faculty Mentor: Christina Foust

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 202

The Rocky Flats Plant, a former nuclear weapons manufacturing plant, operated between 1952 and 1989, but the plant wouldn't officially close until 1992. The Rocky Flats facility was crucial for the production of nuclear weapons until the Nuclear Arms Control bill was signed by President Bush in 1992, which limited, and then, halted the production of new Nuclear weapons in the United States (Gordon, 1992). In its nearly 30 years in operation, Rocky Flats helped to produce the "triggers" that are used in nuclear weapons, also called plutonium pits, these allow for nuclear weapons to be detonated, causing the fission reaction that creates a nuclear explosion (DOE, 2008). It is unknown exactly how many triggers were produced at Rocky Flats, but we do know that the plant employed more than 20,000 people (Ackland, 2015), and there were more than 800 structures in the Rocky Flats industrial zone at the time of its closing (DOE, 2023).

After the plant's official closure in 1992, the buffer area around Rocky Flats has been transformed into a wildlife refuge that is open to the public. Through this oral history project, I will be evaluating the role of environmental communication and greenwashing plays in our memories and future action regarding Rocky Flats. Hearing the stories of people who worked at, or lived down-wind of, Rocky Flats gives us a glimpse into the way that Rocky Flats has impacted people's lives. This oral history project seeks to tell the honest stories of people who have been affected by Rocky Flats, in a variety of different ways. Including, their relationships to nuclear weapons and power, their personal and familial health battles, and how they feel about Rocky Flats now. Learning about the human impact of Rocky Flats can help guide our actions moving forward.

The Influence of the Gut Microbiome on Mental Disorders

Victoria Makkiya – Nutrition and Dietetics
Faculty Mentor: Nyki Giasolli

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #9

Mental health disorders affect 970 million people worldwide. According to research conducted by Tufts Medical Center, the U.S. spends an estimated \$87.5 billion on the treatment of mental disorders annually. The gut microbiome, also known as the "second brain", is correlated to many mental disorders. By treating patients in a holistic approach, it could help people reach long-term remission without side effects of pharmaceuticals. The gut and brain are connected via the gut-microbiome-brain axis, which is a bidirectional communication network that links the central nervous system and the enteric nervous system. When there is a disturbance in the route of the signaling pathway, it can lead to mental disorders. Disorders such as anxiety, depression, bipolar, schizophrenia, and anorexia nervosa have all

been correlated to dysbiosis of the gut microbiome. Suggested interventions for many of these disorders are the use of probiotics, prebiotics, high fiber intake, and fecal microbiota transplant. This research is a literature review analyzing the research suggesting there is a connection between the gut microbiome and mental disorders, and evaluating the treatment of such disorders with their connections to the gut microbiome. Criteria used to find information were terms “gut microbiome and mental disorders”, “gut microbiome and eating disorders”, and “mental health status in the United States”. Publications with case studies using human and rodent research were used, and research no more than ten years old was utilized. A limitation of these studies is that more human trials are needed.

The efficacy of Finish What You Started for college persistence and degree attainment

Diego Maldonado Lopez – Psychology
Faculty Mentor: Sara Jackson Schumate

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 203

College success and completion have remained an acute concern across all colleges historically. Research has demonstrated that multiple factors impede students from enrolling and committing to pursuing their academic objectives, such as insufficient financial aid. Unfortunately, due to the lack of attention paid to students by faculty and staff, many students drop out as they are on their own. Since 2021, the Finish What You Started (FWYS) program at the Metropolitan State University of Denver has been devoted to motivating and helping fund students to return to higher education to graduate. The financial incentives combined with wrap-around student support services are designed to improve retention and degree attainment rates. The scholarship is provided to students who return to college after having stopped out and are experiencing financial difficulties. Students work with a success coach to develop a plan to complete their degree. Through interviews with current students and alumni, this study examines the multiple factors in students’ lives to gain insight into the limitations that keep them from attaining their degrees and meeting their desires to further their education, as well as how they overcome those barriers. Also, the study will evaluate the efficacy of the FWYS program in terms of the degree of assistance to students financially, depending on the stipend and the student’s financial need, and academically by referring to resources, advisors, and access to more scholarships. Lastly, to better understand the advantages of the program along with which areas to improve, students provided feedback on both the strengths and weaknesses of the program concerning fulfilling their personal needs.

Optimization of *Bacillus Calmette–Guérin* and RAW 264.7 Cells

Dominique Malott – Biology
Co-Author: Tagwa Alsanousi
Faculty Mentor: David Merriam

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #10

Bacillus Calmette–Guérin (BCG) is an attenuated strain of *Mycobacterium bovis* used as a vaccine against tuberculosis. The BCG vaccine exhibits trained immunity reducing the mortality rates in children. We are developing a model to study trained immunity, in which BCG is used to prime RAW 264.7 cells, an

immortalized murine macrophage cell line, after which time we will then assess phagocytic capacity of these cells against other fluorescently tagged particles. To do this, we will need to determine optimal growth conditions of both BCG and RAW 264.7 cells. To optimize the growth of BCG, we tested three variables: incubation temperature, agitation, and broth inoculation temperature and assessed growth of these broth cultures via optical density with a spectrophotometer. We grew RAW 264.7 cells following manufacturer's recommended media, supplemented with Penicillin and Streptomycin, at 37C ° with 5% CO₂. We assessed cell confluency, and at approximately 70% confluency typically every 2-3 days. We passaged them into two or three flasks depending on the amount of growth. We froze cells for long-term storage in LN₂ using either media supplemented with 5% DMSO or pure FBS supplemented with 10% DMSO and successfully recovered cells on re-thaw from media with 5% DMSO but not pure FBS with 10% DMSO. From the results of these experiments, we will analyze the growth kinetics and develop the optimal culturing protocols for both respective cell cultures. With protocols optimized for our lab, we will provide a steady supply of both BCG and murine macrophage cell cultures, which will be necessary for future experiments. We will use these optimized cells to assess phagocytic potential, cytokine expression, and alterations in the phenotype of RAW 267.4 cells using flow cytometry.

Variation of Lactate Dehydrogenase with Relation to the Heat Shock Response of *Oncorhynchus clarkii stomias*

Eleanor Mancilla – Biology
Faculty Mentor: Douglas Petcoff

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 200

The Greenback Cutthroat Trout (GBCT) *Oncorhynchus clarkii stomias* is a threatened subspecies of Cutthroat Trout native to the Rocky Mountains. Their population is mostly maintained by a broodstock in Zimmerman Lake. However, they suffer from a fair amount of inbreeding depression as a result of genetic bottlenecks. This may be the reason embryos from this lake have been noted to be very difficult to raise. Some threats faced by GBCTs are climate change, invasive trout species, and Whirling disease. One way to look for broad genetic issues is by examining the differential expression of mRNA under heat shock. This also helps gain insight into their response to climate change. To explore this, a common gardens experiment examining the transcriptomic response to acute thermal stress was designed by Dr. Kevin Rogers and Dr. Douglas Petcoff. The GBCTs from Zimmerman Lake were compared to three populations of Colorado River Cutthroat Trout (CRCT) *Oncorhynchus clarkii pleuriticus* and a population of Yellowstone Cutthroat Trout (YSCT) *Oncorhynchus clarkii bouvieri*.

One enzyme that is a well-studied model for the adaptation of thermal tolerance is Lactate Dehydrogenase (LDH). The presenter's role in this study was to examine the differential expression of LDH under heat shock. It was found to be downregulated in GBCTs. RT-qPCR was also performed to validate the RNA-seq data from the experiment. Two pairs of primers were designed based off *ldha* and *ldhb* sequences from Rainbow Trout (RT) *Oncorhynchus mykiss*. These were designed to anneal to the exon four/five junction of the gene, which is directly downstream of a highly conserved proton transfer site (GEHGDS in the A isoform, GEHDTS in the B isoform). Exon junction spanning primers were picked to filter out genomic contamination.

Active Learning Courses Effect on the Mindset of Undergraduate STEM Students

Brandon Martinez – Psychology and Philosophy
Co-Authors: Charles Ciociola and Cath Martin
Faculty Mentor: Cynthia Erickson

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 203

The nature of educational instruction can profoundly affect a student's mindset. Among the many pedagogical methods, active learning has been posited to foster deeper understanding, better retention, and greater engagement. Active learning can be characterized by higher levels of student engagement throughout the learning process rather than the traditional lecture instruction where learning is passively and potentially poorly retained from the instructor. This research seeks to understand the relationship between active learning courses and mindset, particularly the shift between fixed and growth mindsets. A fixed mindset regarding education is the set belief that intelligence levels are static such as someone believing they are not a “math person.” A belief in a growth mindset is that there are ways to expand one’s own intelligence and understanding capabilities.

Implementing active learning strategies into the classroom could help overcome these hurdles by building a sense of community within these students, enhancing engagement with professors, and providing practice and problem-solving techniques that they will use both in school and in the real world. When applied throughout an undergraduate course, active learning, as we have defined it, fosters critical thinking and the application of knowledge, which are essential skills in the modern world. The goal of our research was to determine if an active learning course leads to an increase in first-generation students’ mindset from fixed to growth. We hypothesize that first-generation undergraduate students who engage in active learning courses will demonstrate a significant positive shift in their academic mindset compared to those in traditional lecture-based courses.

Do Extreme Risk Protection Orders (Red Flag gun laws) in Colorado have an impact on firearm suicide incidence?

Katie McGhee – Geography
Faculty Mentor: Sylvia Brady

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #12

Gun violence is a persistent public health risk in the United States. People fear mass shootings, yet suicides account for most firearms deaths in Colorado. According to the CDC, between the years 2015 to 2019, 76% of firearm deaths are suicides and 20% are homicides in Colorado. Extreme Risk Protection Orders (ERPO’s) or red flag gun laws, aim to prevent gun violence by permitting law enforcement to temporarily remove firearms from a person believed to be a threat to others or themselves. They are civil court orders that need approval from a judge. ERPO’s can be filed by law enforcement officers, district attorneys, licensed medical professionals, licensed mental health professionals, family and household members, and licensed educators. Colorado passed ERPO’s in 2019 and came into law Jan 1, 2020. The use of ERPO’s is hindered by the public’s lack of knowledge and confusion on how to file ERPO’s. Citizens claiming ERPO’s infringe on the second amendment right to bear arms has led to 39 of 64 Colorado counties passing Second Amendment Sanctuary resolutions. Law enforcement will not

follow ERPO's laws in these counties. Examining ERPO's reasons for being filed (person in crisis being a threat to self, other, or both others and self), if the ERPO was successfully filed, why the ERPO was not filed, if the firearms were confiscated, demographics of those involved, can provide an idea of how ERPO's are being implemented. Comparing firearms suicide incidence (from Colorado Department of Public Health and Environment's Vital Statistics) since passage of ERPO's, the county's Secondary Amendment status, and ERPO case details can show us how these factors impact firearm suicide. This information can help in taking steps to address concerns or possible actions to limit firearm suicide.

Effects of non-coding region on translation of the blackcurrant reversion virus

Steven Mendoza – Biochemistry

Co-Authors: Steven Mendoza, Laura Baquero, Adam Nicks, Will Hogan, Luis Delgado-Garcia, Kate VandeVenter, and Bosun Olabode

Faculty Mentor: Megan E. Filbin

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #11

Translation typically begins when a 5' methylated guanosine cap binds initiation factors that subsequently recruit the protein synthesis machine: the ribosome. However, many RNA viruses are not capped and must use noncanonical mechanisms to recruit the ribosome to translate their viral proteins. Plant viruses in particular use a cap-independent translation enhancer (CITE) also known as a non-coding untranslated region (UTR) at the 3' end of the genome, that binds initiation factors and delivers them to the genome's 5' end through an end-to-end RNA-RNA interaction. In the Blackcurrant Reversion Virus (BRV) the CITE structure and function are unknown. Preliminary secondary structure and functional data point toward important BRV CITE elements. To identify whether viral variants with natural mutations support our data, we aligned 3' CITE sequences from geographically broad variants of the BRV RNA-1 genome. We then mapped all conserved and variable sequences onto our preliminary secondary structure and compared them to our functional data to verify that the conserved variant sequences are structurally important for viral translation initiation. We also used minimum free energy structure predictions to identify structural similarities across the RNA-1 variants and found universal conservation of two stem-loop structures that are also present in the BRV RNA-2 genome. Combining our variant sequence alignment and modeling with our empirical structure and functional data highlights the specific structures and nucleotide sequences important in initiating translation and begin to define the mechanism of BRV's non-canonical translation initiation. This approach also allows us to learn more about how end-end RNA-RNA interactions affect translational efficiency. With the discovery of specifics like this, we can create therapeutic drugs that bind to specific sequences/structures to treat plants infected with BRV.

Adapting Microwave Synthesis for High Altitude Learning Environments

Dominic Mestas – Chemistry, Community College of Denver

Faculty Mentor: Lisa Eytel

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #8

Microwave reflux techniques have been effective in decreasing usage of both time and energy, but commercial microwave reactors are prohibitively expensive for many teaching institutions. Historically, domestic microwaves have been used successfully in a teaching environment but no consistent relationships between power settings, wattage, and heat time have been established in the literature. Our institution is also impacted by a high-altitude variable which impacts reaction times and temperatures. To establish a predictable relationship in order to easily replace reflux conditions with a microwave reaction, we investigated the impact of the time and power settings of a 1250-watt domestic microwave on different solvents and reaction vessels. These results provide potentially time, energy, and cost-saving measures for high-altitude chemistry teaching environments.

A Pilgrim's Guide to Tourism: How Medieval Pilgrims Helped Establish Tourism and the Tourism Economy in Religious Sites Across Europe and the Near East

Molly Mildenerger – Hospitality Leadership
Faculty Mentor: Kimberly Klimek

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 202

Religious Pilgrimages are a heavily researched and discussed topic, especially during the Middle Ages when Christianity, Judaism, and Islam consolidated their many beliefs into distinct sects of religious ideology and narratives. However, religious tourism is seldom used to describe the act of pilgrimaging despite fitting the definition of tourism. Jerusalem gained prominence through the dissemination of stories told through each faith's respective scripture: The Bible, The Torah, and The Quran. This paper will discuss how the religious pilgrimages to Jerusalem from the worshipers of the Christian, Islamic, and Jewish faith through the 11th to 15th century played a significant role in establishing Jerusalem as a major tourist destination. The influx of religious travelers from Europe, North Africa, and West Asia contributed to Jerusalem's status as a major destination for tourism, prompting changes within the city to accommodate the surge in popularity. Jerusalem evolved into a tourist destination driven by laws aimed at protecting pilgrims due to their cultural importance, the implementation of souvenirs marking visitors travels, and the city's adaptations to accommodate tourists. This paper will shed light on the impact that religious tourism had on the city of Jerusalem and its enduring impact on the city through the 11th to 15th century.

Gene Expression of the Cancer Regulator, *macc1*

Peyton Minner – Biology
Co-Author: Casey Roberts
Faculty Mentor: Vida Melvin

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #11

Metastasis associated in colon cancer 1 (MACC1) is a biomarker for cancer metastasis in humans and this gene regulates proliferation, metastasis, and resistance to apoptosis in over 20 different cancers. MACC1 is known to interact with multiple signaling pathways in cancer, including the HGF/MET, P13K-Akt, and Stat1/3 pathways and acts as a direct transcriptional regulator of the MET and NANOG genes. The normal function of MACC1 is largely unknown. Previously, *macc1* was shown to be expressed in zebrafish

embryos at 24 and 48 hours post fertilization. Additionally, morpholino knockdown of *macc1* led to craniofacial defects in zebrafish larvae, suggesting that *macc1* may play a role in craniofacial development. The *met* and *nanog* gene targets for *macc1* both play a role in development in zebrafish, but their connection to *macc1* in development is not known. The goal of this project is to expand our understanding of the gene expression patterns of *macc1* focusing on developmental timepoints and tissues that are known to express *met* and *nanog*. *Nanog* and *met* are expressed during early cleavage and gastrulation stages of embryogenesis and in adult tissues, including the ovaries and testes. I will use RT-PCR and in situ hybridization to detect *macc1* mRNA in the embryonic and adult tissues of wildtype zebrafish embryos. The data from these studies will direct our phenotype analyses in *macc1* loss of function mutants.

Factors that affect the quality and accuracy of data collection for health professionals

Merideth Miranda – Speech, Language, Hearing Sciences
Faculty Mentors: Jessica Rossi Katz, Sarah Beckman, and Sarah Gyory

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 202

Data collection is a key consideration for many health professionals because it directly connects to clinical outcome measures. Speech-language pathologists compose SMART (specific, measurable, achievable, relevant and time-based) goals for clients. Data collected during sessions help determine if a client is making progress or not; data also guide whether new goals will be developed, or existing goals will be modified. Although the ability to take good quality data is essential, it can be very difficult when working with young children (pre-K age range), whose behavior and moods can be unpredictable. Finding the data tracking system that works best for both individual clinicians and clients is essential. This project explores what factors impact the quality of data being collected, including factors specific to the behaviors of the client and the nature of the intervention activities. I draw from my own experience collaborating with graduate student clinicians and speech-language pathologists providing clinical services at the Auraria Early Learning Center. I offer tips to navigate different data-collection challenges with the goal of obtaining high-quality data. This work will be useful to any professional responsible for collecting data to inform decision making.

Human-Elk Interactions on an Aggression Scale

Victoria Mitchell – Biology
Co-Authors: Danielle Schucker and Victoria Mitchell
Faculty Mentor: Jennifer Gagliardi Seeley

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #6

Human disturbance causes wildlife to decrease important survival behaviors, which includes feeding, resting, migrating, reproduction, and parental care. With growing human-wildlife interactions, management protocols are suffering to keep up, which is causing crop damage, loss of animal sustainability, even injury or death to humans. However, over prolonged periods of human interactions, animals can become habituated to human activity. If habituation affects the humans' distance to the male elk, then we predict humans will be closer to elk and male elk aggression will be lower in Estes Park

than in Evergreen. In addition, if human presence affects wildlife behavior, then we should see a negative correlation between average human distance to elk and elk aggression scale. We observed Rocky Mountain Elk (*Cervus canadensis nelsoni*) in Evergreen and Estes Park during rut (mating season). Due to elk being corpulent, observations were taken at sunrise and sunset. We recorded the male elk's aggression toward humans approaching their harem. The average male aggression was higher, and the average distance was farther away in Evergreen compared to Estes Park. Based on the results, our hypothesis on habituation affecting human distance and male aggression was supported. This suggests that elk are more habituated to humans in Estes Park due to the large number of people that come to view the elk during rut. There was no significant correlation between human distance to elk and male aggression for both Estes Park and Evergreen; thus, we reject our hypothesis on the correlation between human distance and male elk aggression. Although not significant, a negative trend was observed in both Evergreen's and Estes Park's human distance to elk and male aggression. Gathering more data during future rut seasons will increase our sample size and could affect the correlation significance. This research could impact future human-elk conflict management plans.

Cytosine Methylation of Cherry Creek Freshwater Alga

Skylar Nicholls – Biology, Community College of Denver
Faculty Mentor: Mark Haefele

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #12

Epigenetics involves studying the stable phenotypic changes that do not occur from alterations in the DNA sequence. When a cell attaches a methyl group to the fifth position of cytosine, transcription is blocked, thus preventing the expression of genes encoded with that specific cytosine. For this reason, 5-methylcytosine (5-mC) is referred to as the “silencing gene” and is an important cell mechanism for the control of gene expression in eukaryotes. Additionally, methylated DNA is heritable, and can be passed on generationally. DNA can become methylated by many processes; however, this study is focused solely on environmental pollution stress and its effect on methylation levels in eukaryotic freshwater algae.

Investigating Detoxification: Researching Massage Cupping with an Interdisciplinary Lens

Adam Nicks – Biochemistry
Co-Author: Whit Oyler
Faculty Mentors: April Hill and Alexis Karris Bachik

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 202

Massage cupping as a therapeutic treatment can be traced back over 5000 years. Recently, through a combination of wellness influencers and high-profile athletes embracing this treatment, it has reached the level of general consumer familiarity. Despite its popularity, minimal research has been done into the effects of cupping treatment on the body. Specifically, the widespread claims that cupping detoxifies the body are unsubstantiated. As a licensed massage therapist administering cupping treatments, the primary author of this work witnessed firsthand the effects of massage cupping on hundreds of patients, including a small subset that experienced symptomatology consistent with acute detoxification. The author, an MSU Denver Psychology and Biochemistry double major, recruited two MSU Denver faculty members to serve as mentors on a multidisciplinary investigation of massage cupping.

We are developing a toxicology screening method using liquid chromatography with tandem mass spectrometry (LC/MS-MS) to screen urine samples collected pre- and post-cupping treatment. We are specifically looking for metabolites of a range of common environmental pollutants known as BTEX (benzene, toluene, ethylbenzene, and xylene). In tandem with this toxicological investigation, we are developing a psychological assessment to probe for the possibility of a nocebo effect. Our goals for this presentation are to (1) discuss our progress to date in evaluating the physiological and psychological effects of cupping, (2) challenge pseudoscience, and (3) encourage other MSU Denver undergraduates to explore their own research questions. Hence, this presentation will cover a brief history of cupping and preliminary results from the toxicology studies, as well as the process of creating and leading a research team and securing funding as an undergraduate student.

Spatial Analysis of Crime around Light Rail Train Stations in Denver from 2019 to 2023

Caleb Ondrak – Criminal Justice & Criminology
Faculty Mentor: Hyon Namgung

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 200

Public transportation in Denver through the RTD system has become increasingly popular, with more infrastructure being built than ever before. In fact, Denver has witnessed a surge in the use of light rails as a mode of transportation over the past several years, both through buses and light rail trains. This shift is understandable because it has become an easy and cheaper way to get around compared to driving. However, as more people choose to use public transportation, it has also become important for them to be aware of the associated risks in order to safely navigate the light rail system in the city. Due to light rails being somewhat new in the Denver area people are new to understanding the potential risks that are rising at these new stations. While prior studies have examined safety issues around the public transportation system, a spatial analysis of local crime around train stops in Denver can further aid policymakers and police in addressing these concerns. Since crime continues to rise in these areas with more stations being built, the rise in crime could be correlated to this. This exploratory research examines crime around train stops in Denver using secondary data from the Open Data Catalog. It analyzes spatial and temporal patterns of crime in these areas using a cloud-based geographic information system, ArcGIS Online. The findings of this research will help light rail administrators and police leaders develop and implement measures to lower crime rates and enhance safety in these public spaces.

Sequencing the GFP Gene in *Acropora millepora*

Brooke Paslay – Biology
Co-Author: Brianna Winkler
Faculty Mentor: Maria Cattell

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #3

Coral populations serve significant ecological roles for the habitats they inhabit as well as an economical role for human populations. Under environmental stress, coral eject their photosynthetic algal symbionts, known as symbiodinium, through a process known as bleaching. The term bleaching results

from the white appearance of their calcium carbonate skeleton once the colorful symbiodinium has been expelled. After ejection of the algae, the coral will eventually starve to death. However, coral has a period where they can attract more photosynthetic symbiodinium and recover from the bleaching event. Recent research suggests a possible biological signaling mechanism where green fluorescent protein or GFP produced by the coral influences the symbiodinium's likelihood of recolonizing the coral. Symbiodinium have an eyespot that can detect light, and evidence proposes that GFP detection may encourage recruitment back to the coral. Our lab is working to locate and sequence the gene that codes for GFP within the coral species *Acropora millepora* to cause the over expression of the GFP to observe the recruitment process.

Our research is focusing specifically on the amplification of GFP gene from the *A. millepora* genomic and cDNA using PCR. The cDNA is different from the genomic DNA because it does not include the introns and using both as templates provides more information about the GFP gene. Primers pairs were designed to both introns and exons and tested on the genomic and cDNA. Products were analyzed by gel electrophoresis to determine if amplification occurred. Promising fragments were isolated and cloned into plasmid vectors. Those potential clones were analyzed using colony PCR and fragments with expected lengths were grown in liquid culture and sent off for sequencing. Once GFP is amplified and sequenced properly, CRISPR/Cas9 based genome modification tools will be designed to allow for editing of the GFP gene.

Modeling the Structure of a Neutron Star Using Python

Gerardo Perez-Llamas – Physics
Faculty Mentor: James Dove

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 202

The extreme density of neutron stars gives rise to exotic phenomena that can't be found anywhere else in the universe. Modeling the structure of a neutron star can elucidate what processes keep a neutron star in hydrostatic equilibrium and their limits in doing so. A neutron star's maximum mass is still uncertain as models of its structure need to account for the complex and varied effects that keep a neutron star in hydrostatic equilibrium in the equation of state (EOS). We modeled the structure of a neutron star using different EOS and equations of hydrostatic equilibrium to compare how they affect the neutron star's structure and confirm the results of previous work of neutron stars. Our models of the structure of a neutron star used an equation of state (EOS) for either relativistic or non-relativistic neutron degeneracy pressure and an equation of hydrostatic equilibrium based on Newtonian gravity or general relativity. We numerically solved them in Python for different central densities. The results of our models showed similar predictions for the neutron star's density profile for central densities below nuclear density. Increasing the central density beyond nuclear density resulted in significant differences between the model's predictions. The model that used the special relativistic EOS and Newtonian gravity predicted a maximum mass for a neutron star of $\approx 5.6 M_{\odot}$. The models using general relativity differed significantly, with the model using the non-relativistic EOS predicting a maximum mass for a neutron star of $0.96 M_{\odot}$, while the model using the special relativistic EOS predicted $0.85 M_{\odot}$.

Examining Student Perceptions of Gender Non-Binary Instructor Competence and Likability

Alicia Phinnella – Psychology

Co-Authors: Bug Bobitsky, Matthew Day, Joshua Isom, Ezra Toledo, Deanna Bright, Jackeline Martinez Haro, Kalista Kuchka, Kaysie McGurk, Dane Showalter

Faculty Mentors: Aaron Richmond and Chad Mortensn

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #1

Student evaluations of teaching (SET) are widely utilized across higher education institutions as a crucial metric for assessing teaching effectiveness and informing administrative decisions, such as promotions. Despite its widespread usage, numerous studies on SET suggest that students' personal biases often influence SET scores. Notably, past research has consistently identified an instructor's perceived gender as a significant factor influencing scores on these evaluations. However, there is significantly less research on how student knowledge of a professor's gender nonbinary or transgender identity might impact these ratings. For the current study, we examined whether students' estimations of teaching capabilities are influenced by the gender identity of the professor. Students were asked to evaluate a professor whose gender identity was made salient through a syllabus biography. The SET scores for the professors were then analyzed.

Examining How Student and Instructor Accent Congruence Influences Student Ratings

Alicia Phinnella – Psychology

Co-Authors: Carrie Bohlmann, LaKrisha Fehringer, Jackeline Martinez Haro, Deanna Bright, Kalista Kuchka, Kaysie McGurk, Dane Showalter, Ezra Toledo

Faculty Mentors: Chad Mortenson and Aaron Richmond

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #1

While Student Evaluation of Teaching (SET) plays a crucial role in faculty and course development, previous analyses have shown that utilizing SET ratings for administrative purposes (such as evaluating a professor's suitability for tenure or promotions) has raised concerns due to inherent susceptibility to student bias. Prior studies have consistently shown disparities in SET ratings based on the perceived non-standard accents of professors. However, prior research has focused primarily on Asian faculty members with a non-standard accent compared to White faculty members with General American Accents. The effect of Hispanic/Latinx minority status and accent on professors' SET evaluations remains understudied. The current study aims to address the limitations in the literature. In addition, the study aims to examine whether congruence in student and professor characteristics influences SET ratings. Students listened to a short lecture by a White or Hispanic professor with either a standard American or Latin American accent. We then tested students' learning and their perceptions of the professor.

Navigating the Emotional Landscape of Academic Misconduct: The Influence of Affect on Students' Attitudes of Academic Plagiarism

Alicia Phinnella – Psychology
Faculty Mentor: Maureen Flynn

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 203

Plagiarism remains a growing concern among college and university faculty members. While demographic variables have been shown to predict attitudes toward plagiarism, there is limited research on how students' emotions might influence their attitudes and subjective norms. The current research aims to replicate Tindall and Curtis's (2020) study on emotionality predicting plagiarism attitudes. Our sample consisted of 41 undergraduate students from a large public university who completed a measure of attitudes toward plagiarism, affect, anxiety, and stress. Emotionality significantly added to the prediction of attitudes toward plagiarism, above and beyond demographic variables. Moreover, higher negative affect predicted positive attitudes and subjective norms toward plagiarism, which Tindall and Curtis's (2020) study did not find.

Synthesis of Achiral p-alkoxy Liquid Crystalline Compounds

Jonathon Plomin – Chemistry, Community College of Denver
Co-Authors: Ruth Stevens, P. Blackwell, Connor Edelman
Faculty Mentor: Lisa Eytel

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #9

Liquid crystals are compounds that exhibit a unique condensed phase at temperatures between the solid and liquid phases that is characterized by liquid-like mobility while still demonstrating molecular order akin to crystalline solids. Compounds that demonstrate this liquid crystal phase have exciting applications in various materials sciences, from electronics applications like flat screen video displays to high strength materials like Kevlar. Optically inactive p-alkoxy benzoic acids and p-alkoxy acetanilides have shown liquid crystalline properties and provide synthetic routes suitable for organic teaching labs. We synthesized a series of achiral liquid crystalline compounds to further investigate the impact of the alkyl chain and the self-assembled properties of p-alkoxy benzoic acids with p-alkoxy acetanilides for potential liquid crystal applications.

The Influence of Religion/ spirituality on Breast cancer treatment

David Quintana – Health Care Information System
Co-Author: Natalia Chavez-Ruiz
Mentors: Garvita Thareja and Lyn Riebel

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 202

One of the most prevalent cancers that exist here in the United States among women is Breast Cancer. Though research has advanced significantly, there are about 240,000 cases of breast cancer in women

and 2100 in men each year (CDC, 2024). More specifically, it negatively affects the Hispanic and Latina populations as it is their leading cause of death.

Religion/spirituality is a critical perspective that holds high value for many people, especially in health care. These beliefs can vary depending on religion and person. This research focuses on the positive influence of religion and spirituality on women's ability to manage this hardship.

While on the journey to understand the complexities of breast cancer and the treatments that follow through, we were also really intrigued with the idea of how a patient's religious/spiritual status influences their treatment process. Considering a variety of research studies, many women facing the challenges of breast cancer claim that religion and spirituality helped them cope with their experience of breast cancer, including psychosocial adjustment. For many women, religion offered a sense of purpose and meaning in life and helped them make sense of their cancer diagnosis; other women who do not consider themselves very religious/spiritual stated that observing religious practice and receiving prayers from healthcare workers provided a sense of hope and emotional comfort. Overall, religion /spiritual practices offered women the encouragement needed to adjust and manage their new course of treatment and the psychosocial changes that came with it. In conclusion, this research highlights the multifaceted aspects of breast cancer, including medical advancements in personal experiences and the role of faith, shedding light on the holistic approach to understanding and addressing this disease.

Recording the Reef on a Budget: Utilization of Underwater Photogrammetry in Coral Monitoring and Conservation

Kyle Ralphs – Anthropology
Co-Author: William McCormack
Mentor: Robert Hancock

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #13

In this study, we sought to examine the possibility of the use of photogrammetry as a method of documentation of conditions of reef coral in the Florida Keys as well as a monitoring of the conservation of coral by having a precisely dated 3D model of the coral that could be used to compare to the living coral conditions at a later date. Questions involved in this research included whether this research could be accomplished within the confines of a reef ecology course that was multifaceted and not specifically focused on photogrammetry, could the research be done with fairly low budget, using the equipment already at hand for the reef ecology course, and whether the data collected would be able to be turned into viable models that represent the living coral. Photography of the coral was collected during scuba dives with handheld cameras and executed by capturing images of the coral from multiple angles from bottom to top by circling the coral, taking images as we went. The data from the trip was then put through a photogrammetry program to construct the 3D models. The findings of this research were that it was possible to construct models for some of the coral photographed and some were not able to be modeled but can go towards refining the technique and informing on the number of photographs needed to accomplish a viable model. Considerations towards future research in this project include possible recollections of data in the future to compare to collected data.

Domestic Alchemy: Rotting Fruit, Patinaed Metal, and the Radical Freedom of Letting Go

Erica Rawson – Bachelor of Fine Arts, Sculpture

Mentor: Anne Yoncha

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 200

How can the contrasting forces of mechanical human intervention and organic processes be harnessed to create work that speaks to the illusory nature of control and the radical freedom of accepting decay within the domestic environment? This project explores the tension between impermanence and our desire for control within the domain of domesticity. By utilizing rotting fruit, borax-based patinas, and salt-vinegar solutions on copper surfaces, I aim to create a visual and olfactory experience that challenges the environmental control often associated with the home to reveal the underlying beauty of decay. Bananas, lemons, limes, and apples have been arranged on a copper plate, sealed, and allowed to decompose naturally. The rotting fruit, with its progressive breakdown, symbolizes the impermanence and vulnerability in the realm of domesticity. The contrasting patinas on copper, initially vibrant and controlled, interact with the decomposing fruit, causing potential stains or discoloration. This interaction highlights the limitations of human control in the face of natural processes. The olfactory element introduced by the rotting fruit and vinegar-based patinas further disrupts the idealized image of the domestic space. This exploration serves as a commentary on the domestic environment and speaks to the idea of precious metal protecting sacred spaces, while preservation consumes. Just as embalming and pickling paradoxically accelerate decay, our attempts to enshrine love through objects and control domestic spaces ultimately lead to a different kind of transformation. This decay, however, is not destruction but a disclosure, a stripping away of illusions to expose the core truth. As the fruit decomposes, the copper beneath the patina is revealed, much like the framework for new growth emerges from a crumbling shell. This project suggests that decay is not the enemy but a necessary step in a cycle of transformation; a liberation from the illusion of control.

Convergences: Interactions of Queer Bodies, Substances, and Objects

Rae Richards – industrial design

Mentors: Sonny Dhoot and Anahi Russo-Garrido

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 204

Bodies, movements, and time collide as this research explores the affective potential of jewelry for cultivating a politics of care and embodying intentional sex and substance use practices within queer club cultures. Prominent frameworks classify queer substance and sexual practices as misuse, relegating users to individuals with substance use disorder (SUDs) or removing users' agency, presenting their use as result of stress from external structures (the minority stress model). Exploring queer substance use and sexual practices, this project operates from a politic of harm reduction to investigate alternate ways of being and becoming—attentive to how queer folks find personal and communal meaning, explore new ways of being in their bodies, and navigate associated risks, pleasure, and safety surrounding sex and substance use in queer club cultures. Based on a series of interviews, auto-ethnography, interactions and contexts, this work contends that the queer club serves as a site for and form of world making—a space for generating new possibilities and embodiments—contributing to discourse on the intersections of identity, pleasure, and safety within marginalized communities.

As a product design student, object maker, metalsmith, and scholar, I present a collection of jewelry that embodies a politic of care, queerness, and resistance. The series works to encourage more intentional sex and substance use practices within queer nightlife, drawing insights from the experiences and substance use practices of friends and community members.

Post-emergence sugar deprivation increases attack and engorgement performance by mated *Aedes aegypti* mosquitoes in the laboratory.

Nicole Robbins – Biology
Mentor: Robert Hancock

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #15

The *Aedes aegypti* mosquito is an effective vector that plays a significant role in the transmission of very serious arboviral diseases including yellow fever, dengue fever, chikungunya, and Zika fever. In preliminary laboratory studies when subjugated to sugar deprivation, we have found that *Aedes Aegypti* female mosquitos exhibit increased attack speed and engorgement performance. For each trial, two cohorts of approximately 200 mosquitos were reared. One of these cohorts received a 20% sucrose solution and the other group was given only water. Males in each group were removed from the population by aspiration 24-48 hours after emergence. The two groups of mated female *Ae. aegypti* mosquitoes were allowed a 10-minute opportunity to blood feed on a human host. The blood feed was captured by video recording and analyzed using Adobe Premier Pro software. The attack speeds, number of attacks, engorgement times, and degree of engorgement were measured. Investigation into these blood feeding behaviors may give rise to information that aids in the understanding of the relationship between nectar feeding, vectorial capacity, and disease transmittance of the *Ae. aegypti* mosquito.

Shoot for the Stars: An Analysis of Michelin Star Impact on DMOs Marketing Strategies Around Gastronomic Tourism in the State of Colorado

Xitlalic Rodriguez – Hotel Management
Co-Authors: Camille Rawinski, Molly Quinn Mildemberger, and Kiyana Shafieizadeh
Mentor: Kiyana Shafieizadeh

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #14

Michelin Stars are highly esteemed awards for restaurants offering exceptional culinary excellence, based on five universal criteria that reflect elevated cooking standards. While existing research highlights the social and economic impacts of Michelin Stars on individual restaurants (Bang et al., 2022), little is known about how Michelin Stars impact the marketing strategies adopted by Destination Marketing Organizations (DMOs) around gastronomic tourism. DMOs are instrumental in strategically promoting destinations to attract visitors, thereby stimulating tourism and fostering economic growth. These entities typically operate across multiple tiers, encompassing local, regional, and national levels. Since Michelin Star restaurants are gaining popularity among consumers, the purpose of this research is to fill

the research gap by investigating the broader impacts of Michelin Stars on Colorado front-range DMOs' marketing strategies. Some previous studies have researched the effects that high-quality restaurants may have on tourist destinations (e.g., Daries-Ramon et al., 2021) but have yet to show the changes in DMO marketing strategies. Content analysis will be utilized to thoroughly examine the marketing practices of DMOs before and after receiving a Michelin Star in their city. The analysis aims to evaluate trends, themes, and changes in destination marketing strategies through culinary-related word usage frequency in visitor guides from October 2022 to October 2024. This study contributes to existing literature by shedding light on the strategic responses of DMOs to the growing prominence of Michelin Star restaurants, thereby enriching scholarly discourse on destination marketing, gastronomy, and tourism management. Moreover, this research may offer insights into how Michelin Stars can enhance city gastronomic tourism marketing, thereby guiding DMO strategies to capitalize on these awards. Additionally, the study can aid DMOs in assessing the potential applications and benefits linked to the pursuit of Michelin Stars

Between Two Writers; Borges and Ribas

Miguel Rodriguez – Spanish and Philosophy
Mentor: Maria Rey Lopez

Cancelled

In this study, I explore different moments of a relatively new genre of literature in the Spanish language. I am referring to what is known in Spanish as the “novela negra” (noir fiction), created around the 1940s in the United States. In addition to investigating the history of the crime fiction and its development until the present day, my literary analysis compares two short stories by Jorge Luis Borges, “Emma Zunz” (1949) and “La muerte y el compás” (1944), with the novel *Entre dos aguas* (2007) by Rosa Ribas. By examining the similarities and differences between Jorge Luis Borges and Rosa Ribas' works, this poster presentation seeks to determine how the genre has adapted to both writers' times and creative needs.

Utilizing Simple Technology to Create an Instrument for Accessibility-Friendly pH Measurements

Grace Servia – Chemistry and Math
Mentor: Shailesh Ambre

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #10

The pH of a solution is an indicator of the acidity (or basicity) of a scientific sample. It is a fundamental concept that is impactful to biological, chemical, industrial, and environmental systems. Therefore, several methods have been designed to measure pH with varying levels of accuracy and precision. In the undergraduate laboratory, one of the most widely used qualitative methods of pH measurement is via paper that has been coated with pH responsive dyes. The dye changes color in response to a given solution, and this color can be matched to a scale with corresponding pH values. This method is quick, easy, and affordable, but has the major pitfalls of being inaccessible to visually impaired students and susceptible to producing measurements that have been impacted by the paper itself or skewed by differences in human perception. The aim of this project is to create a practical and convenient instrument that uses a fully accessible output to provide a standardized reading of the color value of a

pH responsive dye. The device will utilize a Raspberry Pi computing system, simple circuitry, Computer-Aided Design, 3D printed components, and Python coding. This project also serves as an example of multidisciplinary research and demonstrates a proof-of-concept that effective chemical instrumentation can be made on obtainable, small scales.

Spatial and Temporal Patterns of Motor Vehicle Theft in Denver, 2019-2023

Chmura Smith – Criminal Justice & Criminology
Mentor: Hyon Namgung

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 200

Research on motor vehicle theft is critical because it affects people's fear of crime and involves significant financial costs. For example, one estimate reveals that over one million cars were stolen in the United States in 2022, costing vehicle owners more than eight billion dollars. In this context, it is beneficial for practitioners and researchers to examine the impact COVID-19 may have had on motor vehicle thefts in Denver and investigate if there have been any changes after the pandemic. The goal of this research is to examine the possible changes in temporal and spatial patterns of motor vehicle thefts in Denver over the last 5 years. This study will use publicly available crime data from the Denver Open Data Catalog. An analysis will explore three timeframes to examine the possible spatial and temporal changes in patterns of motor vehicle theft: pre-COVID in 2019, during COVID in 2020-2021, and post-COVID in 2022-2023. Using a cloud-based geographic information system, ArcGIS Online, this research will utilize several spatial analysis tools and time heatmaps to reveal spatial and temporal patterns of the crime in Denver over five years. This study will help understand the geographic patterns of motor vehicle thefts in Denver, focusing on the pandemic's potential impact. Furthermore, this study could enlighten practitioners and policymakers about potentially vulnerable places in the city and provide suggestions and strategies to address this problem.

Of Moss and Men

Drew Steinheimer – Biology
Co-Author: Quinn Pedrick
Mentor: Erin Bissell

Poster Presentation, Session II (10:30 am – 12:00 pm), Poster #14

Mosses play a critical role in nutrient cycling, soil formation and stabilization, and moisture retention in most terrestrial ecosystems. Despite their importance, mosses are often overlooked in ecological studies, especially factors that affect sexual reproduction. Moss Phenology in Built Environments (EREN Moss Project) was developed by researchers at primarily undergraduate institutions (PUI) across the United States as part of the EREN-NEON-EDDIE Workshop series. The purpose of the EREN Moss Project is to compare production of gametangia (gametes) and sporophytes (spores) by mosses growing in built versus natural environments at a continental scale.

To allow for continental-scale comparisons, *Bryum argenteum* was chosen as the focal species for this research due to its ubiquitous presence across the United States. In the field guide "Bryophytes of

Colorado: Mosses, Liverworts, and Hornworts,” experts note that sporophytes were rarely observed in *B. argenteum* in the Rocky Mountain West (Weber & Wittman 2007). Students involved in preliminary data collection in 2023-2024, however, have documented multiple instances of sporophyte production by *B. argenteum* in the Denver Metro area.

Given differences between modern observations and historical records, we will explore the following research questions in the 2024-2025 growing season. What potential environmental factors limit gametophyte growth and sporophyte production in the Rocky Mountain region? How has climate change impacted the life cycles of Bryophytes like *B. argenteum* in the Rocky Mountain region?

We will collect data on gametophyte size and sporophyte production in *B. argenteum* at a minimum of 10 sites in the Denver Metro area. Sites will be chosen based on variability in human impacts and substrate types. We will also collect data on soil moisture content, land use, and sun exposure to determine if these factors affect gametophyte size and sporophyte production.

Optically Active Color Changes in Liquid Crystalline Mixtures

Ruth Stevens – Chemistry, Community College of Denver
Co-Authors: Jonathan D. Plomin, P. Blackwell, and Connor Edelman
Mentor: Lisa Eytel

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 202

Colors in mood rings and state-of-the-art digital displays appear through similar molecular responses of liquid crystals. Liquid crystalline molecules display properties of both a liquid and a solid as they proceed through multiple transition phases: smectic, nematic, and isotropic. Chiral liquid crystals exhibit the optically active chiral nematic transition phases, allowing for visible color changes in response to stimuli, like heat. As liquid crystals impact more of our lives, we aimed to develop a materials-focused experiment that incorporates laboratory skills across the curriculum. We developed a reliable “classic” synthesis of p-alkoxybenzoic acids. We then investigated the impact of mixing these achiral liquid crystals with optically-active cholesterol compounds to identify a series of mixtures that showed unique temperature-dependent color changes. This research provides a readily adapted materials science experiment for all levels of chemistry teaching labs.

Bio Art as a Catalyst for the Human-Microbe Connection

Caroline Sueper – Biology
Mentor: Helene Ver Eecke

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #6

Bio art, a vibrant convergence between biology and art, has increasingly incorporated microbial organisms as protagonists of creative expression. Microbial art harnesses the inherent biological processes of microorganisms to generate visually captivating and conceptually profound artworks. The research team, made up of microbiologists and artists, employed techniques such as bioprospecting, strain isolation, and propagation to explore the phenotypic expressions of ubiquitous microbes coming to life. Favorable isolates were identified through taxonomy and cryopreserved for future artworks.

Genetic tinkering and bioluminescence manipulation of such bioprospects served as artistic tools, enabling the creation of intricate compositions that reflect the dynamic dance between microbial communities. Additionally, microbial art extends beyond aesthetic representation, serving as a playground for interdisciplinary dialogue on critical issues such as microbial ecology and human-microbe interactions. Observing bioprospects under the microscope and handling macroscopic specimens allowed the artists to connect with the dimensionality these microorganisms contribute to the surrounding environment, offering yet another avenue of inspiration. By infusing elements of creativity and playfulness into scientific exploration, microbial art makes the study of microbiology not only intellectually stimulating but also naturally enjoyable. Through their artworks, bio artists invite lighthearted contemplation on the complex interplay between microbial organisms and their environments, highlighting the interconnectedness of all living systems. Furthermore, microbial art challenges traditional notions of authorship and creativity, as artists collaborate with living organisms whose behaviors and characteristics are inherently unpredictable. By engaging with microbial communities in unconventional ways, bio artists contribute to the accessibility of scientific knowledge and foster interdisciplinary collaborations between artists, scientists, and the public. Ultimately, exploring the microscopic world through bio art offers a fun and enriching journey, inviting audiences to revel in the beauty, diversity, and significance of microbial life while reconsidering their place within the microbial tapestry.

The Intersectional Study of Gender, Race, Poverty, & Age Mortality in Bexar County, Texas

Cadence A. Thorne - Gender, Women, & Sexualities Studies
Mentor: Anahi Russo Garrido

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 204

Thesis: Historically segregated communities in San Antonio, Texas are living shorter lives due to inequitable access to healthcare services. Introduction: Statistics in Bexar County, Texas demonstrate that I will not live to celebrate my 70th birthday. According to reports done by UT Health, who published average age mortality research per zip code for the state of Texas, the zip code of my childhood reflects a shorter life span than the state average of 78.5 years. This study examines health maps, historical and social context, poverty rates, and canvassing efforts while utilizing an intersectional lens of feminism to demonstrate the impact of inaccessible health services to communities with the highest need. This study found that, the age of mortality in the urban zip codes 78202 and 78208 of San Antonio, Texas, are informed by layers of oppression and privilege. By investigating these connections, theory will be the first step to impacting actionable progress to change. Literature Review: Health and Sociological literature reflect that healthcare access in the United States, Texas, and San Antonio is greatly informed by social factors such as gender, race, and poverty rates. This work will bridge the gap between these social lenses by providing a feminist perspective; acting as an interloper for communities impacted by inaccessible healthcare. Methods: Quantitative analysis with use of health maps reflecting mortality rates in the greater Bexar County, Texas. Quantitative analysis utilized by applying historical context to impacted communities; as well as auto-ethnography. Analysis: Communities with a concentration of systemic oppressions (poverty, race, and gender) are at greater risk of not meeting wellness needs. Accessibility to healthcare resources based on ability to take off time, travel, and cost of services intersect. Conclusion: Providing solutions to healthcare barriers will improve the age of mortality in historically oppressed San Antonio communities.

Let's get frisky and risky: Cultural influences on Hispanic and Latinx sexual behaviors and access to sexual health services

Gabriel Trujillo – Psychology
Mentor: Randi Smith

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 203

In a diverse society like ours, groups and individuals hold different values, especially when it comes to something as robust as sex and sexual health. Sex, fornication, the birds and the bees, whatever one may call it, has different meanings and connotations depending on a plethora of factors including the culture one comes from. Moreover, a variety of intersectional cultural factors including familial values, religion, etc., contribute to the differences between perspectives on sexuality and sexual health. While some cultures may view sex as a sin, others may view it as a leisure activity. Those with negative views can also create another barrier when trying to access sexual and reproductive healthcare.

Hispanic and Latinx culture is one of many that hold a plethora of traditional and conservative values, ultimately negatively influencing an individual's view on sex and sexual health. Additionally, these cultural values lead to many Hispanic and Latinx individuals facing additional stigmas and obstacles when accessing sexual health services and resources.

In this study, I will conduct a survey and interviews to examine how Hispanic and Latinx cultural influences such as gender roles and expectations, religion, and social influences specifically impact the way an individual looks at sex and alters their access to sexual and reproductive healthcare. Also, I want to examine the language and informational barriers along with Hispanic and Latinx media and their influence. With my research, I hope to add to the existing literature surrounding cultural values and their impacts on sexuality. Furthermore, I want to expand on other gaps in the research as is the case with familial values and the media.

“It Was a Disaster!”: A Qualitative Study on Sex Education in Colorado Schools

Gabriel Trujillo – Psychology
Mentor: Randi Smith

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 203

Sex education in schools has always been a controversial topic and one that has gained a lot of attention in recent times. Although a 2014 Planned Parenthood poll showed that 96% of parents support sex education in high schools, the implementation of sex education remains highly polarizing. Different states have different laws regarding sex education and the content that can be presented to students with some states emphasizing abstinence-only education while others try to be more comprehensive. Many times, the decisions on content are left to the districts to decide, creating discrepancies across the U.S.

At least five states mandate discriminatory sex education on LGBTQ+ experiences which prevents a significant minority of students from being represented in their classes and receiving adequate health information. Also, many states do not require information on pregnancy, birth control, and alternatives

such as abortion; nor do they require information to be medically or evidence based. Many young people in this nation continue to be under- or un-informed regarding sexual health, resulting in high rates of unplanned pregnancies and STIs.

Some states, including Colorado, have implemented legislation requiring sex education content to be comprehensive and inclusive. Interestingly, there is no national mandate for sex education of any sort. Even Colorado's recent legislation does not require that sex education be taught in our public schools; rather HB19-1032 Comprehensive Human Sexuality Education requires that if sex education is taught in Colorado public schools, it must not emphasize sexual abstinence nor exclude diverse identities. If pregnancy is part of the curriculum, all options including abortion must be discussed. We ground this presentation with the findings from our quantitative study, but the real focus here is the themes that emerged as our focus group participants recounted their experiences with K-12 sex education in Colorado.

Investigating the Role of a Conserved RNA Structure with a Viral 3' Cap-independent Translation Enhancer

Kate VandeVenter – Biochemistry
Co-Authors: Bosun Olabode and Adam Gordon
Mentor: Megan Filbin

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #13

Blackcurrant reversion virus (BRV) of the Nepovirus genus infects blackcurrant plants of the Ribes species causing blackcurrant reversion disease. BRV is one of the leading causes of crop failure within the agricultural growth of blackcurrants and redcurrants. BRV utilizes a method of non-canonical translation initiation, which uses RNA structures at the 3' end of the genome, called a cap-independent translation enhancer (CITE) to recruit the ribosome to the viral genome. The 3' CITE binds to and delivers initiation factors to the 5' end of the viral genome upon circularization, mimicking the interaction between a methylated guanosine 5'-cap and the 3' poly(A)-tail in canonical translation. Stem loop 3 (SL-3) within the 3' CITE is conserved between BRV's RNA-1 and RNA-2 genomes, but its function in noncanonical translation initiation is unknown. To determine SL-3's role in directing noncanonical protein synthesis, we measured translation efficiency of two SL-3 mutant RNAs using a luciferase reporter construct. First, we disrupted the Watson-Crick base pairing within the stem of SL-3 and observed a reduction in protein synthesis, indicating SL-3 is important for translation initiation. Next, to determine whether SL-3 is essential, we deleted the stem-loop and observed an increase in translation. Minimum free energy secondary structure modeling of our SL-3 deletion indicated a structural shift in the CITE that stabilizes the downstream SL-4's structure when SL-3 is removed. Overall, our results suggest SL-3 is important for BRV RNA-1 CITE-directed translation initiation. We predict SL-4 within the RNA genome may play an important role in recruiting initiation factors to the 3' end, and SL-3 may be a regulatory structure within the viral RNA, ensuring viral protein synthesis bypasses cellular defense mechanisms.

Assessing Sexual Dimorphism in Amygdala Connectivity

Isobella Veitch – Biology and Psychology
Mentors: Nidia Quillinan and Jose Vigil

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #5

Prevalence: Cardiac arrest effects over 356,000 people in the United States and those who survive often experience brain injury (Center for Disease Control and Prevention, 2023). Symptoms of cardiac-arrest induced brain injury include high rates of depression (30%), anxiety disorders (40%), and posttraumatic stress disorder (25%) (Naber & Bullinger, 2018). Survivors also experience cognitive deficits in attention, memory, verbal fluency, spatial awareness, and executive function (Naber & Bullinger, 2018). The amygdala is a region of the brain responsible for emotional processing, emotional experience, fear conditioning, autonomic responses, and emotionally charged memory. Previous research in my lab has found that male mice models that undergo cardiac arrest with cardiopulmonary resuscitation (CA/CPR) present amygdala dysfunction whereas female mice models undergoing CA/CPR do not present any dysfunction. The CA/CPR male mice presented diminished cued fear response and significantly reduced long-term potentiation (LTP) in the cortical input to the basolateral amygdala (BLA).

Hypothesis: My work aims to uncover why CA/CPR males experience significantly diminished amygdala functioning. The hypothesis is that male and female mice present sexually dimorphic neural connectivity from the amygdala, producing amygdala dysfunction in males after CA/CPR.

Methods: This research is based in the discipline of neuroscience and uses mice models. Methods used were stereotaxic injection surgeries of a retrograde tracer into the BLA to map the neural circuits. The brains were extracted via transcardiac perfusions and sectioned using a sliding microtome. After sectioning, sections were stained using immunohistochemistry (IHC). Following IHC, sections were mounted and imaged using confocal microscopy. Following imaging data analysis occurred.

Results: No qualitative sexual dimorphism was found in structural connectivity between males and female mice however our sample size was small. We are now using an anterograde Adeno-associated virus (AAV) to increase expression and quantify connectivity.

Romanism & Religion in Gallia Narbonensis

Jolie Voss – Art History
Mentor: Summer Trentin

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 204

Ancient Roman architecture and urban design were shaped by a culture of conquest. Gaul, a region that included modern France, Luxembourg, Belgium, Switzerland, Germany, the Netherlands, and Northern Italy was conquered by Julius Caesar and incorporated into the Roman world. Romanization came earliest and was most successful in Gallia Narbonensis, modern Southern France, and Provence. It is in this region we see the architecture dictated by local religious customs. This paper focuses on the Gallic worship of water and its incorporation into the Roman temples and worship spaces after the conquest of Caesar. One site that is particularly focused on is the Maison Carrée in Nîmes. A connection between

Gaul and Rome is also made through their religious views and uses of water, and how this has a visual effect on temple structures throughout the region of Gallia Narbonensis.

Maximus the Confessor and the Indwelling of the Holy Trinity

Rose Webster – Mathematics
Mentor: Caleb Cohoe

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 203

The aim of this paper is to investigate how the theological thought of Maximus the Confessor can inform and illuminate an understanding of the doctrine of the indwelling of the Holy Trinity. This is the Christian doctrine that God, as Father, Son, and Holy Spirit, dwells in the souls of the just according to a personal mode -- a mode of presence over and above his ordinary presence in all things by causation, knowledge, and providence. This paper defines the distinctive aspects of Maximus' conception of the unity of the soul and body and the image of God, and then discusses how these ideas contribute to an understanding of this doctrine. Ultimately, this paper argues that Maximus' thought, drawing on a robust and subtle metaphysics of relation and hierarchy, characterizes the Church as a liturgical synthesis of all creation being made the dwelling of the Holy Trinity.

Brothers in Strange Lands: Higoanna Kanryo, Trade, and the Experience of an Okinawan Merchant in the Later 19th Century

Robert L. Welch – History
Mentor: Ziyao Ma

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 202

This study explores the status and actions of Okinawan merchants in Fuzhou Province through the events in the life of Higoanna Kanryo. Through the methods of social and economic history the author seeks to demonstrate the deep connections that existed between the inhabitants of the Ryukyu Islands and Southern China during an era of great political and cultural upheaval in both societies. During this time Okinawa came under full control of the new Meiji Imperial System in Japan, whilst in China, the end of the Qing dynasty inaugurated an era of anarchy and lawlessness. Higoanna Kanryo's experiences as an Okinawan merchant trading with Fujianese partners provide the post-modern historian with unique insight regarding challenges faced by Okinawan traders during his complex era.

Towards a Terrestrialist Urban Design: A Critical Analysis of Plans for Denver, Colorado

Tanner Welsh – Individualized Degree Program
Mentor: Sylvia Brady

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #11

As we collectively enter an age of unprecedented climate crises and intense urbanization, the question of how and by whom our cities are designed and developed is a highly consequential one. The practice of urban planning and design—like all design practices—is informed by political perspectives and theoretical frameworks. Current trends in urban design reveal a preoccupation with “sustainable” practices and “green” building, all within a liberal market capitalist system of planners, developers, architects, and builders. Despite their purported “green” aims, the construction industry remains one of the largest sources of greenhouse emissions and countries around the world continue investing in infrastructure for sprawling, car-centric urban landscapes. Is urban planning as it is practiced today equipped to address these challenges, or are new approaches needed?

In this paper, I review and analyze contemporary urban plans for Denver, asking how the geographic processes of urban design and planning can be reframed through the lens of the “terrestrial” as conceptualized by the late French philosopher Bruno Latour. In his 2018 book “Down to Earth: Politics in the New Climatic Regime”, Latour calls for a new type of “terrestrialist” politics centered on “learning new ways to inhabit the Earth” other than nationalistic localism or extractive globalism. I have adapted this political philosophy to a set of design principles and a framework for evaluating proposed urban developments. I use qualitative data analysis to review planning documents for civic and private development projects in and around the Auraria Higher Education Campus in Denver and compare their design approaches to the terrestrialist principles. I expect to find areas of overlap and divergence between the methods. This research contributes to the scholarly discussion on urban planning and how it can create a more inhabitable earth for all.

The Influence of Operational Sex Ratio on Pair-bond Formation and Mating Behavior in the Convict Cichlid (*Amatitlania nigrofasciata*)

Christopher Wicker – Biology

Co-Author: Leah Vitale

Mentor: Jennifer Gagliardi Seely

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 200

Operational sex ratio (OSR) can affect mating success & fitness. This study uses convict cichlids to investigate if OSR affects pair-bond formation in a monogamous fish. If OSR affects pair-bond formation, then the mutual mate choice group (2 males: 2 females) will form the most pair-bonds the fastest and that the control group (1 male: 1 female) will form the fewest pair-bonds the slowest. This study consists of 1 control and 3 experimental groups with varying OSRs. The duration until pair-bond formation and the total number of pair-bonds formed were recorded. Between the four treatment groups, there was no significant difference in number of pair-bonds formed nor duration until pair-bond formation. However, the control, male mate choice (1 male: 2 females), and mutual mate choice each had significantly more replicates exhibiting pair-bond formation than the replicates that did not pair, but the female mate choice (2 males: 1 female) did not. Our prediction on mutual mate choice and pair-bond formation was rejected. However, the high number of unsuccessful pairs in the female mate choice suggest that the 1 female:2male OSR may hinder pair-bond formation.

The Ideology of Plastic

Alisha Wilkins – Anthropology

Mentor: Michala Stock

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #8

Biological anthropologists are uniquely suited for the study of milk feeding using infant bottles. The incidence of exclusively feeding from the breast for a biologically normal duration is very low according to the CDC's 2020 Breastfeeding Report Card. Bottle use is a part of the American baby. The replacement of breast with bottle at its current scale is a major change in human evolution and it has many possible implications to human growth and development. To minimize the risk of exposure to microplastics and chemicals in plastics, many health experts suggest alternatives such as glass, silicone, and stainless steel. There are many decision-making factors that go into selecting a bottle. This study focuses on bottle material type, material availability at local retailers, bottle volume, and cost comparing data collected from the two largest national retailers (Target and Walmart) in the Denver-metro region. Neither store had stainless steel bottles. Both offered silicone bottles. Only Target offered glass bottles, and they had smaller bottles with preemie nipples which is associated with being more "breastfeeding friendly." Larger milk volume bottles are more associated with formula use. An ANOVA comparing the average bottle price between plastic, silicone, and glass bottles demonstrated a significant difference between the price of silicone vs. plastic and glass vs. plastic (Tukey's honestly significant difference test: $p=0.008$ & 0.001 , respectively). Walmart offered significantly larger bottles compared to Target (Welch's two-sample t-test, $p=0.015$), and while the average price per bottle did not differ significantly ($p=0.11$), the price of the bottle when overall volume was accounted for did differ significantly between the stores ($p=0.001$). With low purchasing availability of plastic alternative bottles locally and the high costs associated with choosing such bottles, practices to promote plastic-free bottles are not supported as a consumer shopping with a baby to feed.

Implementing museum-inspired structure among MSU Denver's scientific entomology collection: a focus on selected native bee taxa

Kyra Zerucha – Biology

Co-Author: Claudia Vasquez

Mentor: Robert Hancock

Poster Presentation, Session III (2:00 – 3:20 pm), Poster #4

Since 2008, students in a senior-level fall entomology course have contributed to MSU Denver's entomology collection. Today, this collection currently houses more than 13,000 specimens, which for the first time, are starting to become cataloged. To begin this process, we started with two families of native Colorado bees currently housed in the collection: Apidae and Halictidae. Consulting with senior staff at the Denver Museum of Nature and Science, we implemented museum-inspired methods to set up the collection to ensure future progression and proper database qualification. We focused on specimen integration, numbering system creation, family identification, Darwin-core formatted data input, and publication quality stacked photography. By introducing the data input process with the native bees in the entomology collection, our objective was to organize a collection in which data could be used/analyzed. We are also collaborating with the MSU Denver herbarium collection team to set goals

for the future of both collections, surrounding succeeding student involvement and potential database publication.

Qualitative Interviews Provide Insights to Student Success at HSI University

Tierra Zuniga – Psychology

Co-Authors: Mary E. Usry, Brennan C. Cowing, and Sara K. Ikenberry

Mentors: Cynthia Erickson, Arijana Barun, and Shalini Srinivasan

Poster Presentation, Session IV (3:30 – 4:45 pm), Poster #2

What factors influence student success in STEM fields? This question drives our project. Focusing on student perspectives regarding their academic and emotional experiences has been found to increase student retention (Hood et al., 2020). In this study, students were asked a series of open-ended questions relating to their academic experience. This study is inspired by a larger project regarding effective teaching in STEM fields. The purpose of this study is to identify factors contributing to the perceived quality of students' education.

Students were asked open-ended questions in a one-on-one interview to explore student perceptions of quality education relating to four categories. The categories were 1) professor engagement and relationships, 2) classmate connectedness, 3) course design, and 4) attitudes towards homework and testing. For example, "In your opinion, what is a high-quality education?" and "Do you feel a sense of connectedness to classmates?" To recruit student participants, we reached out to those students who had agreed to participate in the larger study. Interviews were conducted virtually (via Teams).

One insight revealed from our interviews was an agreement in appreciation for engaging and passionate professors who utilize interactive teaching methods and organize course materials effectively. Interviewees expressed how high-quality education provides knowledge and tools for future success. Group work was positively regarded as they believed that peer interactions and groupwork are beneficial for understanding course materials. Conversely, an additional theme was discomfort with peer interactions, particularly in online courses. Data collection is ongoing; however, the most prominent theme thus far is the importance of teacher engagement. In the future, we will combine the qualitative information collected through the open-ended questions with the quantitative data collected from an online survey given to a larger sample of students.



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