

## 14<sup>th</sup> Annual

# Undergraduate Research Conference

A Symposium of Scholarly Works & Creative Projects

## April 25<sup>th</sup> 2025

Jordan Student Success Building

UNDERGRADUATE RESEARCH & CREATIVE SCHOLARSHIP PROGRAM



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## WELCOME

Welcome to the 14<sup>th</sup> 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. 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.

In addition to the students, I would like to celebrate the mentors. Seventy faculty mentored 140 students in over 100 projects presented today. These mentors work tirelessly to provide research opportunities for students. Without them, this conference would not be possible.

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







# KEYNOTE Dr. Brandon Ogbunu

### "The Panorama: Proteins, Pathogens, and Science in Peril"

In this Keynote, I will discuss various projects that examine the forces the dictate disease dynamics, including protein evolution and mathematical epidemiology. Lastly, I will discuss my work at the intersection between science and culture.



Dr. Ogbunu is an Assistant Professor in the Department of Ecology and Evolutionary Biology at Yale University. He is also a Resident Member of the Santa Fe Institute.

**Research**: Many large questions in contemporary biology involve understanding how the world we live in influences essential features of living systems. In his research, Brandon examines this context dependence across various settings, from the shape of molecular evolution to the drivers of epidemics and the intimate connection between science and culture. His goal is to develop new theories and methods to better appreciate the myriad factors that shape complex biological and social systems.

### OUTSTANDING MENTOR FOR UNDERGRADUATE RESEARCH: Dr. Cynthia Erickson



Over the past four years, Dr. Cynthia Erickson has mentored 20 unique undergraduate research assistants. Of those, 15 presented at the Undergraduate Research Conference, nine presented at the Rocky Mountain Psychological Association, two presented at the Society for Neuroscience and four presented at the American Chemical Society; two are co-authors on a manuscript, seven have received awards in recognition for their research and presentations. She was nominated by three of her students and a colleague. Here's some what they had to say:

"Cynthia Erickson is perhaps the single most passionate undergraduate mentor with whom I have had the privilege to work in my 20-year career. Cynthia gives her students an incredible amount of creative latitude with regard to the direction and topic of their research projects. She believes firmly in following students' interests and serving as a

guide who helps to empower and realize students' visions to the degree possible. Also remarkable is how well Cynthia knows each of these students, their projects, their aspirations and dreams, and their lives. She adores them and would walk through fire for them. This is her calling." – **Dr. Courtney Rocheleau** 

"Dr. E saw potential in me that I wasn't aware of. She helped me find more confidence in my ability to succeed as a researcher, teaching assistant, academic, and overall human being. I'm so inspired by women like her who are shaping the field of academics to be more inclusive, empowering, and fun. I carry that with me every day as I proceed through my graduate studies at Boston College – a school I didn't know I could get into until she showed me how capable I actually am." – **Catherine Martin** 

"Dr. Erickson is the primary reason I stayed at MSU Denver and can proudly call myself a Roadrunner. I have never had a professor who cared so deeply about me, my education, and my future. From my very first class with her, she recognized potential in me, nurtured it, and helped me flourish in research. Her expertise, dedication, and care were a constant source of motivation, even during challenging timelines, demanding responsibilities, and forks in my journey. I cannot think of anyone more deserving of this award than Dr. Erickson." – **Brennan Cowing** 

"Dr. Erickson has consistently shown an exceptional commitment to mentoring undergraduate students in research, providing guidance, support, and inspiration that has profoundly shaped their academic and professional development. She has mentored a diverse group of students, fostering a dynamic research environment that encourages curiosity, critical thinking, and independent inquiry. She has demonstrated outstanding mentorship by fostering an inclusive, hands-on, intellectually stimulating environment for undergraduate researchers." – Nana Akua Adu Owusu

Join me in congratulating Dr. Cynthia Erickson!



Use the QR code to nominate an Outstanding Mentor for Undergraduate Research today!

## 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!

Raelyn Begay, Biology Mentor: Vida Melvin

**Kylle Been**, Bachelors of Fine Art Mentor: Tsehai Johnson

**Apollo Blue**, Anthropology Mentor: Jade Luiz

**Deanna Bright and Ezra Toledo**, Psychology Mentor: Aaron Richmond

Brittany Brown, Biology Mentor: Christy Carello

Juan Castaneda Ramirez, History Mentor: Anthony Garcia

**Mia Conley**, Bachelors of Fine Art Mentor: Marin Abell

**Ryan Dorman**, Bachelors of Fine Art Mentor: Leslie Boyd

Jeromie Dorrance, Biology Mentor: Maria Cattell

**Abayomi Fadeyi**, Bachelors of Fine Art Mentor: Anne Yoncha

LaKrisha Fehringer and Justin Montoya, Psychology Mentor: Aaron Richmond

Margaret Fitzgerald, Bachelors of Fine Art Mentor: Natascha Seideneck

**Cecilia Jones**, Theatre Mentor: Alyssa Ridder

Kyle Kramer, Bachelors of Fine Art Mentor: Marin Abell Samuel Lynch, Nursing Mentor: David Merriam

**Diego Maldonado Lopez**, Psychology Mentor: Sara Jackson Shumate

**Eleanor Mancilla**, Biology Mentor: Douglas Petcoff

Averie McLain and Maria Mondragon, Psychology Mentor: Bethany Fleck Dillen

**Steven Mendoza**, Biochemistry Mentor: Megan Filbin

Nicholas Miller, Psychology Mentor: Cynthia Erickson

Nikia Parker and Paul Guzman, Communication Design Mentor: Peter Bergman

Casey Roberts, Biology Mentor: Vida Melvin

John Rotherford, Biology Mentor: Erin Bissell

Isabel Thomas, Biochemistry Mentor: Shailesh Ambre

**Ezra Toledo**, Psychology and GWS Mentor: Chad Mortensen

**Zoe Ward**, Biochemistry Mentor: Andrew Bonham

Laura Widger, Political Science Mentor: Shayla Bischoff

Khalif Williams, Biology Mentor: Maria Cattell

# Research Scholars

In the Fall of 2021, we piloted the Undergraduate Research Opportunities Workstudy Program (U-ROWdy) to pay students through workstudy to do research with a faculty mentor. In the Fall of 2022, we received 3 years of funding from the Provost's Office to include non-workstudy eligible students. At that time, U-ROWdy became Research Scholars. Since its inception, the program has grown from eight to eighteen scholars a year.

Research Scholars are exceptional students who commit a minimum of 4 research hours a week to work on a research project with a faculty mentor. Scholars are required to submit a report on their progress each semester, attend at least 2 workshops, and present at MSU Denver's Undergraduate Research Conference.

Annalyse Bastres, Criminal Justice & Criminology Mentor: Jennifer Cheek

Raelyn Begay, Biology Mentor: Vida Melvin

Brittany Brown, Biology Mentor: Christy Carello

Artemis Douglas, IDP Mentor: Jessica Parker

Maria Green, Biology Mentor: Maria Cattell

**David Lee**, Computer Information Systems Mentor: Daniel Haupt

**Reece Logan Baily**, Biology Mentor: Jennifer Bousselot

Brandon Martinez, Psychology Mentor: Cynthia Erickson

Peyton MInner, Biology Mentor: Vida Melvin

Visit our website for more information:

Nana Akua Adu Owusu, Psychology Mentor: Cynthia Erickson

**Elicia Perez**, Computer Science Mentor: Ranjidha Rajan

Caoimhin Perkins, Physics Mentor: Kamran Sahami

Quinn Pedrick, Biology Mentor: Joshua Craver

**Ezra Toledo**, Psychology Mentor: Aaron Richmond

**Casey Roberts**, Biology Mentor: Vida Melvin

Kaylyn Shearer, Biology Mentor: Jennifer Bousselot

Krista Sherman, Anthropology Mentor: Michala Stock

Julia Sickrey, Psychology Mentor: Joven Hernandez



# MSU Denver Faculty Research Symposium

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

# October 24<sup>th</sup>, 2025

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 the annual conference:

#### **Undergraduate Research Grant Reviewers**

Rebecca Canges Cynthia Erickson Megan Filbin Megan Hughes Andrew Holt Deborah Horan Hsiu-Ping Liu

Sara Jackson-Shumate Vida Melvin Bridget Murphy-Kelsey Jeffry Parker Sarah Schliemann Anne Yoncha



Janine Davidson, Ph.D. President



**Matt Makley,** Ph.D. Provost & Executive Vice President Academic Affairs



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



Jeffrey Newcomer, Ph.D. Interim Deputy Provost

Thank you to our Keynote Speaker Brandon Ogbunu, 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

8:00-3:00 pm: Conference presenters and all guests sign-in Jordan Student Success Building (JSSB)

8:30 – 9:45 am: CONFERENCE SESSION |

**Oral Presentations – JSSSB** 

Room 200	Room 203
Room 202	Room 205

10:00 – 11:15 am: CONFERENCE SESSION II

**Oral Presentations – JSSB** 

Room 200	Room 203
Room 202	Room 205

Poster Presentations – JSSB Mezzanine / 1<sup>st</sup> Floor

**11:30 am:** Lunch in Tivoli Turnhalle**11:45 am:** Keynote: Dr. Brandon Ogbunu

1:15 – 2:00 pm:

CONFERENCE SESSION III

Oral Presentations – JSSB

 Room 200
 Room 203

 Room 202
 Room 205

Poster Presentations – JSSB Mezzanine / 1<sup>st</sup> Floor

2:45 – 4:00 pm:

**CONFERENCE SESSION IV** 

Poster Presentations – JSSB Mezzanine / 1<sup>st</sup> Floor

# MAP



Jordan Student Success Building (JSSB): Presentations Tivoli Student Union, Turnhalle: Keynote Lunch

Parking is available at any lots including the 7<sup>th</sup> "Street Garage

Oral Presentations will be held in upstairs classrooms 200, 202,203, and 205, and Poster Presentations will be held on the 1<sup>st</sup> 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.



D B S S S S S R **H** 

# ABSTRACTS

#### (listed alphabetically by submitting presenter's last name)

#### Sense of Belonging Among Students of Different Ethnic Groups in STEM

Nana Akua Adu Owusu – Psychology Co-Authors: Nicholas Miller, Brandon Martinez, Ayden Joshi, Sarah Rones Faculty Mentor: Cynthia Erickson

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 203

Sense of belonging is the feeling of acceptance, value, and inclusion in every aspect of life. This feeling is important for students' academic success and retention in STEM (Science, Technology, Engineering, and Mathematics). However, disparities in belonging result in challenges for underrepresented minorities. This research examines sense of belonging among students of different ethnic groups in MSU Denver enrolled in biology, psychology, and chemistry courses. To understand factors that influence sense of belonging, students enrolled in entry-level STEM courses were asked to complete an online survey at the beginning and at the end of the semester. Sense of belonging was measured using two scales: belonging at the university and belonging within STEM courses. An example of the types of questions asked on the survey was "How welcoming have you found MSU Denver to be?" A total of 396 students from MSU Denver participated in the study. Participants identified as White (42%), Black (4%), Latinx (32%), and mixed/other (22%). There was no difference in sense of belonging between White, Hispanic, Black and mixed/other race individuals F (3,362) = 1.17, p = .32. There was a significant difference in gender F (2, 363) = 4.40, p = .01. Women (M = 3.49, SD = 0.68) reported higher sense of belonging compared to men (M = 3.28, SD = 0.74), but not non-binary (M = 3.24, SD = 0.58). Overall, there was no difference in sense of belonging between different ethnic groups, however there was a difference with gender. Our study differs from prior research because our work was conducted at an open enrollment Hispanic serving university, whereas previous research was conducted at selective universities. In the future we will study other factors such as affinity groups contribution to sense of belonging in STEM courses and the university.

#### Microvideography of Sabethes cyaneus Copulation

Hal Arons – Biology Faculty Mentor: Robert Hancock

Poster Presentation, Session II (10:00 – 11:15 am), Poster #4

The Sabethini tribe of mosquitoes is known to exhibit a complex series of stereotypic courtship behaviors as well as to have notably large and complex male genitalia. During copulation of *Sabethes* 

cyaneus, the male gonostylus is first superficially attached to, then inserted inside the female. The female will often show her preference against a particular male by exhibiting a typical pushing behavior to dislodge him, before or during superficial genital connection. We have isolated female Sa. cyaneus virgins within twenty-four hours of emergence from their pupal state. We then introduced several virgins to a cage populated with several males and filmed their copulation from a distance of around 24 mm using a lens specialized for microvideography and repeated this process over multiple trials. We have observed and characterized various stereotypic pre-copulatory genital movements of the male, including a rhythmic pulsation of the gonostylus before genital contact, occasional flexion and separation of the claspers while pulsation is occurring, and a sudden full extension of the gonostylus in order to establish genital contact with the female. The intricacy and repetition of the genital movements could indicate a measure of internal courtship, internal genital movements meant to encourage successful insemination and fertilization of the female's egg, by the male after genital contact is established. The female's mate choice via her pushing behavior or lack thereof could indicate a satisfaction or dissatisfaction with the performance of the male's courtship ritual, possibly including her perception of his genital movements. After the gonostylus has become attached to the female, this choice could also extend to the female's perception of and stimulation by internal movements.

#### Purple Roof Majesties: Evaluation of Crocus sativus L. on Green Roofs in the Rocky Mountains

Reece L. Bailey – Biology Faculty Mentor: Jennifer Bousselot, CSU SPUR

#### Oral Presentation, Session I (8:30 – 9:45 am), JSSB Room 200

Green roof and rooftop agrivoltaics systems have been gaining popularity in urban areas over the past decade for their ability to improve food security in populous cities. Saffron (Crocus sativus L.), a high value perennial herb historically cultivated in arid mountainous regions of the Middle East, thrives under similar abiotic stressors experienced on green roofs such as limited precipitation, nutrient poor, fast draining soils, and high solar radiation. Little research currently exists on saffron cultivation in green roof systems or under shade. This study seeks to investigate the performance of saffron in rooftop agrivoltaics systems by quantifying the effects of shade on floral yield and vegetative growth. 200 saffron plants were studied across ten solar treatments in nine rooftop agrivoltaics plots and one at grade control plot-five at CSU Spur Campus in Denver, Colorado, and five at the CSU Foothills Campus in Fort Collins, Colorado. Corms were planted 15 cm deep with 10 cm spacing and received supplemental hand watering weekly. Data collected included substrate volumetric water content, substrate surface and subsurface temperatures, and solar radiation. Bi-Weekly observations and harvest measured floral timing, abundance, along with fresh and dry stigma weights (g). Vegetative measurements on leaf length were taken after the flowering period. Overall shade was seen to have a significant impact on the floral yield (p<0.05) and vegetative growth (p<0.05) of saffron. With the greatest amount of floral production, abundance, and harvested stigma weight coming from the 20% shade plot. While the greatest amount of vegetative growth came from the 90% shade plot. These findings support the hypothesis that light is a limiting physiological factor to saffron performance in rooftop agrivoltaics systems.

#### Victimization and Student's Perception of Administrative Response on a Large Urban Campus

Annalyse J. Bastres – Criminal Justice and Criminology Faculty Mentor: Jennifer Cheek

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 202

Various forms of violence plague the population as a whole, but individuals who identify as part of minority populations are overrepresented in the rate of victimization, specifically in rates of discrimination, various forms of violence, microaggressions, and harassment. This issue is one that appears in all institutions, but the purpose of this study is to investigate the rate at which these forms of victimization occur at the university level. This study evaluates victimization and administrative response to said victimization at a large urban university in the West, characterized as a Hispanic Serving Institution (HSI) and a commuter campus. Furthermore, this study follows that of a study conducted at a Midwestern small liberal arts university, in which a similar methodology was deployed. Following the online survey students may choose to voluntarily participate in an interview, in which a more thorough investigation of victimization and administrative response (anticipated or actual) is evaluated. From these data, we conduct regression and qualitative analyses.

#### Hyper-tufa cement Metal Mindset

Kylle Been – Bachelors of Fine Art (BFA) Faculty Mentor: Tsehai Johnson

Poster Presentation, Session III (1:15 - 2:30 pm), Poster #1

The research being conducted is about hypertufa cement. A lightweight, versatile material often used for creating garden ornaments and structures. It is composed of a mixture of cement, peat moss, perlite, and vermiculite, which makes it lighter than traditional concrete. This composition allows for easy shaping and molding, making it ideal for crafting lightweight pedestals for my ceramic sculptors that will be shown during the Fall 25 thesis show at the MSU Center for Visual Arts. The porous nature of hyper-tufa also allows it to blend naturally with other materials for color and decoration as well as outdoor environments, providing an aesthetically pleasing and durable solution for various landscaping needs. Additionally, hyper-tufa pedestals are valued for their affordability and ease of customization, making them a popular choice among DIY enthusiasts and professionals alike. I will be adding several different colors and metals to invoke the conversation about trace metals in our environments. hypertufa will provide a solid stricter and an aesthetically pleasing and durable solution for various artistic needs.

#### The T-box gene eomesa specifies few sclerotome cells to expand and form the median fin skeleton

Raelyn Begay – Biology Faculty Mentor: James T. Nichols, University of Colorado Anschutz Medical Campus, and Vida Melvin

Oral Presentation, Session I (8:30 – 9:45 am), JSSB Room 200

Paired fins, specifically pelvic and pectoral fins, have garnered considerable scientific interest due to their homology with tetrapod limbs. However, the most evolutionarily ancient vertebrate skeletal appendages are the median fins, including the anal, caudal, and dorsal fins, which remain relatively understudied. Previous work demonstrated that median appendages are derived from paraxial mesoderm, yet the genes that determine the location and development of these fins remain unclear. In recent work, we used Cre-based lineage tracing to demonstrate that these appendages originate from the sclerotome, a sub-compartment of the paraxial mesoderm. Surprisingly, my studies inducing sparse, permanent labeling of just a few sclerotome cells suggest that few sclerotome-derived cells have the capacity to populate the entire fin. This observation motivates a mechanism in which a few sclerotome cells are specified to migrate to the site of the nascent fin, then expand to contribute to the full fin structure. To investigate the genetic mechanisms governing this specification, we focus on the zebrafish eomesa mutant, which exhibits a loss of the dorsal fin skeleton. *eomesa* encodes a T-box transcription factor known for its role in dorsal-ventral patterning, epiboly, and endoderm specification. However, the mechanisms underlying the loss of dorsal fin in eomesa mutants remain unexplored. We do not detect strong *eomesa* expression in the sclerotome but *do* detect it in the early fin bud. These data motivate the hypothesis that eomesa functions to specify a few sclerotome-derived cells to migrate to the median fin bud and expand. Our study provides insights into the mechanisms of vertebrate appendage development through the underexplored angle of the median skeletal appendages.

### The Chemical Composition of the Rind that Coats the Upper 3 to 8 feet of the Castle Rock Conglomerate

Brendan Bialy – Applied Geology Faculty Mentor: Barbara EchoHawk and Uwe Richard Kackstaetter

#### Poster Presentation, Session II (10:00 – 11:15 am), Poster #14

The Castle Rock Conglomerate is a fluvial deposit dating to the late Eocene, with an age of 36.7-34.0 Mya. The conglomerate is roughly 230 feet (~70 meters) thick and is nearly flat lying, composed of materials ranging from the Idaho Springs Formation, Coal Creek Canyon Quartzite, the Pikes Peak Granite, and the Wall Mountain Tuff. Uniquely cemented by white opal and chalcedony, the Castle Rock Conglomerate is a formation that exhibits unique historical and physical characteristics compared to both surrounding Formations and to other conglomerates found in Colorado. Only recently has major information regarding its physical characteristics and diagenetic history been analyzed and published, especially on the formation of the conglomerate's opal-chalcedony cement. Through field excursions to multiple locations in Castle Rock, Colorado, Franktown, Colorado, and Sedalia, Colorado, a visually distinctive portion of the Castle Rock Conglomerate was observed occupying the top 3 to 8 feet of the Formation. This segment of the conglomerate, referred to as the Layer of Interest or LoI, possesses a distinctive bedding structure and a red-to-orange rind that coats most of the exposed portions of the Lol. Despite the distinct nature of this portion of the conglomerate, there is no mention of a rind nor is there a delineation of the top 3 to 8 feet of the conglomerate in the literature, indicating little to no research has been conducted on the LoI. The focus of this research is to identify the chemical composition of the rind that coats the upper 3 to 8 feet of the Castle Rock Conglomerate. Though outside the scope of this research, discoveries made about the LoI and its rind could have implications that extend to paleosols and ancient environments in the Central Colorado area during the Neogene and Holocene.

#### The Music of the Labor Rights Movement Museum Exhibition

Apollo Blue – Anthropology Faculty Mentor: Jade Luiz

#### Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 205

The Music of the Labor Rights Movement Museum Exhibition is an experiential learning projects researching the relationship between the labor rights movement and music. Research done for the project will be turned into a museum exhibition at the Gilpin History Museum. Research will be done on related artifacts and using documents from the labor rights movement, including sheet music. The information will become a fully realized museum exhibition involving artifacts, historic documents, and historic photographs. This exhibition will aim to give the public an understanding of the history of labor unions and how music was used to aid the movement.

#### Faculty Self-Disclosures: Are Students' Perceptions Impacting Learning?

Bug Bobitsky – Psychology Faculty Mentor: Cynthia Erickson and Katherine Hill

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 203

Does self-disclosure impact students' perceptions of instructors? Some professors frequently share experiences and information about themselves. Sharing may "humanize" the instructor and reinforce learning. However, sharing could also impact teaching evaluations. This study expands on two prior studies (Hill et al., 2021; Erickson et al., 2024) that focused on providing simple vignettes about various conditions and questioning the participants. Students' perceptions of the professor were dependent on the type of self-disclosure. Students read vignettes describing professors' lectures on different topics and disclosing personal information. Participants rated self-disclosures of physical conditions such as brain tumors positively and self-disclosures of psychological conditions such as opioid addiction negatively. We are directly comparing past studies to further our understanding of opioid abuse and brain tumor selfdisclosure among faculty members. We expanded upon the two vignettes selected, providing the participants with comprehensive knowledge of brain tumors and opioid addiction. By limiting the number of vignettes, we hope to better understand how the participants' perceptions directly impact learning. After consenting and confirming their age, participants read vignettes from both lectures. Participants answered the Instructor Self-Disclosure Scale (Cayanus & Martin, 2004), followed by the Composite Approval Score (Hill et al., 2021). The Cognitive Learning Scale (Steinke et al., 2002) and Evaluating University Teaching (Hildebrand et al., 1971) are randomly presented for each vignette. After participants answered both sets of vignettes and scales, they answered learning assessments based on the information provided in each vignette. The past results lead us to assume that student's learning will be significantly diminished in the opioid vignette compared to the brain tumor vignette. This information will provide faculty with a better understanding of self-disclosure.

#### Predator in the Water: Hunting Prey in a neotropical tree hole as Sabethes Mosquito Larvae

Isaiah Bonilla – Biology Co-Author: Haddel Dahabreh Faculty Mentor: Robert Hancock

#### Poster Presentation, Session II (10:00 – 11:15 am), Poster #5

Mosquito larvae of the genus *Sabethes* are typically hatched in neotropical tree-holes known as phytotelmata. Other species of mosquito do live as co-habitants in the same tree holes. It is known that these larvae are both mechano- and photoreceptive, meaning they react to both physical and light stimuli. This suggests that these larvae are likely able to sense other larvae that are within their tree hole through their movements. *Sabethes cyaneus* and *Sabethes chloropterus* have been found, in controlled laboratory studies at MSU Denver, to be predatory both inter- and intra-specifically making them facultative predators as well as cannibals. While it is now known that they have the capability to kill and eat prey, it is not yet known if these *Sabethes* larvae intentionally hunt their prey as opposed to striking if and when the opportunity arises. It is from this unknown that a potential behavior known as "sharking" arises. Sharking is the behavior a mosquito larva exhibits in which it swims through the water, particularly when searching for prey. We are addressing this unknown to further understand how these larvae survive in such a resource-competitive space.

#### Breeding Behavior of the Ferruginous Pygmy Owl (Glaucidium brasilianum) in Costa Rica

Brittany Brown – Biology Faculty Mentor: Christy Carello

#### Poster Presentation, Session II (10:00 – 11:15 am), Poster #6

The Ferruginous Pygmy Owl (Glaucidium brasilianum) is a common Neotropical raptor found throughout central and south America. Although the Ferruginous Pygmy Owl (alpha code FEPA) is considered common due to its widespread range, species abundance and general behavior is understudied. During the spring of 2025 (currently ongoing), MSU Denver undergraduate research student Brittany Brown has been working as a field tech in the central valley province Alajuela of Costa Rica, near the country's capitol, San José. This project has been ongoing for several years under the leadership of Costa Rican native Emmanuel Guzmán on his family property where he installs nest boxes. MSU Denver joined the research in mid-January of this year and have been following one mated pair to learn about breeding behavior. We conduct surveys using Abask trail cameras and a Wildlife Acoustics Song Meter Mini 2 bioacoustics monitoring device. These have been installed outside of the nest box the pair is currently using and are recording 24/7. Physical observations are also made daily during peak hours of activity. These FEPA individuals appear to be more nervous around humans than previously observed, therefore we believe this pair may have experienced nest failure and have re-established a pair bond or are newly mated. This research is ongoing and therefore our current results are limited to recordings from trail cameras and bioacoustics; no formal statistics have yet been calculated. Although this is a behavioral study, we hope to quantify data about courtship, mating, nesting behavior, incubation and fledging during the breeding season of the Ferruginous Pygmy Owl in Costa Rica. We have used previous footage taken by Emmanuel to learn more about life histories and are hopeful our results will help establish information critical to understanding this species.

### Examining the Effects of MEK and GSK-3 Inhibition on mRNA Methylation in Mouse Embryonic Stem Cells

Tristan Bunting – Biochemistry Co-Author: Eden Chavez Faculty Mentor: Christopher Phiel, UC Denver

#### Poster Presentation, Session II (10:00 – 11:15 am), Poster #1

Embryonic stem cell (ESC) pluripotency is an active process that is controlled by distinct signaling pathways. Two of the most critical signaling pathways for controlling pluripotency are regulated by MEK and GSK-3, but the downstream effectors of these pathways on pluripotency are not well-understood. Recently evidence has emerged that levels of mRNA methylation (m6A) are accurate indicators of ESC state, with reduced m6A levels correlating with pluripotency. In an effort to understand the effects of MEK and GSK-3 signaling on m6A, we have performed RNA-seq and m6A-seq on ESCs in which MEK and GSK-3 activity is inhibited individually and together. Our experiments should shed light on the role of MEK and GSK-3 signaling on m6A modifications in mouse ESCs.

#### Finding Winning Strategies in Monopoly by Using Markov Chains

Colin Burkhart – Statistical Science Faculty Mentor: Shahar Boneh

#### Oral Presentation, Session I 8:30 – 9:45 am), JSSB Room 203

Monopoly is a well-known property-trading board game involving a high degree of chance, since almost all player movement is controlled by rolling dice. Consequently, developing effective playing strategies requires a basic understanding of probability. In this project, we examine rent values and probabilities to determine which properties are most beneficial to own and improve, in order to maximize income and probability of winning. We first consider two game situations: one in which a player chooses to escape jail immediately, and one in which a player attempts to remain in jail as long as possible. For each situation, we first calculate the long-run probabilities of landing on each space, independent of starting position, by modeling the game as a Markov chain. Then, we calculate the expected income per roll from each property, accounting for variables such as improvements and the number of properties owned. Our results show that all properties are not created equal, and that some are more valuable than others. In particular, we show that proximity to jail is a major factor in determining how often a property is visited, and that probability, rent, and number of improvements all play a role in a property's expected income. Finally, we discuss the impact of our findings on playing strategy, including which properties are most beneficial to own in order to maximize one's probability of winning the game.

#### Comparison of E. coli Antibiotic Profiles Relative to Source

Charlotte Campbell – Biology Co-Author: Briana Wagner Faculty Mentor: Rebecca Ferrell

#### Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #18

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 specifically human sewage, and efforts to find ways to differentiate *E. coli* strains of human origin from those found in the gut of other vertebrates have generally not been successful. Despite this limitation, E. coli quantification is widely used for public health and regulatory purposes, and so it is important to understand the characteristics of this bacterial species. Additionally, the spread of antibiotic resistance threatens public health in its own way by reducing the efficacy of treatment options. In this study, we compare antibiotic resistance profiles of 26 E. coli strains collected from Canada goose (Branta canadensis) feces with a larger number of new isolates from surface waters of Cherry Creek. These E. coli strains were isolated from Colilert medium in Quanti-Tray, streaked for isolation 3 times on EMB (eosin methylene blue) agar, and confirmed by fluorescence in Colilert medium. Kirby-Bauer analysis is done on Mueller-Hinton agar when a lawn of bacteria are exposed to disks impregnated with a known amount of a single antibiotic. We routinely test for resistance to 6 antibiotics: penicillin, ampicillin, tetracycline, kanamycin, erythromycin and streptomycin. These antibiotics use a range of different modes of action, and bacterial resistance takes different forms for each. Analysis of these results in comparison with those from goose isolates may provide new insights into the complex environmental roles carried out by E. coli strains.

### Unexpected cohabitants with Rocky Mountain Blackflies: The Discovery of Brilliant Red Alpine Hydras in Colorado

Charlotte Campbell – Biology Co-Authors: Lake Harding and Haddel Dahabreh Faculty Mentor: Robert Hancock

Oral Presentation, Session I (8:30 – 9:45 am), JSSB Room 200

Aquatic larvae of hematophagous *Nematocerca* often occur in diverse communities. In the Rocky Mountains of North America, alpine blackflies (Diptera, *Simuliidae*) are diverse, abundant and they are cohabitants with other insects including caddisflies (Trichoptera) and stoneflies (Plecoptera). In August of 2024, while surveying blackflies in the outflows of alpine lakes above 3,350M at Loveland Pass in Colorado, we discovered on submerged rocks, along with blackflies in the genus *Prosimulium*, brilliant red hydras (*Anthoatheceta, Hydridae*). This is the only report of alpine Hydras in the United States, as there was a single article from the mid-1800s depicting similar characteristics, including the bright red color, found in an England outflow. Two trips for specimen collection took place, one at the end of August and one in November, where it was found they can survive the subzero temperature of winter in a flowing stream. We have successfully colonized these in a refrigerated incubator (8oC) in aquaria with site-collected water pumped over the rocks. Our colony animals are maintained on a diet of brine shrimp, and we have observed both asexual (budding) and sexual reproduction. More trips to the sight

are planned to observe their natural behavior as the lake and stream begin to warm, and with the hopes of discovering what they feed on, how often they reproduce, and if they are active hunters of the established Blackfly/ Caddisfly populations. Ongoing research will include molecular species identification, the chemical nature of the red pigmentation and, in the summer of 2025, further characterization of blackflies and hydras sharing the same rocks and identification/characterization of relationships between them.

#### The Function of macc1 in Post-Embryonic Growth in Zebrafish

Jailene Carrillo – Biology Co-Authors: Raelyn Begay Faculty Mentor: Vida Melvin

Poster Presentation, Session II (10:00 – 11:15 am), Poster #7

Metastasis associated in colon cancer 1 (MACC1) is an oncogene known for its role in tumor progression, cell invasion, and metastasis. While extensively studied in cancer, the normal physiological function of MACC1 remains unknown. Preliminary observations in our zebrafish suggest that macc1 may play a role in post-embryonic growth, as fish that have one copy of a loss of function mutation in macc1 (heterozygotes; +/-) seem to show significant size variations. This study aims to quantitatively determine if the macc1 gene is required for normal post-embryonic growth in zebrafish. Standard length in millimeters, the length from the zebrafish snout to the base of the caudal fin, is a well-accepted method to quantitate growth of post-embryonic zebrafish. To investigate the relationship between macc1 function and growth, we will mate macc1 heterozygotes to each other to generate fish with three different genotypes – fish with two normal macc1 genes (+/+; wild type), heterozygotes (+/-), or mutants (-/-) that have two copies of macc1 mutations. We will measure standard length at key developmental stages after fertilization and correlate growth with genotypes obtained through PCR and capillary gel electrophoresis on the ABI genetic analyzer. If macc1 is required for growth, we anticipate that mutant fish and/or heterozygous fish will be smaller in size compared to wild type fish. If no differences are observed, it would suggest that macc1 is not involved in post-embryonic growth. Our findings will provide insight into the physiological role of macc1 beyond its cancer-associated functions.

#### Rhetoric

Juan Castaneda-Ramirez – History Faculty Mentor: Anthony Garcia

#### Poster Presentation, Session III (1:15 – 2:30 pm), Poster #9

The purpose of my work is to catalogue the tools used to control and contain the Mexican diaspora in the United States of America, and what it can tell us about the structures and systems that have formed around it. Moreover, I want to tie my findings into the real world, spreading awareness about the specific mechanisms used by the oppressors, and how to spot them in the wild. This exercise is based around the central research question of how rhetoric has been used to oppress the Mexican diaspora. This more abstract investigation seeks to understand how the rhetoric used changed throughout time, and how the themes it promotes remained the same.

Historical Research- To research this topic, I've consulted the works of Natalia Molina's How Race is Made in America, journals of Aztlan, Eduardo Bonilla Silva's Racism Without Racists, among other sources and bits referenced in these works. This variety will hopefully allow me to grasp a more complete take and offer insights that the audience might've not considered before. Moreover, I hope by using a journal like Aztlan for example, I can get inspiration of the visual language I want to use for my works. Artistic Technique- Moreover, this project will be painted with gouache, with supporting mediums as necessary. The composition will be several works, each building on each other, each depicting one of six eras from the Treaty of Guadalupe Hidalgo, to the present. Six pieces as an homage to Los Seis de Boulder, martyrs who were bombed in the early 70s during a demonstration for Hispanic rights. The implications of my work are grave as the trend demonstrates an eerie similarity to violent clashes seen throughout the 20th century.

#### Circo Anima

Mia Conley – BFA Art Education Faculty Mentor: Marin Abell

Poster Presentation, Session III (1:15 – 2:30 pm), Poster #4

*Circo Anima* is an immersive art installation that reimagines early American circus imagery to explore Albert Camus's Theory of the Absurd and Carl Jung's concept of spiritual alchemy. Centered on the archetype of the clown, the work delves into the historical, cultural, and psychological significance of the fool in the human collective consciousness. Through a blend of historical analysis and narrative short film, *Circo Anima* illuminates the role of the 'Sacred Clown' as a social construct that fosters collective self-reflection and the healthy processing of shame. By employing exaggeration and satire, the clown also becomes a powerful tool for critiquing societal norms and challenging the constructs that confine us. My research concludes that a society that represses this archetype is a society that suffers. *Circo Anima* is an invitation to embrace absurdity in the face of chaos and reconnect with our most authentic selves.

#### Home in the Hollow: Adaptive Behaviors of Neotropical Sabethes Mosquito Larvae in Tree Holes

Haddel Dahabreh – Biology Faculty Mentor: Robert Hancock

Oral Presentation, Session I (8:30 – 9:45 am), JSSB Room 200

Mosquitoes in the genus *Sabethes* are neotropical diurnally-active species that exhibit bright colorations and ornamentations and perform elaborate behaviors. Although understudied, the most common breeding sites are phytotelmata, especially small tree holes. Tree holes are subject to seasonal drought and therefore risk drying out. Other species of mosquitoes commonly co-occur in tree holes and *Sabethes*, which typically feed on suspended organic material, are also formidable facultative predators. In controlled laboratory studies at MSU Denver, we are researching behaviors adapted for tree-hole survival and competition by two sympatric species: *Sabethes Sabethes cyaneus* and *Sabethes Sabethes Sabethoides chloropterus*. Specifically, we are addressing the following questions: 1) Do these *Sabethes* exhibit cryptic behaviors and/or physiologies to survive desiccation? 2) Do all instars exhibit facultative

predation and to what degree? 3) Are they cannibalistic? and 4) Do they hunt for prey by utilizing chemical and/or visual and/or mechanical stimuli?

#### Does Social Media usage determine Schizophrenia Literacy?

Benji Del Barco – Psychology Co-Authors: Kacey Mears and LaKrisha Fehringer, Aden Walsh Faculty Mentor: Aaron Richmond and Chad Mortensen

Poster Presentation, Session IV (2:45 - 4:00 pm), Poster #4

Mental health literacy (MHL) is crucial for recognizing and addressing mental health disorders, yet misconceptions and stigma persist, particularly regarding schizophrenia. This study examined the relationship between social media consumption and MHL, investigating how exposure to digital platforms contributed to misinformation and stigmatizing attitudes. Additionally, we analyzed demographic factors—such as education level, academic major, gender, age, and confidence in mental health knowledge—to determine their association with varying levels of MHL and stigma. We assessed disorder-specific MHL using validated measures, including the Assessing Knowledge of Schizophrenia scale (Compton et al., 2006). Social media use was measured through objective screen time data and self-reported engagement on platforms such as YouTube, Instagram, TikTok, Facebook, and X. We hypothesize that individuals with greater psychology education will demonstrate higher schizophrenia knowledge and lower stigma, whereas those with less psychology education and higher social media usage will exhibit reduced schizophrenia knowledge and increased confidence in inaccurate beliefs. Findings from this study will highlight gaps in public understanding of schizophrenia, inform mental health education strategies, and contribute to efforts to reduce stigma in digital spaces. This study addressed a critical gap in understanding the intersection of social media and MHL, providing insights into how misinformation spreads and shapes attitudes toward mental illness. By identifying key predictors of stigma, our research has implications for educational interventions, policy development, and mental health advocacy efforts aimed at fostering a more informed and accepting society. Data collection was ongoing, and analysis will be provided once results are available.

Compton, M. T., et al. (2006). Assessing Knowledge of Schizophrenia. PsycTESTS Dataset. https://doi.org/10.1037/t38882-000

#### queer as divine

Ryan Lee Dorman – BFA Art Faculty Mentor: Leslie Boyd

Poster Presentation, Session III (1:15 - 2:30 pm), Poster #3

queer as divine contends with the suppression, discovery, and intricacies of my identity and desires. Growing up queer in the evangelical South, my relationship with love and sexuality has been a journey marked by both resistance and triumph. As I've studied how the forces that sought to suppress me have shaped my identity, I have also come to understand how love dares me to confront and redefine these experiences. Each piece in this collection navigates a different facet of the journey—presence, silencing, intimacy, and visibility. i was here stamps a memo of my existence onto childhood photographs, transforming rejection into assertion. gagged turns the biblical symbol of the apple into a gag, surrounded by spikes that embody shame and repression, confronting the condemnation of queer desire. play with my nipple unboxes sexuality through a layered brooch, culminating in a replica of my nipple as an act of reclamation and vulnerability. for all the glory reimagines a glory hole with golden duct tape on a transparent panel, inviting reflection on intimacy and visibility. For me, these works aren't only about the final object—it's been about the process, the physicality, and the way materials push back. The weight of metal, the pressure of stamping, and the transformation of raw materials mirror my own process of reclaiming identity. queer as divine is my declaration: I exist, and I am sacred in my queerness. I invite viewers to peel back the layers of these works, to sit with the tensions of love, shame, and desire, and to reflect on their own moments of defiance and revelation.

#### Investigating Spawning and Reproductive Mechanisms in Aiptasia Anemones

Jeromie Dorrance – Biology Faculty Mentor: Maria Cattell

#### Poster Presentation, Session II (10:00 - 11:15 am), Poster #8

Coral reefs are among the most biodiverse ecosystems on Earth but face increasing threats from climate change, which disrupt coral-algal symbiosis and reduce reproductive success (AIMS 2024). Coral spawning is essential for maintaining genetic diversity, yet corals are difficult to study in laboratory settings due to their slow growth and sensitivity to artificial conditions (University of Queensland 2019). To overcome these challenges, researchers use the anemone *Exaiptasia pallida* (Aiptasia) as a model organism to study coral-algal interactions and reproductive mechanisms (Phys.org 2024). Aiptasia share key biological traits with corals, including a mutualistic relationship with Symbiodinium (zooxanthellae), which provide energy for gamete development and larval survival. Unlike corals, Aiptasia are fastgrowing, resilient, and capable of both asexual and sexual reproduction, making them ideal for controlled studies on gametogenesis, fertilization success, and genetic variation in offspring (Baird, Guest & Willis 2019). This study examines sexual reproduction and genetic fitness in Aiptasia, focusing on gamete production, fertilization rates, and offspring viability. To stimulate spawning, diel light cycles will be manipulated using artificial light. Gametes will be collected and observed in the lab, laying the foundation for future research on genetic diversity in Aiptasia offspring. By assessing genetic variation, this study aims to provide deeper insights into the genetic mechanisms underlying reproductive success in cnidarians, ultimately contributing to a broader understanding of their adaptability and resilience. Understanding sexual reproduction in Aiptasia enhances knowledge of coral spawning and genetic fitness, offering a framework for studying reproductive strategies in reef organisms. These findings may inform coral conservation efforts by improving understanding of genetic diversity and reproductive resilience, contributing to future research on coral reef restoration (Ross et al. 2024).

#### Real Girls' Talk: Demonstrating Trans Women's Precarity

Artemis T. Douglas – IDP: Feminist Rhetorical Practices Faculty Mentor: Ruso Garrido

Oral Presentation, Session I (8:30 – 9:45 am), JSSB Room 202

Trans women live precarious lives. The available literature shows that trans women have a very high unemployment rate (15% or more) and face additional challenges based on their positionality. These challenges can include being forced out of formal employment, legislation that targets their ability to exist equally in public, being rhetorically constructed as monstrous, and rampant discrimination across all spheres. However, this discrimination includes epistemic erasure from many disciplines, including the disciplines of women's and gender studies. This project addresses a gap in the literature by collecting interviews and survey data from trans women about their lives. The goal of this study is to overcome the epistemic barriers preventing trans women from being considered through demonstration of the real, lived, material conditions they face. The study will use long-form interviews and quantitative surveys to illustrate their precarity and its consequences on their lives. The goal of this study is to open a conversation about trans women using the words of trans women. In short, trans women are women denied access to women's supports, recognition, literature, and resources and the downstream effects of that denial creates and maintains their precarity and this study will attempt to demonstrate such denial.

#### How To Move the Needle: Is MMT Rhetoric an Avenue for Change Within Advocacy?

Artemis T. Douglas – IDP: Feminist Rhetorical Practices Faculty Mentor: Jessica L. Parker

#### Poster Presentation, Session III (1:15 – 2:30 pm), Poster #6

This research project 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 hyperaccurate, 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. This study will measure whether the learning of MMT affects support for publicly funded provisioning of universal basic services. It will do this through a paired experimental assessment- 2 placebo conditions matched to 2 experiment conditions. The mixed-methods survey instrument will gather qualitative data about the state of the economy in 2024 and quantitative data collected both before and after exposure to the experiment conditions. The quantitative data questions specifically ask for support regarding various different federal policies to provide a piece 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 expect the study data will indicate that people in the United States demonstrate an increase in support for federal intervention to provide universal basic services and raise the quality of living in the United States after direct exposure to MMTinformed media content.

#### **Unearthed: Black Colorado Revealed**

Yomi Fadeyi – Fine Art Faculty Mentor: Matthew Jenkins

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 205

The main focus of this project was to uncover the stories of African Americans who lived in Colorado but did not receive the same attention or exposure as other historical narratives. This project provides a new perspective on Colorado's history but more importantly honors the legacy of African Americans in the state and acknowledges their contributions to its history. This project allowed me to examine and study events from Colorado's past, uncovering facts about the African American population and how their lives influenced the history of Colorado and the nation. Through research, I discovered stories and facts that had been overlooked or forgotten yet played a significant role in the lives of African Americans in Colorado and throughout the United States. The facts I have collected have enabled me to create images that revive and retell forgotten portions of Colorado's history while also highlighting the achievements and experiences of African Americans who have resided in the state. The medium I chose for this project is watercolor. I feel this medium is especially fitting because it is delicate, somewhat transparent, and applied in layers—mirroring the way these fragile stories are being retold, adding depth to Colorado's cultural history while also bringing more transparency to its historical narrative. I have chosen to display the images I created in a book which symbolizes the unity of these stories while also representing the legacy that I am putting back together. Although my project is not finished, I feel that it's unfinished state will also represent the forgotten stories and history as they are too only partial stories that provide a portion of what actually happened.

#### Bili: An Open-Source Framework for Evaluating Large Language Models in Sustainability Applications

Luke Farchione – Computer Science Co-Authors: Emily Boyer Faculty Mentor: Daniel Pittman and Alyssa Williams

#### Poster Presentation, Session II (10:00 – 11:15 am), Poster #15

As part of the NSF-funded Sustainability Hub project, we've developed Bili, an open-source framework designed to address Colorado's fragmented sustainability data landscape. The Sustainability Hub aims to create an open-access, user-centered platform that democratizes sustainability data across economic, environmental, and social domains, enabling better regional collaboration and informed decision-making. Bili serves as the conversational interface for this platform, leveraging large language models (LLMs) to provide intuitive access to sustainability data. To ensure Bili meets real-world needs, we employ a community-driven approach, actively engaging with stakeholders to refine its development. We have mapped 1,243 community organizations and conducted targeted surveys to understand information needs, data access challenges, and usage patterns, guiding how Bili's AI responds to sustainability-related queries and enhances decision-making. While originally designed for sustainability applications, Bili's modular architecture makes it adaptable for evaluating LLMs across diverse domain-specific tasks. By sharing this open-source framework, we aim to advance the broader understanding of AI applications, fostering innovation not only in sustainability but across interdisciplinary research fields.

#### Queer and Trans interchanges: mutual aid in the U.S. Mexico borderlands

Amelia Federico – Political Science, Chicana/o/e/x Studies, Sexualities Studies Faculty Mentor: Arlene Sgoutas and Raul Melgoza

Oral Presentation, Session I (8:30 – 9:45 am), JSSB Room 202

The purpose of this research project is to analyze the U.S.-Mexico border as a location of statesanctioned and manufactured violence and how this understanding lends itself to the need for grassroots organizing and mutual aid projects. The work of Chicana Feminist Gloria Anzaldúa, in her Borderlands: La Frontera (1987) is integral to understanding not only borderlands theory, but how the borderlands are a physical place of violence, but also an emotional, and spiritual site of tension (Anzaldúa, preface). Another borderlands theorist and transnational feminist Harsha Walia expands on Anzaldúa's analysis of borders and how borders are inherently violent and are designed to enact violence. Within her analysis in Border and Rule: Global Migration, Capitalism, and the Rise of Racist Nationalism (2021) she contributes critical analysis on the construction, and function of the border. Walia describes liberal reforms to migrant justice as insufficient and proposes mutual aid to organize and build solidarity outside of state-sanctioned entities like non-profits or government agencies. The purpose of this research project is to analyze the U.S.-Mexico border as a location of state-sanctioned and manufactured violence and how this violence mobilizes mutual aid projects (Walia, 2021) that specifically address the needs of queer and trans migrants. The concept of the borderlands (Anzaldúa, 1987) will be used to highlight the violence migrants face and the ways mutual aid networks are organized around the needs of queer and trans migrants in Tijuana, Baja California, and Los Angeles California. Content analysis from various social media platforms will be examined for two groups, Contra Viento y Marea and Trans Defense Fund, to understand how autonomous mutual aid networks are not only supporting the needs of queer and trans migrants but also how the networks are building collective solidarity and resistance.

#### Cyclic tribenzimidazole

Miranda Flynn – Chemistry Faculty Mentor: Michael Jacobs and David Schubert

Poster Presentation, Session III (1:15 – 2:30 pm), Poster #10

Benzimidazoles are a class of drugs primarily used for their anti-parasitic properties, with derivatives being studied for other pharmacological applications. Cyclic tri benzimidazole (CTBI), a derivative compound of benzimidazole and cyclic triimidazole (CTI), is synthesized via an acid-catalyzed redox reaction between copper oxide and benzimidazole, producing benzimidazolate, which is then pyrolyzed to become cyclic tri benzimidazole. CTI crystals have been studied for their interesting optical and photochemical properties; additionally, the nitrogen present in the structure is able to accept hydrogen bonds, which make it possible to build other supramolecular bonds: ordered systems held together by hydrogen bonds. These hydrogen bonds enable the CTI crystal structure to stack in such a way that the outer rings are above and below the central ring. It is possible that CTBI crystals may hold similar properties to CTI due to possessing a larger pi system. There is a dearth of information on the pyrolysis of CBTI; tube furnace pyrolysis and differential scanning calorimetry (DSC) will be used to guide initial

analysis of the structure and properties of CTBI. Various chromatography methods such as gas chromatography mass spectrometry (GC-MS) and infrared spectroscopy (FTIR) will be used to confirm structure and reveal possible isomers present, determine purity of the compound, and quantify the concentrations of structures present. Melting point analysis, thin layer chromatography (TLC) and silica gel columns are also methods used to determine purity of the complex created in lab. Other wet chemistry experiments such as distillation or extractions will be used to create and separate more complexes of CBTI.

#### Chicanx Community Organizing and its Relationship to American Indian Liberation

Ale Fontes – Gender, Women, and Sexualities Studies Faculty Mentor: Zaynab Shahar

#### Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 200

The purpose of my work is to further understand how Chicanx people are understanding Indigeneity as it relates to spiritual practice and community organizing. I hope to bridge the connection between Chicanx Indigenous organizing and American Indian Liberation in ways that show the distinct differences between the two that can offer pathways to decolonization and liberation for all minoritized bodies. The central research question that I address in this presentation is: What are the implications of Chicanx people (re)claiming Indigeneity and thus Indigenous spiritual practices such as rituals, limpias, and danza within community organizing spaces as it relates to American Indian decolonial efforts? The methods of this research includes analyzing public primary sources from three Colorado organizations - Chicano Liberation Committee, Dystopian Times Media, and Womxn from the Mountain. The primary sources include social media posts, event descriptions, and posted manifestos. The analysis will be tied to two key queer and liberatory theories: Decolonial Feminism and Transnational Feminism. An implication is that there's a tribal/blood divide between Chicanx Indigeneity and American Indian identity where many Chicanx people are not considered Indigenous because they are not connected to a tribe or have no direct ties to indigeneity. Further, this work includes understanding how Chicanx Indigenous-identified people understand decolonization and how they're implementing these ideas into their organizing. The last important implication is that there are no clear coalitional efforts happening with contemporary American Indian groups/people and Chicanx Indigenous-identified people in Colorado specifically. Lastly, I highlight Mujeres de Maiz, an L.A.-based coalitional organization that works with people from all groups including but not limited to Chicanx Indigenous, the Lakota community, and Filippinos.

#### Crip Superpositioning: Disabled Temporal Experience in the (in)Accessible Western Academy

Sylas Fox – Gender, Women, and Sexualities Studies Faculty Mentor: Sonny Dhoot

#### Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 200

This project focuses on the ways in which time is experienced and accessed by people with disabilities in a way that is fundamentally different than abled people within the lens of Western academia. An intersectional analysis of the academy and time itself is centered in my research and the disabled experience of time – Crip time – is joined by Black Quantum Futurism as my theoretical framework. In

my work, time is approached as a deeply subjective experience, despite dominant narratives of objective, constant, and linear temporality. Via discourse analysis, I dissect current disability accommodation standards and practices in Western academia, disclosing its exclusion and misunderstanding of the disabled experience. Moreover, I theorize that this harm stems from a place of temporal dissonance; a fundamental difference in Crip vs. abled time that leads to academic institutions failing disabled scholars over and over again, prescribing chronotypical solutions to Crip, chronoatypical experiences and perceptions. I focus my analysis through the lenses of temporal autonomy in the academy, time poverty, and Crip spatial temporalities. Additionally, this analysis of Crip time and the academic accommodations system necessitates a disabled understanding of time to be at the heart of questions of access and accommodation in university. My own experiences and varying degrees of success and failure as a disabled academic both guide my research and provide a methodology in autotheory.

#### Optimization of a Serendipitous Discovery: Synthesis of Glycosyl Chlorides using Tin Tetrachloride

Viktoriya Gidenko – Chemistry Co-Authors: Isabel Thomas and Ernesto Saenz-Rascon Faculty Mentor: Shailesh Ambre

#### Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #14

Glycosylation is an important co- and post-translational modification of various biomolecules. Glycans play an important role in a variety of biological processes including protein folding, cell-cell recognition, pathogen interactions, and tissue structure. However, because it is a non-templated process, obtaining a pure glycan sample is tedious. Regio- and stereoselective glycosylation has widespread applications for the efficient procurement of workable quantities of oligosaccharides to study their biological roles. Chemical glycosylation involves a reaction between a glycosyl donor with a suitable leaving group on the anomeric position with an acceptor. This reaction is facilitated by a Lewis acid activator. A variety of glycosyl donors with leaving groups such as acetates, halides, imidates, thioglycosides, phosphates, and triflates, have been explored to control the reactivity and/ or stability of the donor for achieving the desired stereochemistry in glycosylation. Of these leaving groups, halides have been utilized extensively for their versatility in reactions, regardless of any protecting groups present. However, glycosyl iodides and bromides are highly reactive and extremely difficult to purify. Glycosyl fluorides are relatively stable; however, the use of fluorides poses an environmental hazard as they may generate toxic or corrosive byproducts. Thus, glycosyl chlorides are the most stable, ecologically friendly option among halide donors. Recently, we identified the formation of an anomeric chloride as a byproduct in the glycosylation of rhamnosyl acetate using tin tetrachloride as the activator. Similar observations have been sporadically reported in literature without further investigation. This inspired us to investigate the development of a protocol for the efficient, cost-effective synthesis of an anomeric glycosyl chloride donor using tin tetrachloride. In this study, we report our findings with respect to the optimization of the protocol for making rhamnosyl chloride using varying concentrations of tin tetrachloride, different solvents, and temperature.

#### Chemistry of Urushiol Oil and it's Applications

Stian Gilbertson – Chemistry Faculty Mentor: Michael Jacobs

Poster Presentation, Session III (1:15 – 2:30 pm), Poster #11

Urushiol oil is a common allergen found in poison oak, poison sumac, and poison ivy. Chemically, it is composed of catechols. These consist of a benzene ring with two hydroxyl groups and a single side chain of hydrocarbons. Although urushiol oil has a bad reputation for being in plants that are considered poisonous, surprisingly, it's reportedly found in mangoes and, notably, it's used as a lacquer for furniture. Herein, we present an exploration of urushiol oil in terms of its chemistry and uses.

#### Exploring Microbial Dynamics of Bonairian Coral Affected by Bleaching and Disease

Maria (Meg) Green – Biology Faculty Mentor: Maria Cattell and Helene Ver Eecke

Poster Presentation, Session II (10:00 – 11:15 am), Poster #9

A healthy coral is established through the presence of photosynthetic algae that live in its tissue, providing the coral with necessary nutrients and colorful pigmentation. Due to environmental stresses from climate change, such as rising ocean temperatures, coral reefs are experiencing mass devastation around the globe. These stressful conditions cause the coral to expel the endosymbiotic algae from its tissue, resulting in loss of pigmentation known as "bleaching". The degree of pigmentation directly corresponds to endosymbiont presence and is used to qualitatively assess coral reef health in the field. Another affliction impacting Caribbean stony corals, Scleractinian Coral Tissue Loss Disease (SCTLD), presents similar visible symptoms and is also suspected to be caused by microbiome changes, though the specific microbes responsible remain unknown. To better understand the microbiomic differences between various degrees of bleached coral, and those affected by SCTLD, water samples were collected near affected corals in reefs off the coast of Bonaire. The environmental DNA (eDNA) from these samples will be extracted using a commercial kit, then sequenced to analyze microbial communities, identifying any potential patterns in microbial presence and abundance associated with each condition. This research will provide valuable insights into the microbial dynamics associated with coral bleaching and provide more information on potential microbial causes of SCTLD. Understanding these microbial interactions is crucial for advancing reef management efforts and mitigating the impacts of climate change and emerging coral diseases on vulnerable reef ecosystems.

#### Zeromile Issue #15 – Network

Paul Guzman – Communication Design Co-Authors: Zoe Pendleton, Ashley Street, Kiersten Downing, July Ramirez, Irania Carrazco, Sophie Reese, Elliana Martin, Elle Rothschild, Zoe Gonzales, Katie Johnson, Blake Bentley, Will McGavin, Hoa Nguyen, Raf Garcia, and Nikia Parker Faculty Mentor: Peter Bergman

#### Poster Presentation, Session III (1:15 – 2:30 pm), Poster #5

Our connection to the world around us shapes the connections we share with one another. In today's hyperconnected world, we've become so accustomed to being online that our experiences are often filtered through digital networks. What once influenced how we relate to information now defines the fabric of our relationships. But how did we get here? What changed along the way? And most importantly, what comes next? Zeromile, a biennial, student-led publication from MSU Denver's Communication Design Program, explores these questions in its latest issue, Network. Through collaboration and research, emerging creatives examine the profound impact of the internet on our lives—how digital networks shape relationships, culture, and identity, for better or worse. To reflect the complexities of our online existence, Network takes a flipped light-and-dark book approach. One side highlights the opportunities created by digital connection, while the other confronts its risks, from surveillance to social media's psychological toll. Students independently selected and researched their topics, exploring themes such as digital labor, online addiction, and hidden networks. Featured pieces include Net-Work: What Does It Mean to Work in the Digital Age?, Social Addiction: Are We Really Addicted to Social Media?, and Invisible Networks: Embracing the Chaos of the Dark Web. The class behind Network functioned as a real-world design team, with students taking on a range of roles across editorial, creative, marketing, and outreach positions. From Editor-in-Chief and Creative Director to writers, designers, and strategists, each contributor played a vital role in shaping the publication. More than just a project, Zeromile provides hands-on experience in research, collaboration, and content creation. By critically engaging with the digital age, Network challenges us to rethink our relationship with technology, with each other, and with the world.

#### The Impacts of E-cigarettes and Vapes on the Health of American Youth

Michael Hatchell – Healthcare Administration Co-Author: Maxwell Ricks Mentor: Garvita Thareja

#### Poster Presentation, Session IV (2:45 - 4:00 pm), Poster #1

Vaping and e-cigarette use is an epidemic within today's youth of America. Millions of high school and middle school aged kids use the products and are developing lifelong dependencies on these products. It is vital for the long-term health of American youth that health professionals continue to research and monitor the short and potential long-term health effects of vaping and nicotine use. We conducted a systemic review as our research method. This included reviewing existing literature and analyzing qualitative and quantitative data sets. Literature has shown that there are numerous short- and long-term health effects that come along with e-cigarette and vape usage. There are negative effects to the immune system, respiratory system, and nervous system with prolonged use of vapes and e-cigarettes. One especially concerning finding is the negative effects on brain development that accompany e-cigarette and vape use within the youth. We recommend that comprehensive information and statistics be easily accessible to educate the public of the dire short- and long-term effects of vaping and e-cigarette use within the youth. We also propose immediate changes to the current e-cigarette and vaping marketing that overwhelming targets the youth. As vaping and e-cigarettes are newly developed technologies, further studies need to be done to understand the long-term effects of vaping and e-cigarette use that we are just now getting a glimpse at.

### Identifying Essential RNA Structures for Noncanonical Cap-Independent Translation in Blackcurrant Reversion Virus

Veronica Henderson-Davis – Biochemistry Co-Author: Steven Mendoza Mentor: Megan Filbin

#### Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #12

RNA structures located in the untranslated regions (UTRs) of viral RNA genomes are required for viral replication and pathogenesis, including noncanonical translation initiation. The 3' UTR of plant RNA viruses, such as the blackcurrant reversion virus (BRV), contain a variety of structures that function as cap-independent translation enhancers (CITEs). These CITEs hijack a subset of translation factors to initiate viral protein synthesis in a cellular environment where cap-dependent translation initiation is repressed. Both genomic RNAs in BRV contain a CITE, yet the putative stem-loop 4 (SL4) is not conserved between them, raising the question; is SL4 essential for BRV translation initiation? Minimum free-energy structural modeling revealed that deleting SL4 has negligible impact on the overall CITE secondary structure. Initial in vitro transcription and reporter translation assays show a modest effect on translation initiation when SL4 is deleted, suggesting SL4 is not critical for BRV RNA-1 function. Our results were further supported by multiple sequence alignment of viral variants showing minimal conservation in the loop of SL4. Collectively, our data suggests that SL4 structure folds independently of the other CITE stem-loops, and it may play a minor or redundant role in noncanonical translation initiation.

#### Social Connection Through Gamification: The Next Phase of Roadrunner Connect

Cece Housh – Computer Science Co-Authors: Vincent Cordova and Kyle Zimmerman Mentor: Daniel Pittman and Meredith L Jeffers

#### Poster Presentation, Session II (10:00 – 11:15 am), Poster #16

Roadrunner Connect is an application focused on increasing campus engagement at MSU Denver by making it easier to find, participate in, and share events on campus. Our research explores the question: How can technology continuously evolve to promote community engagement and accessibility? The app, which is now fully launched as of December 2024, leverages an interactive, map-based platform that allows students, alumni, faculty, staff, and the greater Metro Denver community to discover events, participate in contests, and compete in a gamified rewards system. Our poster presentation will showcase the evolution of Roadrunner Connect from its initial development to its current phase of expansion, highlighting its impact on campus life and its potential as a long-term engagement tool for the broader Denver community. This will give the audience insights into our strategy for keeping an active user base, and presenting relevant information to the community in a centralized platform with an intuitive design. Now that our app has publicly launched, our focus has shifted to enhancing its core functionality, improving accessibility, and expanding user interaction. Using Flutter, Node.js, and MongoDB, we are implementing new social features, such as a friends system for friendly competition, an enhanced admin panel for app management, and greater accessibility options to accommodate a diverse audience. To ensure usability, we are conducting 2-4 user testing sessions this semester to refine

the app's experience. This work helps fulfill Pillar 3 of the 2030 MSU Strategic Plan, and strengthens the university's role as an anchor institution by making campus events more interactive and inclusive for all.

#### Distribution of electric scooters in Denver that ride on the sidewalk versus paved road

Austin Ingham – Criminal Justice Faculty Mentor: Hyon Namgung

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 202

Since 2018, the popularity and usage of electric scooters in Denver has skyrocketed, sparking debate about where they should be ridden. In 2019, Denver amended its code of ordinances, prohibiting e-scooter use on sidewalks. While limited data exists on the patterns, timing, severity, and cost of e-scooter injuries, there is no data on the proportion of riders complying with the city's regulations. This study aims to estimate the proportion of riders adhering to the ordinance regarding e-scooter operation, to better understand their integration into Denver's traffic flow. Specifically, this research addresses the following questions: (1) Do the observed population of e-scooter riders in Denver comply with the ordinance by riding on bike lanes or streets, rather than sidewalks? (2) Should the existing ordinances be revised to better reflect the safest riding conditions for both pedestrians and e-scooter users? To address these questions, observational research methods were employed to record e-scooter rider behavior in high-traffic areas identified using Ride Report data. Data collection focused on the primary riding surface used during each observed trip, that being sidewalks, paved roads, and bike lanes. Observations were recorded manually from an approximate distance of 30 feet. Following data collection, the notes will be analyzed to determine rider behavior and related factors. This research will contribute to understanding the impact of public policy on micro mobility in urban environments.

#### Exploring the Role of LMS Interactions with Modules and Academic Success

Kyle Jones – Psychology Faculty Mentor: Bethany Fleck-Dillen

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 203

This study examines how students interact with course modules on the CANVAS Learning Management System (LMS) and how factors such as age, gender, GPA, and class standing influence engagement. While online learning has expanded access to education, the LMS platforms often fall short of maximizing interaction with students. Research suggests that increased module interaction and content engagement can improve academic performance and reduce education-related anxiety. The extent of demographic characteristics' role in student engagement remains an open question. Using a mixed-methods design, this study collects data through an online self-report survey and the CANVAS LMS Analytics. Engagement metrics, including LMS navigation pattern, time spent per page, and dates of module access will be analyzed. Data collection is ongoing and will be completed in the middle of March 2025 with students from in-person and online Intro to Psychology courses participating via the SONA system. The analysis will assess student engagement with the course materials, the methods used to access module content, and the role demographic variables may influence student interaction with the course information. By identifying trends in LMS engagement, this research aims to provide meaningful insight into student

learning behaviors and improve online education strategy. Findings intend to support educators in developing and improving instructional strategies, course structure, and refinement of online learning for a more engaging experience. Understanding how students navigate LMS content can help to improve learning environments, engagement strategies, and enhance overall course effectiveness. Beyond improving course design, this study can provide further insight into how technology can be utilized to better support student learning experiences in an expanding and changing online academic setting.

#### Life of Ragtime

Cecilia Jones – Theatre Faculty Mentor: Alyssa Ridder and Carrie Colten

#### Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 205

I will present my dramaturgical work for MSU's Production of Ragtime. The musical takes place in 1906 in New York and follows three families: a rich white family, a black musician with his pregnant ex-lover, and a Jewish immigrant who has just arrived with his daughter. These groups interact with each other and various figures from history. Famed magician Harry Houdini and radical anarchist Emma Goldman represent the immigrants of the Gilded Era where Harry Houdini is the American dream and Emma Goldman shows the horror and poverty facing the vast majority of immigrants. Inventor Henry Ford, robber-baron J.P. Morgan, and starlet Emma Goldman represent the promise of "glory" pushing the upper-crust white family forward. Meanwhile, a black ragtime musician models his life after Professor Booker Taliaferro Washington, the first black man to be awarded a degree from Harvard. I researched each historical character in the show reading various books and autobiographies and creating a character sheet for each. This allowed the actors and production team to better understand each character's given circumstances. I also did research into the average lives of 'polite society', black people in Harlem, and immigrants which impacted their depiction in the show. At the time, Darwin's theory of evolution had widespread effects on how people viewed social classes and built a "survival of the fittest" view of classes. Understanding this helped actors understand the divide between groups as well as the treatment of the white family's disabled son. The black community in Brooklyn opened gay bars and clubs turning Brooklyn into a haven for queer people of all races.

#### **Evaluating the Correlates of Math Anxiety**

Ayden Joshi – Psychology Co-Authors: Nicholas Miller, Nana Akua Adu Owusu, Sarah Rones, and Brandon Martinez Mentor: Cynthia Erickson, Arijana Barun, and Shalini Srinivasan

#### Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 203

Math anxiety can result in poor math performance and may cause math and STEM avoidance. Some studies have revealed a significant effect of gender on math anxiety, with women showing higher levels than men. Prior studies related to math anxiety have always examined gender as a binary variable, while the current study included non-binary individuals as a third group. Math anxiety was measured using a math anxiety scale and a self-reported rating. Students in psychology, biology, chemistry, statistics, and brain and behavior courses were surveyed over three semesters (N = 402; 228 women, 141 men, and 27

non-binary individuals). When math anxiety was compared at the beginning vs. end of the semester, there was a decrease in anxiety for students in the statistics course (t(16) = 4.04, p < 0.001, d = 0.98), but not for students in chemistry (t(28) = 0.46, p = 0.65, d = 0.09), biology (t(55) = -0.77, p = 0.445, d = -0.10), or brain & behavior (t(37) = 1.52, p = 0.14, d = 0.25) courses. Gender had a significant effect on levels of math anxiety, with women and non-binary students exhibiting greater levels as compared to men (F(2, 376) = 7.57, p < 0.001). Women and non-binary students did not differ significantly in math anxiety. This study indicates that women and non-binary individuals have higher levels of math anxiety relative to men. In addition, anxiety decreased for students in the statistics course, but not in other surveyed courses. Future studies will investigate if math anxiety predicts success, grades, and retention in college overall and based on gender. The impact of implementing student-centered practices on math anxiety and gender will also be investigated across STEM courses.

#### A Random Walk Through Gambler's Ruin

Jackson Jurgaitis – Statistical Sciences Co-Author: Jesus Tena-Sanchez Mentor: Shahar Boneh

Oral Presentation, Session I (8:30 – 9:45 am), JSSB Room 203

This presentation is an exploration of The Gambler's Ruin Problem, a probability model based off of gambling at a casino. We seek to identify trends in probability and optimal choice of parameters, as well as simulate data in order to assist in finding the best strategy of play. We'll be explaining several different graphical depictions of the probability distribution function of the Gambler's Ruin Problem, in which we'll demonstrate how changing each parameter can affect the likelihood of reaching fortune before forfeiture. We'll be using a variety of other methods to accomplish this as well. The Monte Carlo simulation method is a way of simulating a series of events while also ignoring other sources of random error. We're using the Monte Carlo method in order to rule out variation from variables such as how long it takes to play a single game, or gambling on games that don't have a one-to-one payout. We will be using two different gambling/betting strategies; one of which is the Martingale System, where you double your bet after each loss. We will use the Martingale System to compare the results from our initial Monte Carlo Simulation in order to assess if using the Martingale System will increase our probability of reaching the goal before going broke. We will also be using the Kelly Criterion and comparing it to the Martingale System to find which is more effective. Thus, we'll be comparing probabilities between these two strategies to see how our results differ with each simulation.

#### The Evolution of Cooperation Across Different Biological Scales

Charlie Kirkham – Biology Faculty Mentor: Erin Bissell and Caleb Cohoe

Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 203

The history of life on Earth is popularly portrayed through a lens focused primarily on the evolution of complex, multicellular organisms such as plants and animals. This depiction, however, largely ignores the diversity of microbial life on the planet and fails to explain the origins of complexity. A more inclusive

perspective addresses the development of complexity and reveals a picture of life characterized by Major Evolutionary Transitions. This work considers Major Transitions at three hierarchical levels: 1) From replicators to genetic networks, 2) unicellular to multicellular organisms, and 3) solitary organisms to communal groups such as colonies, herds, or societies. These inflection points in evolutionary history are characterized by events involving cooperation between like and unlike biological entities. Evolutionary explanations for the role of cooperation in Major Transitions remain incomplete and, in some respects, controversial. This presentation will philosophically analyze different definitions of biological individuals, how cooperation has led to their evolutionary development, and how these definitions affect debates over explanations of the Major Transitions. Cooperation is a vital component of success in the history of life, including our own history as a species. By developing a deeper appreciation for the role of cooperation in the evolution of complexity, we may gain insights into social and biological interactions that influence our future success. Science finds what it looks for, often neglecting perspectives that haven't been considered. From an intellectual perspective, Major Transitions in Evolution considers life's history as a series of cooperative successes rather than solely a war of nature, ultimately broadening the scope of future inquiry.

#### The Intricacy of Simplicity

Kyle Kramer – BFA Faculty Mentor: Marin Abell

Poster Presentation, Session III (1:15 - 2:30 pm), Poster #2

Imagination is defined as the mental process of creating new ideas, sensations, and visualizations; essentially allowing you to picture things not currently present in your reality. This freedom is often diminished in adulthood due to societal pressures and the prioritization of logic over creative exploration. This decline risks a stifling of innovation, empathy, and our ability to creatively address complex global issues. The Intricacy of Simplicity is an evolving and layered series that explores this vital role of imagination in personal and collective growth. It began as an illustrated novelette, grew into this immersive experience (which will be documented on the poster), and dreams of becoming a stop motion film. Ultimately, The Intricacy of Simplicity project seeks to demonstrate art's crucial role within imagination, personal growth, and the collective ability to envision further connections.

#### **Factorial Frenzy**

Licia Lamb – Mathematics Faculty Mentor: Diane Davis

Oral Presentation, Session I (8:30 – 9:45 am), JSSB Room 203

Factorials have been a topic of fascination and study for millennia, serving as the quiet foundation for a plethora of mathematical concepts. While complicated at first glance, there are distinct and reliable patterns given by factorials. For example, each factorial greater than 1! is an even number. Approaching factorials through this lens of pattern recognition, we observe that for  $n \ge 5$ , n! has at least one trailing zero. In this presentation, we give a formula that predicts the number of trailing zeros on n! and proceed to further generalize this idea to determine the maximal k for which n! is divisible by mk. The process of
deriving this function and our results highlight the impact of prime factorizations within large numbers. As we explore the continuously expanding world of factorial patterns, we can utilize them to demonstrate the value and applications of theoretical mathematics.

#### Investigating Acyl Fluorides as a Potential New Class of SHAPE reagents

Gage Leach – Biochemistry Co-Authors: Lizeth Hernandez and Daniel Gerber Mentor: Ambre Shailesh and Megan Filbin

#### Poster Presentation, Session II (10:00 – 11:15 am), Poster #2

The COVID-19 pandemic has underscored the critical need for rapid advancements in molecular biology, particularly in understanding RNA structures and their functional roles. Over the past few decades, technological innovations have significantly enhanced our ability to determine RNA structures with improved efficiency and precision. Among these advancements, Selective 2'-Hydroxyl Acylation analyzed by Primer Extension (SHAPE) has emerged as a powerful technique for probing RNA structure. SHAPE utilizes chemical probes to modify unpaired nucleotides, offering detailed insights into RNA loop formation in both secondary and tertiary structures. However, many traditional SHAPE probes, such as 1H-Imidazol-1-yl(2-methyl-3-pyridinyl) methanone (NAI) and N-methylisatoic anhydride (NMIA), are limited by short-lived electrophilic reactivity, nucleotide bias, and the need for advanced synthetic expertise, thereby restricting their broader applicability. To address these limitations, we are exploring acyl fluorides as a novel class of SHAPE probes. Acyl fluorides offer distinct advantages, including enhanced water solubility, improved stability, and broader reactivity profiles. In this study, we report our progress in designing water-soluble acyl fluoride probes and evaluating their stability, nucleotide preference, and ability to label RNA both in vitro and in vivo. By expanding the SHAPE toolkit with these probes, our work contributes to the development of more accessible and versatile tools for RNA structural analysis. This advancement holds promise for enabling deeper insights into RNA biology and fostering wider participation within the RNA research community.

# **Unpacking Containers: Building a Custom OCI-Compatible Container Engine**

David Lee – Computer Information Systems Faculty Mentor: Daniel Haupt

Oral Presentation, Session I (8:30 – 9:45 am), JSSB Room 205

This research project explores the foundational concepts behind container engines through practical development of a custom, simplified OCI (Open Container Initiative)-compatible container engine using Python and Linux. By systematically dissecting containerization technology—focusing specifically on Linux namespaces, control groups (cgroups), and OCI specifications—this project offers an in-depth, hands-on approach to understanding container runtimes as used by Kubernetes. Emphasis will be placed on creating isolated execution environments using Linux namespaces, applying resource constraints with cgroups, and managing container images following OCI standards. The project not only illuminates the underlying mechanisms employed by industry-standard runtimes such as containerd and runc but also bridges the gap between theoretical knowledge and practical application in Kubernetes ecosystems.

Additionally, the research addresses practical concerns around complexity and maintainability encountered when using container orchestration systems, highlighting both strengths and limitations of popular technologies such as Docker Compose and Kubernetes. Ultimately, this work will evaluate the feasibility of using custom-built runtimes in production scenarios, aiming to clarify when and why it might be advantageous to use simpler, tailored solutions versus established, comprehensive orchestration tools like Kubernetes. This project deepens understanding of container technologies and Kubernetes internals, facilitating better architectural decisions, troubleshooting, and innovative approaches in containerized application deployment.

# Transportation and Ridesourcing in the Blind and Low Vision (BLV) Community

Jordan Lestenkof – Geography Co-Authors: Libby McGavran, Ronan Brennan, and Noah Cowperthwaite Mentor: Sylvia Brady and Sarah Schliemann

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 202

The purpose of this project is to gain experience with qualitative research analysis while documenting the Blind and Low Vision Community's (BLV) experiences with Transportation Network Companies (TNC) - otherwise known as rideshare platforms - across several regions of the United States. As rideshare has become more available across the United States, individuals with disabilities that limit their ability to drive have started using these services in greater numbers. We use open-ended, qualitative semistructured interviews with BLV people to elicit their opinions on rideshare successes and failures as well as differentiate between TNCs such as Uber and Lyft. Using inductive-thematic qualitative data analysis, we code the interviews to look for common themes amongst the responses. Preliminary results include overall satisfaction with the platforms' ability to get them where they need to go, and experiences of discrimination and ride denial, especially for those with service animals. This project addresses a gap in research on the impact of disabilities on the use of rideshare, as well as the discrimination of BLV individuals who must balance the convenience factor of rideshare services with the concern of poor treatment or trip denials. Through the research and analysis process, we had the opportunity to learn and practice working with qualitative data, including verifying transcriptions, inductive coding, and pattern recognition. In future research, we will conduct interviews with policy makers in public transit and rideshare who have piloted public-private partnerships (PPPs) to address transportation needs for the disabled community. The results of this research can be used to benefit BLV users of rideshare and help make recommendations to policy makers who are interested in using similar PPPs.

# **Infiltration Swale Study**

Eric Linkhart – Anthropology Faculty Mentor: Sarah Schliemann and Gabrielle Katz

Poster Presentation, Session II (10:00 – 11:15 am), Poster #13

CDOT in partnership with MSU Denver designed a study to determine the effectiveness of subsoiling as a maintenance practice to reestablish infiltration rates within permanent water quality swales. This study was modeled after a University of Minnesota and MNDOT study which found that subsoiling water

quality swales has the potential to increase infiltration rates up to four times depending on the soil type. Subsoiling is a minimal tillage agricultural practice that is used to break up compacted soil to reestablish infiltration. CDOT maintenance subsoiled the main channel of the test site swale and backfilled the trenches that were created with Type C infiltration media. Students from MSU Denver conducted infiltration tests before and after the subsoiling process to determine if there was a statistically significant increase in infiltration. Students used Modified Philip Dunne (MPD) infiltrometers to determine the infiltration rates. A control site was also monitored for to rule out any natural fluctuations in infiltration rates. Students conducted follow up infiltrometer tests over the following two years to determine if any increase in infiltration would sustain over time. The subsoiling maintenance practice initially indicated a 123% increase infiltration when compared to the before data. The results from the follow up infiltrometer tests showed a decrease in infiltration over time as well as a significant amount of variance in infiltration rates at both the test site and the control site (see graph). CDOT would like to test the subsoiling process at a different site to conclude if the subsoiling process will be a viable long term maintenance practice.

# Assessment of BCG-Induced Trained Immunity in RAW264.7 cells following heterologous challenge with *Streptococcus pyogenes*

Samuel Lynch – Nursing Co-Author: Tagwa Alsanousi Mentor: David Merriam

Poster Presentation, Session IV (2:45 - 4:00 pm), Poster #3

Trained immunity is a phenomenon in which innate immune cells exhibit enhanced responses upon heterologous pathogen exposure. The Bacille Calmette-Guérin (BCG) vaccine, which is a live attenuated strain of Mycobacterium bovis, has been shown to induce trained immunity through epigenetic modifications in innate immune cells. This study aims to investigate whether BCG exposure enhances immune response to Streptococcus pyogenes in in-vitro murine macrophage cell line (RAW264.7). In this experiment, four test groups of the immortalized murine cell line RAW264.7 will be observed. The two experimental groups will be stimulated with BCG overnight, rested for three days, then subsequently inoculated: one with S. pyogenes and the other with BCG, allowing us to assess differences in heterologous and homologous stimulation. The two control groups will not be inoculated with BCG; however, one will be inoculated with S. pyogenes after the same period of rest, while the other will receive neither BCG nor S. pyogenes. Changes in the immune activity of RAW264.7 cells will be quantified using an ELISA to measure the level of proinflammatory cytokines IL-6 and IL-12 in the culture supernatant, as well as measuring CD80 expression, a phenotypic marker of activation in macrophages. Comparisons will be made between the BCG trained cells, S. pyogenes-stimulated cells, and unstimulated cells to determine whether BCG exposure increases IL-6/ IL-12 production and/or markers of activation in RAW264.7 cells after inoculation with S. pyogenes. This study provides a foundation for further research into trained immunity using in-vitro murine macrophage models, which offer advantages over in-vivo models in terms of reproducibility and ease of manipulation. Findings may contribute to understanding the role of IL-6, IL-12, and CD80 in BCG-induced trained immunity as well as support future studies exploring non-BCG bacterial inducers of trained immunity.

#### A structural look at Drosophila melanogaster Malvolio and its role in ion transport

Bella Maher – Biology Mentor: Emily Ragan

Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #19

Malvolio (MvI) is a divalent metal ion transporter in *Drosophila melanogaster*, orthologous to mammalian DMT1, and plays a crucial role in iron (Fe2+) and possibly copper (Cu2+) homeostasis. Understanding iron uptake mechanisms in insects is essential, as metal ion transport is highly conserved across species and has implications for human disease research. Given that disruptions in metal ion homeostasis are linked to neurodegenerative disorders and metabolic diseases, studying MvI in Drosophila provides insight into these processes in a genetically tractable model organism. This project utilizes AlphaFold structural modeling and ChimeraX visualization software to investigate MvI's three-dimensional structure, focusing on residues that may be involved in ion transport. By highlighting negatively charged residues, we aim to identify potential pathways for metal ion movement through the protein. Through computational analysis, we seek to refine our understanding of how MvI facilitates iron uptake and its potential interactions with other ions. These findings will contribute to a broader understanding of metal ion transport in biological systems and may offer insights into human diseases related to metal dysregulation.

# Undocumented Undergraduate College Students: An Examination of College Persistence and Mental Health

Diego S. Maldonado Lopez – Psychology Mentor: Sara Jackson Shumate

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 203

Undocumented students face many unique uncertainties accessing college and furthering their education. Multiple factors interfere with their abilities to enroll and commit to pursuing their academic and career goals. These factors include limited funding and lack of legal status. Although these individuals have great potential, financial instability frequently makes higher education unattainable. In addition, lacking legal status brings shame and students hesitate to seek assistance, contributing to isolation and uncertainty for career outcomes after graduation. Higher education faculty, staff, and administrators often lack preparation to assist these students, leaving undocumented students with few advocates. If anything, it fosters isolation and discouragement from pursuing college degrees. Some laws and programs help some individuals earn work authorization and pay in-state tuition rates; however, more work is needed to ensure all immigrant students are benefited. This literature review examines previous research findings on policies to assist undocumented individuals at universities and legal systems. Students' input and experiences are also discussed to understand their outcomes, ways of persisting, and obstacles that inhibit their ability to attain their degrees and a better quality of mental health. The impact of support systems and opportunities on undocumented students is also evaluated to keep track of changes in college enrollment and persistence. In addition, a survey is proposed to understand the barriers that students at a Hispanic- and Minority-Serving Institution face, the resources they have access to and need, how they cope with such obstacles, and the impact of these barriers and their backgrounds have on their mental health.

#### qPCR Validation of RNA-seq Transcriptomic data for Heat Shock in Oncorhynchus clarkii stomias

Eleanor Mancilla – Biology Mentor: Douglas Petcoff

Poster Presentation, Session II (10:00 – 11:15 am), Poster #10

The Greenback Cutthroat Trout *Oncorhynchus clarkii stomias* (GBCT) is a threatened subspecies of Cutthroat Trout native to the Rocky Mountains. A brood stock of GBCTs has been raised at Zimmerman Lake to reintroduce healthy fish into the environment. However, this population has experienced severe genetic bottlenecking and shows signs of inbreeding depression. Beyond issues of genetic diversity, another concern for these fish is their thermal tolerance. They are adapted to live in cold waters, so climate change may limit their potential habitat distribution.

Since thermal tolerance is one obvious concern for the conservation of these fish, Colorado Parks and Wildlife (CPW) has funded research by Dr. Kevin Rogers and Dr. Douglas Petcoff comparing the thermal stress responses of GBCTs with other cutthroat trout. Dr. Petcoff has performed RNA sequencing (RNA-seq) on five populations of heat shocked and control cutthroat trout to identify differentially expressed genes (DEGs) unique to the thermal stress response of GBCTs. Not only does this provide insight into the thermal tolerance of these fish, but it can also provide insight into genetic stresses caused by inbreeding depression. In this process, Dr. Petcoff has identified thousands of DEGs and many pathways with unique expression patterns for GBCTs. This kind of transcriptomic research utilizes statistical predictions by advanced computational algorithms. Because of that, data found through it must be validated through more direct forms of gene expression analysis. My main role in the study has been using Quantitative Polymerase Chain Reaction (qPCR) assays to analyze the expression seen in the transcriptomic data are consistent with those found through qPCR.

# **Challenges for Development & Implementation of Evidence Based Teaching Practices**

Brandon Martinez – Psychology & Philosophy Co-Authors: Nicholas Miller, Ayden Joshi, Nana Akua Adu Owusu, and Sarah Rones Mentor: Cynthia Erickson, Arijana Barun, and Shalini Srinvasan

#### Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #6

This literature review focuses on the barriers of implementing and developing Evidence Based Teaching practices. The primary study surveyed 584 professors who had been trained in EBT practices on their experiences implementing EBT practices. This study examines the perceived supports and barriers educators have when implementing EBT practices. The secondary study examines EBT practices development & propagation at the undergraduate level. The goal of the secondary study is to analyze the development of new teaching practices, characterize what the developmental process looks like, to understand what characterizes successful implementation, with the intention to replicate successful EBT practices. We focus specifically on college level STEM courses. Despite significant research supporting the efficacy of EBT practices, social norms within departments can largely dictate whether professors implement them or not. A common issue cited is the amount of work involved in redesigning existing

courses. Further, professors claim they do not want to defy students' expectations of a traditional lecture-based course which makes resigning their course even less appealing. Professors fear a non-traditional active learning experience may lead to bad reviews from students which could affect their standing in the department. There are some common supports that professors cite that influence whether they implement EBT practices or not. For instance, if professors were already confident that they can easily cover all their class material throughout the semester, they would be more likely to implement EBT practices even though this required more work in their course design. Additionally, departmental support of EBT practices played a significant role in the professor's implementation of these practices. From here we plan on interviewing and surveying professors on their teaching practices and their perceptions of departmental and colleagues support in the Fall 2025 semester to develop our own research project.

#### Metacognition and constructing learning

Bekah McGehee – English Co-Author: Julia Stitt Mentor: Elizabeth Klienfeld

Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 203

Metacognition practices in writing centers are beneficial for both the consultants facilitating a session and the clients participating in them. Metacognition is the process of thinking about thinking. This exercise encourages the participant to examine the actions and thoughts that make up their daily routines, learning methods, and actions within a space. Metacognition is a process in which a person actively reflects on their practices, revealing why they do what they do and how their own actions are informed by their learning processes. In writing centers, consultants use metacognition to identify clients' needs and evaluate how best to address them. This helps consultants guide a diverse client base through the stages of the writing process using scaffolding to guide multimodal expression. Consultants can model metacognitive skills by narrating their practices in a session and offering choices for how a session can proceed. When consultants model metacognitive skills in their sessions, they extend these skills to their clients, helping the client use reflective practices to increase their agency as writers, enhance investment in their own writing, and eventually develop greater independence as learners. Evidence supporting metacognitive practice has been gathered through observations and interviews with mentors, consultants, and clients in the MSU Denver Writing Center. This evidence demonstrates that using metacognition in writing centers allows these spaces to help clients become not only better writers but better learners overall, because of increased personal investment in learning, introspection into how they construct knowledge, and more accountability in the outcomes of their learning.

# Does Second Amendment Sanctuary Status and Extreme Risk Protection Orders (Red Flag Gun Laws) in Colorado Impact Firearm Suicide?

Katie McGhee – Certificate-GeoInfoSystems-GIS Mentor: Sylvia Brady

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 202

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 were suicides and 20% were 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 needing 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, coming into law Jan 1, 2020. ERPO's use is hindered by the public's lack of knowledge and confusion on filing ERPO's. Citizens claiming ERPO's infringe on second amendment rights 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 firearms were confiscated, demographics 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, county's Secondary Amendment status, and ERPO case details may reveal how these factors impact firearm suicide. Denver, a known liberal county, and El Paso county, a national vocal opponent to ERPO's provide extremes in attitudes towards firearms. Contrasting these attitudes can help in taking steps to address concerns or possible actions to limit firearm suicide.

#### **Expert Evaluation of ChatGPT-Generated Parenting Advice**

Averie McLain – Psychology Co-Author: Maria Mondragon Mentor: Bethany Fleck Dillen

Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 203

Parents have always necessitated advice regarding childrearing. In today's digital age, many parents turn to technology for quick solutions. We question if Chat-GPT can provide trustworthy, accurate, and helpful parenting advice. To address this issue, we consulted experts to evaluate online parenting advice provided by ChatGPT. Using an online survey, this study specifically assesses experts' evaluations on four advice scenarios produced by ChatGPT (about children's sleep, anger, anxiety, and sibling fighting). One hundred and four participants were recruited through word of mouth and Prolific. Participants read four advice scenarios that were generated by ChatGPT and were asked to rate the advice on trustworthiness, accuracy, helpfulness, intelligence, ethics, and relevance. Expert evaluations of ChatGPT's parenting advice were generally positive, with sleep-related advice receiving the highest ratings (M = 6.23, SD = 0.92) and sibling fighting advice receiving the lowest (M = 4.45, SD = 0.72). Statistical analysis (ANOVA, F(3,96) = 277.38, p < 0.001,  $\eta p = .90$ ) confirmed that the fighting scenario was rated significantly lower than the others. Despite these differences, all advice scenarios were considered highly relevant for parents across demographic groups, suggesting broad applicability of Algenerated parenting recommendations. These findings indicate that ChatGPT may be a valuable tool for parenting advice, particularly in sleep and emotional regulation, where experts who worked with families and had advanced degrees rated the guidance as accurate and helpful. The significantly lower ratings for sibling conflict resolution highlight limitations, suggesting AI struggles with complex interpersonal dynamics requiring deeper human expertise. This study contributes to discussions about AI's role in family life and underscores the need for ethical considerations, expert oversight, and

continuous evaluation to ensure responsible AI use. Future research should explore how AI-generated advice compares to professional recommendations and whether expert feedback improves its accuracy and applicability.

# Common Trajectories of Economic Boom Amidst Divergent Governmental Systems

Heather Menger-Elite – College of Business Mentor: Sabina Mlodzianowska

Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #8

Vietnam and Indonesia both possess rapidly expanding economies, often compared to the original 'Asian Tigers' due to their strong macroeconomic growth and increasing global influence, and while macroeconomic vitality is strengthening broadly throughout Southeastern Asia and the Indo-Pacific, Vietnam and Indonesia, themselves, are each transitioning towards 'wealthy-nation' status amidst conversions to clean energy. Commendable progress towards ambitious renewable energy and sustainability goals has been achieved in each nation with greater shifts to clean energy production and utilization underway. Governmental policies embracing clean energy production, mechanisms of foreign investment, and the interplay of these countries' emerging renewable energy blends in their domestic and regional growth help define their uniquely "Vietnamese" and "Indonesian" macroeconomic identities and challenges - in a capital-based free market, *i.e.*, Vietnam is a Communist-oriented nation since 1975 whereas Indonesia is an anti-Communist nation since the late 1960s.

# Grit score is not correlated with time spent working on anagram problems

Nicholas Miller – Psychology

Co-Authors: Nana Akua Adu Owusu, Ayden Joshi, Sarah Rones, and Brandon Martinez Mentor: Cynthia Erickson, Arijana Barun, and Shalini Srinivasan

Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 203

Grit is defined as persistence to solve a problem or work towards goals despite adversity or slowed progress. Previous research indicates that those who score high in grit tend to set longer term goals. Grit correlates with higher achievement in life, both in career and in education. Students with higher grit scores tend to achieve higher GPAs. The following research questions were posed: Does a student's grit score correlate with their time spent solving an anagram problem? Does grit score help determine if a student will answer an anagram problem correctly? Do grit scores change over the course of a semester? In this study, students in introductory biology, chemistry, and psychology courses were surveyed twice, once at the beginning and once at the end of the semester and asked to solve anagram problems. Participants answered questions relating to two different grit scales: persistence of effort and consistency of interest. The results indicate that grit score was not correlated with time spent on an anagram problem, neither at the beginning (r(395) = .05, p = .29) or at the end of the semester (r(245) = .05, p = .44). There was no difference in grit scores in a t-test between correct and incorrect answers on anagram problems found. When comparing grit scores at the beginning and end of the semester, there was no difference for either persistence of effort or consistency of interest. One factor that may influence the lack of correlations between grit score and correct answers, as well as that of grit and time

spent on the problems is that these problems are unimportant for students. Further research on this topic will inquire whether grit score is an accurate predictor of GPA and withdrawal/drop rates from classes.

# Exploring the Experience and Lessons from National Case Study Competition: An Investigation into Health Disparities in Vulnerable Communities

Julianna Montoya – Public Health Co-Authors: Alexandra Soto Garcia, and Melany Marin Munoz Mentor: Garvita Thareja and Erin Seedorf

Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 200

Health disparities impact the lives of historically marginalized communities on a daily basis. Quality of life of these marginalized populations is impacted by many things including low life expectancy, language barriers, mental health issues and many more. Individuals who face barriers to healthcare are at risk of lower health literacy, poor health outcomes and the continuance of mistrust in the healthcare system. By participating in an opportunity to analyze, strategize and investigate public health case studies addressing a health crisis in a vulnerable population, students are participating in a nationwide casestudy competition to gain first-hand experience in assessing the challenges and priorities that arise when seeking to solve a case related to health disparity in disadvantaged populations. Based on previous case study competition topics, the case study presentation will focus on outreach in marginalized communities and address a growing crisis related to the health and wellness within a community. Student participants are experienced in public health topics, community health education constructs and aim to achieve health equity among vulnerable populations. These lessons learned from the case-study competition and presentation will provide the opportunity for a student team to apply lived experience, bilingual abilities, and academic theories to provide recommendations for interventions and strategies that can be adopted in a public health field while educating the audience about these barriers and challenges.

# The Rising of Mental Health Stigma: The Role of Social Media Misinformation

Vilma Moreno – Psychology Co-Author: Ariana Rosales Mentor: Aaron Richmond and Chad Robert Mortensen

Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #5

We examined students' knowledge of mental health disorders, specifically ADHD. This study is essential as this knowledge shapes the understanding, attitudes, and behaviors toward individuals with ADHD (Bisset et al., 2021). It aims to identify factors (e.g., social media use, demographics, education) that may impact an individual's knowledge of ADHD. Mental health stigma is on the rise and may be influenced by social media misinformation. We will discuss the findings within the context of past research. Participants will be recruited via the Introductory Psychology subject pool and Prolific, a system that automatically pulls participants from a pool of randomly selected individuals. Participants will be directed to Qualtrics to complete the survey. Additionally, after consenting, participants will complete a

32-item Attitude Scale for Mental Illness and an 8-item demographic questionnaire. We will collect and analyze data to confirm our initial assumptions. We will verify each analysis' assumptions after gathering data. We will evaluate construct correlations and structural equation modeling pathways determining mental health literacy. This study is expected to produce results and potential knowledge that may be utilized in applications to reduce the mental health stigma of ADHD and increase mental health literacy. Social media use is global, and it is essential to understand the connections between potential misinformation and mental health stigma and literacy of ADHD. By exploring these dynamics, we aim to reveal education's impacts on developing knowledge and the acceptance of people experiencing complex psychological pathology. This may educate educational campaigns conducted over social media to improve public comprehension of mental health, potentially diminishing stigma and enhancing overall psychological well-being.

#### Characterization of leucomethylene blue binding to DNA to improve biosensor sensitivity

Christabel Ofori – Biochemistry Co-Author: Nico Tenorio Mentor: Andrew Bonham

Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #13

Detecting proteins and biomolecules is crucial in biotechnology. Traditional small molecule detection methods can be time-consuming, expensive, and require complex lab equipment. Electrochemical aptamer-bound (E-AB) biosensors offer a promising strategy for rapid, inexpensive bio-sensing. These probes could revolutionize biomolecule detection and monitoring, leading to earlier disease diagnosis. Most novel E-AB biosensors use methylene blue (MB) as the electroactive signaling agent. E-AB biosensors undergo conformational changes upon binding to the target, altering the local environment of MB and generating measurable electrochemical signals corresponding to analyte concentration. However, methylene blue raises concern due to significant binding interactions with DNA. Numerous studies have explored these interactions, highlighting how MB binding to DNA impacts its photophysical properties. During electrochemical signaling, MB is reversibly converted into leucomethylene blue (LMB). No prior studies have systematically characterized LMB's potential binding interactions and complications with DNA. Addressing this knowledge gap will ultimately improve biosensor technology. We characterized LMB interactions with double- and single-stranded DNA constructs of varying sequences and artificial peptide nucleic acids (PNA) using UV-Vis absorbance and fluorescence methods. MB exhibited strong binding to G10 oligonucleotides, with KDapp values of 3.7  $\pm$  2.3  $\mu$ M (UV-Vis) and 5.9  $\pm$  1.6  $\mu$ M (fluorescence), showing no significant difference (p-value 0.45). MB showed negligible binding affinity for A10, C10, T10, and poly-dAdT constructs. LMB displayed negligible binding affinity for all constructs evaluated. Our study revealed that MB binds strongly to G10 oligonucleotides, while LMB displayed negligible binding affinity for all constructs. This assessment of LMB's DNA interactions will inform future E-AB biosensor designs for optimal sensitivity and selectivity. Future research could investigate MB binding kinetics and thermodynamics with G10 oligonucleotides,

analyze binding interactions structurally, and explore biological implications and therapeutic applications of MB binding.

The Spatial Distribution of Iron Oxides in a Weathered Iron-Nickel Campo Del Cielo Meteorite Fragment

Mariah Ormsbee – Applied Geology Mentor: Uwe Kackstaetter

Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 202

The Campo Del Cielo meteorite is an iron-nickel meteorite containing mainly kamacite (Fe-Ni alloy, Ni<7.5%) and taenite (Ni-Fe alloy, Ni>;25%) which are rare minerals found only in meteorites (Tilley and Bevan, 2013). Kamacite forms iron-nickel alloy crystallization bands through slow cooling over millions of years within the parent body and taenite is the byproduct of excess nickel. The bandwidth is used to establish cooling rates in iron and stony-iron meteorites. The kamacite in the Campo Del Cielo meteorite has an octahedrite structure and the bandwidths of 3mm classifying the meteorite as a coarse octahedrite. The band pattern within kamacite can be made visible on a polished meteorite surface through acid etching and is known as a Widmanstatten pattern. The Campo Del Cielo meteorite is classified as a type IAB meteorite which contains inclusions of mafic silicates, such as plagioclase and various sulfides, oxides and phosphates (Rubin, 1997). The Campo Del Cielo meteorite impact site, 800 kilometers northwest of Buenos Aires, Argentina, is estimated to be 5,800 years old based on carbon-14 dating of samples beneath the crater ejecta. Crustal oxidation of meteorite fragments in Argentina's temperate humid climate can be minimal because of the relatively recent impact. However, studies showing the spatial distribution of iron oxides in the weathered crust of an iron-nickel Campo Del Cielo meteorite fragment are rare and inconclusive. Such spatial distribution of various secondary minerals created in the oxidized meteorite crust using a Scanning Electron Microscope (SEM) with pinpoint x-ray fluorescence chemical analysis (EDX) capabilities. The anticipated results should give better insight on how Earth's climate can affect and deteriorate meteorites over time.

# The Future of Business Intelligence: How Data Visualization is Being Redefined by Generative AI

Urvi Pal – Business Intelligence Mentor: Ranjidha Rajan

Oral Presentation, Session I (8:30 – 9:15 am), JSSB Room 205

To effectively extract actionable insights from the increasingly vast volumes of data generated in the realm of business intelligence (BI), advanced visualization techniques are essential. This study delves into the integration of generative AI models within business intelligence frameworks to enhance data visualization, streamline decision-making processes, and automate complex analytical workflows. Through a comprehensive evaluation of contemporary BI visualization strategies and the emerging capabilities of generative AI, this research aims to quantify the improvements in interpretability, accuracy, and efficiency that AI-generated imagery can provide. The analysis juxtaposes traditional visualization methods, like bar charts and line graphs, with innovative, AI-driven approaches that utilize machine learning algorithms to create dynamic visual representations. By exploring various generative AI frameworks, the study assesses their potential to produce context-aware and adaptive graphics that not only simplify data analysis but also facilitate deeper insights for various stakeholders. Furthermore, this research identifies critical challenges associated with the deployment of generative AI in BI, such as issues of interpretability, wherein the visual output may obfuscate the underlying data trends, bias

where AI-generated results may misrepresent data due to training flaws, and computational efficiency where complex models may strain existing hardware resources. The findings indicate that generative AI can greatly improve business intelligence (BI) dashboards by converting static data displays into engaging and tailored visual stories. Nevertheless, the research highlights the necessity of strong evaluation frameworks for models, as well as the ethical issues related to deploying AI, to promote responsible use in business settings. By showcasing the innovative capabilities of generative AI in enhancing visualization methods, this research provides important insights into the fast-changing field of AI-driven business intelligence.

# AI-Assisted Music Composition: Enhancing Creativity and Performance

Cass Pangell – Music Mentor: David Farrell

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 205

Artificial Intelligence (AI) is an exploding, controversial technology where artists and creative thinkers are asking questions of the validity of AI as an art creator, but can AI be a symbiotic tool to expand our inherent, natural artistic abilities and ideas instead of as a sole creator of a work? As I explore creatively and through scholarship, I am investigating ideas surrounding musical creation and performance with AI generation in live musical spaces. As a double major in Art and Music Composition, my aim is to present a social performance experiment by presenting a music work that provides new and deeper musical connections between people regardless of musical background and experience with the use of AI. This research proceeds in tandem with my BA Art Thesis project. I was curious whether AI could be introduced as a live co-creator in live musical spaces -- as a tool and relationship for expanding an ever evolving, creative doorway into live art performances. This project consists of a live vocal experience where the performers receive instructions via headphones from a web-app accessed via their smart devices for sung, spoken, or cued movements. The performers (and audience) interact with a typewriter set in the middle of a room. The text from the typewriter is sent to a computer which is formulated into a prompt model with performance driven instructions into AI then integrated into the performance realtime. Each singer is given performance cues through headphones as the piece continuously reshapes itself through space and acoustic specific directions. As a result, the experience may be integrated into the audience, bringing depth to the composition by challenging barriers typically existing between performer and audience member. The final performance will be held during the BA Art Thesis show at Emmanuel Gallery 4/24/2025.

# Berry Tasty? On the Carbon Dioxide Enrichment of Strawberry Plants

Quinn Pedrick – Biology and Environmental Engineering Mentor: Joshua Craver

Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #20

With a rapidly changing modern climate, it is more important than ever to understand how increased carbon dioxide (CO<sub>2</sub>) exposure impacts plant life, particularly food crops. Therefore, the objective of this experiment was to evaluate the impact of increased CO<sub>2</sub> concentrations on vegetative and reproductive

growth of *Fragaria* x *ananassa* (strawberry) plants produced in controlled hydroponic environments. Four Conviron growth chambers were used to grow two varieties of strawberry, 'Ozark Beauty' and 'Albion' with constant nutrient input, photosynthetic photon flux density, and 16-hour photoperiods with air temperatures of 20°C during the 'day' and 12°C during the 'night'. Two growth chambers received an elevated CO<sub>2</sub> concentration of 900 ppm and two chambers received an ambient CO<sub>2</sub> concentration of 450 ppm. The general findings illustrated that the elevated strawberry plants did produce more fruits, particularly in the beginning of the CO<sub>2</sub> enrichment period. By the end of the experiment there was an approximate ratio of elevated CO<sub>2</sub> fruit output to ambient CO<sub>2</sub> fruit output of 1.3, which could be a worthwhile difference for growers depending on the efficiency of resource use. Further research based off this work aims to analyze resource use efficiency to determine if elevated CO<sub>2</sub> exposure is a worthwhile treatment for these food crops. In particular, stomatal conductance would be measured and compared across different CO<sub>2</sub> treatments at varying points throughout the day and course of the experiment. This would serve as a measure of water use efficiency of the treated strawberry plants which should be evaluated in tandem with carbon sequestration and fruit output of CO<sub>2</sub> enriched plants.

# **Perceptions of Neurodiversity**

Reed Pennell– Human Development and Family Studies Co-Authors: Deanna Bright and Daniel Niewiarowicz Mentor: Chad Mortensen

# Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 200

This study seeks to investigate how participants' perceptions other students change upon reading a vignette featuring a student who is disclosed as allistic (neurotypical), neurodiverse (someone who processes information in an atypical way) or autistic, replicating Nah et al. (2022). This study also seeks to identify how participants who identify as cisgender, non-binary, or gender expansive differ in their perceptions of the people in the vignette depending on their disclosure. These vignettes include the labels of, neurodivergent, autistic, or no label with participants being asked to rate measures for openness, knowledge of autism, and attitudes toward people with disabilities. We hypothesize that the labels of neurodiversity will cause significant differences in the responses received, with the largest difference being in ratings of openness between the allistic label and the other two (neurodivergent or autistic) labels with allistic receiving the lowest rating. Furthermore, we also hypothesize that participants identifying as feminine, transgender and gender expansive will be more accepting of those with the labels of autistic and neurodiverse. This study contributes to the existing body of literature by further examining how students react differently to their peers based on levels of neurotypicality. This furthers understanding of the potential interpersonal effects disclosure of neurodivergent or autistic identities can have. Educational institutions can use this knowledge to identify stigma around these mental disorders and develop strategies to support students who are not neurotypical by identifying how stigmatizations around these disorders are expressed in various aspects.

Nah, Y. H., Neo, Y. F., & Chen, A. S. H. (2022). Do labels matter? The effect of specific and generic labels on university students' openness towards autistic peers. Research in Autism Spectrum Disorders, 97, 102020.

#### **Evaluating Dimensionality Reduction Techniques for Social Network Clustering**

Elicia Perez – Computer Science Mentor: Ranjidha Rajan

Oral Presentation, Session II (8:30 – 9:45 am), JSSB Room 205

Social network clustering is an essential task for understanding relationships and community structures within a network. It simplifies complex datasets into a 2D representation, making it easier to identify patterns. This study compares Principal Component Analysis (PCA) and t-Distributed Stochastic Neighbor Embedding (t-SNE) for dimensionality reduction and visualization of clusters within a real-world STEM ecosystem network. PCA, a linear technique, efficiently captures global variance but may struggle with preserving local neighborhood structures. In contrast, t-SNE, a non-linear technique, effectively separates clusters by preserving local similarities but suffers from high computational complexity. Using a STEM collaboration dataset, we constructed a network adjacency matrix, applied PCA and t-SNE for dimensionality reduction, and performed K-Means clustering to identify communities. PCA provided a faster and interpretable reduction, while t-SNE produced superior cluster separation but at a significantly higher computational cost. The findings suggest that PCA is preferable for scalability and initial analysis, whereas t-SNE is better suited for exploring complex relationships within social networks, albeit requiring careful hyperparameter tuning and higher computational resources. PCA preserves the global variance of the data, helping to maintain the overall patterns. Conversely, t-SNE, on the other hand, focuses on preserving local relationships to uncover hidden clusters. K-Means clustering assigns data points to clusters based on proximity to centroids, refining centroids to minimize within-cluster variance. Cluster quality was assessed using silhouette scores. The scores ranged from -1.0 to 1.0. The lower the score indicates weaker cluster structures. The higher the score, closest to 1, represents a strong cluster structure. PCA is fast and efficient, especially for larger datasets, while t-SNE is better for visualizing complex relationships in smaller datasets but requires more computational power.

# High-Altitude Orographic Cloud Conditions Above Arsia Mons

Caoimhín Perkins – Physics Mentor: Kamran Sahami

Poster Presentation, Session II (10:00 – 11:15 am), Poster #18

The Arsia Mons Elongated Cloud (AMEC) and Perihelion Cloud Trails (PCTs) are recently identified weather phenomena on Mars that have yet to be properly understood. Both are expected to form from diurnal gravity wave forcing along steep topographic gradients, such as Arsia Mons (AMEC and PCTs) and Valles Marineris (PCTs)(Hernandez-Bernal et. al, 2021; Clancy et. al, 2021). While similar to orographic clouds on Earth, both phenomena occur at much higher altitudes (~45km), the AMEC and PCTs can reach synoptic-scale lengths (1300-800 km and 500-1000 km, respectively). Both phenomena and the Martian water cycle have limited data, and modeling has yet to replicate them. Hernandez-Bernal et. al (2022) replicated the head of the AMEC and its associated water-ice hazes, but failed to replicate the tail. They used the LMD Mars Mesoscale Model, which could not meet the necessary wind speeds at the AMEC's altitude (the model reached 90m/s vs. the observed 130-170m/s advection of the cloud tail) and could not match the observed optical depth or water ice density. These problems suggest similar issues for modeling PCTs. The NASA Ames Mars Climate Modeling Center's Legacy Mars General Circulation Model

(GCM) can be used to probe if available water vapor, wind speeds, and particle size distribution impact the conditions for formation. In this study, we modify global water vapor and then restrict injections of seasonal water vapor to the tropics to test whether a lack of water vapor prevented the LMD group from attaining the observed optical depth of the AMEC. Then, we alter global wind speeds to test whether this affects regional condensation. Lastly, we alter the particle-size distribution to test whether this impacts both condensation and the lifetime of regional clouds.

# Are your Dice Cursed? Statistical Modeling for 20 Faceted Dice Defects

Carl Perry – Statistical Science Mentor: Shahar Boneh

Oral Presentation, Session I (8:30 – 9:45 pm), JSSB Room 203

The most commonly modeled die is a standard 6-sided die, but a variety of more complex dice are frequently used in tabletop roleplaying games, such as Dungeons & Dragons. A critical die in many systems is a regular icosahedron or a 20-sided die. Due to its complex shape, air bubbles are a common defect. A common method used to detect such a defect is floating a die in a saline solution and spinning it. The die will settle with the lightest portion facing up and the longer the die spins the fairer it is considered. While the salt method may validate a perceived flaw it is lacking mathematical accuracy. The better question is not if there is a defect, but how much does such a defect influence the fairness of the die and at what point does it become mathematically detectable. In order to define this, dice with defects of 3 different sizes in 2 different locations were geometrically modeled in a 3D modeling software and 3D prints were created. For the purpose of this project, a data set of 2000 rolls for each category of die will be collected and the probability mass function (pmf) of each die will then be calculated using the proportion of each face in relation to the sample size. Chi squared goodness of fit tests will also be employed as a measure of fairness and binomial proportion confidence intervals used to statistically model the dice. Establishing a mathematical measure for determining fairness in tabletop gaming will lead to a better experience for all players.

# Ugly Beautiful Bioremediation: An Artistic Study

Katie Perry – Biology Mentor: Helene Ver Eecke

Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 202

Science and Art have been regarded as very separate disciplines in education for some time. Many students at higher levels of education have not engaged with art since early childhood and this can lead students to feel that art isn't for them or that they aren't creative. But Science requires its own kind of creative thinking. Experimental design requires ideation and creativity, documentation can take the form of drawn images or photography. In order to bridge this conceptual gap, the artist chose to highlight a scientific practice artistically. Bioremediation is a practice where microbes are used to break down pollution in the environment that is difficult to remove in any other way. This can include dangerous industrial, agricultural, and medical wastes. Rather than focus on the harm these pollutants create, this project aims to highlight the amazing beauty of the microbes scientists work with to accomplish the task

of bioremediation. Starting with images of microscope slides, a vector-based image software was used to separate each image into multiple layers of color. This data was then used to create multiple stencils that were then layered to recreate the images as paintings. Four microbes were selected based on morphology and function and a central image was produced depicting an actual acid mine drainage bioremediation site. Special attention was paid to the composition and balance of the pieces to give the feeling of the microbes overwhelming the mess. The result is a painting series that makes a statement about bioremediation, but also demonstrates that art can be accessible to people of all abilities and skill-levels.

# Disability Decarceration: the death of disabled Asian Americans and Prison Abolition

Hang Pham – Gender, Women, & Sexualities Studies Mentor: Sonny Dhoot

Oral Presentation, Session II (10:00 – 11:15 pm), JSSB Room 200

This paper examines the intersections of race, gender, and disability in the experiences of Asian Americans, focusing on the deaths of Victoria Lee and Yang Yong, two disabled Korean Americans killed by police during mental health crises. Using an interdisciplinary framework that incorporates crip-ofcolor critique, mad studies, disability studies, and Liat Ben Moshe's "race-ability" framework, this study explores how the criminalization and pathologization of disabled Asian Americans render them disposable and unworthy of protection. These deaths highlight how disability, gender, and race coconstitute and reproduce one another, reinforcing the racialized death-making of disabled people. By investigating the deaths of Victoria Lee in New Jersey and Yang Yong in Los Angeles, I demonstrate how these seemingly separate locales fit into the broader U.S. racial formation. The study argues that Asian disabled bodies do not conform to dominant frameworks of productivity, morality, and whiteness, leading to their criminalization and pathologization. Additionally, I contend that the racialized deaths of Victoria Lee and Yang Yong connect to the broader racialized project of killing Black individuals with mental illness. Drawing from abolitionist theory, the study critiques reforms as an expansion of carceral violence and examines the damaging effects of such reforms. This paper aims to explore: What does crip survivance look like for mad Asian Americans? What structural shifts are necessary for mad Asian Americans to survive? Ultimately, this project illustrates how Lee and Yong's deaths fit both within larger racialized and ableist death-making, as well as how disabled Korean Asian Americans index the limits of liberal modes of inclusion.

# The effect of grazing and defecation of Canada Geese on urban environments

Paige Phillips – Biology Co-Author: Virginia Santillan Mentor: Robert Hancock

Poster Presentation, Session II (10:00 – 11:15 am), Poster #11

Urban environments host large populations of Canada geese (*Branta canadensis*), which deposit significant amounts of scat into the environment. While goose scat is rich in nitrogen and phosphorus, its ecological effects remain unclear. This study investigates both the chemical composition of goose scat

and its impact on plant growth to assess its potential as a nutrient source or disruptor of soil balance. The first phase of this study analyzed nitrogen content in goose scat collected using safe protocols and personal protection equipment (PPE) from Washington Park and Auraria Campus using colorimetric tests. Samples were collected using 20m transects sectioned into five quadrats. All samples were individually dehydrated and examined to test the ammonia and nitrate levels. Higher nitrate and ammonia concentrations were found in Washington Park, possibly due to fertilized vegetation. The second phase will examine whether goose scat enhances or inhibits plant growth by growing mustard greens (Brassica juncea) and cat grass (Dactylis glomerata or similar) under controlled conditions. Scat will be either dehydrated and ground into a uniform texture or collected fresh for direct use, then incorporated into soil free of any chemical additives at varying concentrations. Each treatment will include multiple replicates and additional variations. Plant metrics including plant height, leaf count, overall health, soil pH changes, and final dry biomass will be tracked. Soil pH will be measured before planting and after the experiment to assess decomposition effects. Fresh scat treatments will be tested separately to prevent microbial cross-contamination. This study will determine whether Canada goose scat enhances or inhibits plant growth by influencing soil nutrients. The results will provide insight into its potential as a natural fertilizer or a disruptor of soil balance. Our findings will contribute to understanding how Canada geese waste affects plant-soil interactions.

#### Food and Femininity: Food Security, Sovereignty, and Justice in the Middle East and North Africa

Mary Preston – Political Science Mentor: Jennifer Seman

#### Poster Presentation, Session IV (2:45 - 4:00 pm), Poster #10

As humans compete with the rest of nature, environmental challenges do not merely equate an issue area; political thinking and political communities must direct normative and critical attention to the nonhuman world as the center of inquiry. When environmental issues are linked to everyday material needs, patterns of land use, complex reactions to these shifting patterns invite a mutiny against structures of power in the human world to create socio-economic justice. Concerns regarding food security in the Middle East and North Africa (MENA) have been brought to the fore of policy discourse and materialization by lingering economic crises, food price spikes, and climate change. The current situation and its related concerns, and any political and policy responses may be examined through a framework of drivers that shape the socio-political conditions, including those conditions pertaining to food security, sovereignty, justice, and food as a human right. Dissent to food insecurity, unemployment, and inequality have inspired protest and revolution in a public body that rejects political and economic disenfranchisement of youth and women and where food subsidies are deployed as a means of repression, coercion, persuasion. An expansion of the conceptualization of food security that moves toward consideration of food sovereignty, food justice, and food as a human right, where access to preferred, nutritious, culturally appropriate, socially acceptable food is a fundamental right is essential. Dissent of food insecurity not only responds to food insecurity itself, but also to fundamental injustices, including a sense of being "cheated, deceived, betrayed, misled, or otherwise exploited," where moral outrage is a decision driver. Climate change, politics, the private sector, the international economy, and agriculture drive and stress how gender operates in relation to food access in the Middle East and North Africa with women as food managers, reclaiming space through their market and non-market labor and leisure.

#### Building Students' Social Justice-Based Critical Thinking: An Action Research Plan

Ari Rabinovich – English - Secondary Education Mentor: Charlie Potter

Poster Presentation, Session III (1:15 - 2:30 pm), Poster #7

Amid growing societal divisions and persistent systemic inequalities, education is a pivotal space for challenging injustice and promoting equity. This thesis aims to examine and advocate for education and curricula that emphasize literacy and active civic engagement; therefore, teaching students to first recognize privilege and then uplift their marginalized peers in order to deconstruct systemic oppression and move towards a more just world. In a nation where low literacy rates hinder democratic participation and perpetuate inequity, literacy education is fundamental to fostering informed, critically engaged citizens. This action research project will serve as a foundation for developing a classroom model that prioritizes democratic, community-based thinking, literacy education, and active civic engagement at the secondary level. The initial phase consists of an in-depth literature review and analysis of the most effective curricula and pedagogical frameworks that cultivate social-justice-based critical thinking. By examining various instructional approaches, including discussion-based learning, project-based civic engagement, and interdisciplinary literacy practices, this research works to highlight the ways in which curricula that center student voice, democratic dialogue, and experiential learning can contribute to their development as socially conscious and engaged citizens. Ultimately, this research will underscore the need for curriculum development and policy reform that position education as a transformative tool for justice. Ultimately, this research will underscore the need for curriculum development and policy reform that position education as a transformative tool for justice and aims to support educators in creating learning environments that equip students with the skills and knowledge necessary to navigate and reshape the social structures that shape their lives.

# Development and Evaluation of Advanced Machine Motion Table for Kinematic and Dynamic Motions

Abigail Read – Mechanical Engineering Technology Co-Author: Sabina Arroyo, Alfredo Cervantes, Oscar Hammond, and Kyle Mathiesen Mentor: Devi Kalla and Mingli He

Poster Presentation, Session II (10:00 – 11:15 am), Poster #17

The objective of this project is to develop an advanced machine motion table capable of demonstrating and testing various mechanical, kinematic and dynamic motions, specifically focusing on linkages and gears that transmit rotational forces. This is intended for use in educational settings to enhance students' understanding of different mechanical systems and motion. The kinematics, dynamics, and mechanical design of the system are as described. The new design will incorporate increased power and linkage capabilities, allowing for experimental validation of theoretical concepts and providing a more hands-on approach to engineering technology education. To achieve this, SolidWorks and other prototyping methods are utilized to simulate multiple design iterations, significantly aiding the design process. Finite Elemental Analysis (FEA) using ANSYS was conducted on the tabletop and table base. Additional FEA analysis was done on the linkage accessories and motor carrier using SolidWorks Simulation. This ensures all components met the safety, strength, and validity of requirements. The electric motor for the table must have a power output between 0.1-0.5 horsepower. The new table will be large in size to accommodate an increase in power and linkages but must still fit through a standard doorway. The integration of SolidWorks for design simulation and ANSYS for component analysis will ensure the table's safety and performance, contributing to a robust educational tool for mechanical engineering studies.

#### ndnf loss-of-function in zebrafish craniofacial development

Casey Roberts – Biology Co-Author: Frost Gordon Mentor: Vida Melvin

Poster Presentation, Session III (1:15 – 2:30 pm), Poster #12

Craniofacial development is regulated by complex tissue interactions and signal transduction pathways. These pathways coordinate the formation of the pharyngeal arches, which develop into skeletal structures of the skull and face. Neuron-derived neurotrophic factor (ndnf) was identified in a reverse genetic screen to discover novel genes involved in craniofacial development. ndnf morphant zebrafish larvae show significant reduction of the ethmoid plate, a cartilage homologous to the mammalian palate, and ndnf is expressed in cells that are adjacent to developing craniofacial cartilages from 36-72 hours post fertilization. Together these data support the idea that ndnf is a regulator of palatogenesis in zebrafish. The ndnf gene encodes a secreted protein containing a fibronectin type III domain and has been shown to play a role in neuron growth, survival, and migration, as well as endothelial cell survival and vascularization. The Drosophila homolog of ndnf, called nord, is induced by hh and dpp and modulates dpp signaling in wing development, however loss of nord does not produce profound wing defects. Similarly, mice that have a loss of function in ndnf do not show overt phenotypes, rather they had decreased resistance to induced muscle atrophy. To better understand the role of ndnf in zebrafish development, we used the CRISPR-Cas9 system to induce mutations in the ndnf gene. These mutations are predicted to be loss of function as they disrupt most of the functional domains of the protein. Zebrafish homozygous for ndnf mutations are viable to adulthood and are fertile. Contrary to the findings in the morpholino study, the ndnf mutants do not display any significant phenotypes in craniofacial structures suggesting that loss of ndnf alone is not sufficient to disrupt craniofacial development. We are currently examining the interaction of ndnf with hh and bmp pathways in zebrafish craniofacial development.

# Between Two Writers; Borges and Ribas

Miguel Angel Rodríguez – Spanish and Philosophy Mentor: Maria Rey-Lopez

# Poster Presentation, Session III (1:15 – 2:30 pm), Poster #8

In this study, I briefly 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), consolidated around the 1940s in the United States. In addition to investigating the history of the written crime fiction in the Spanish language and its development until the present day, my literary analysis compares two short stories by Jorge Luis Borges, "La muerte y el compás" (1944) and "Emma Zunz" (1949) 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.

#### Mosquito Trap Catch Biodiversity Patterns Along the Front Range Urban Area of Colorado

Yailenne Rodriguez – Biology Co-Author: Maddison Hepplewhite Mentor: Robert Hancock

Poster Presentation, Session III (1:15 – 2:30 pm), Poster #13

Mosquito populations are influenced by various environmental factors, like temperature, precipitation, and habitat availability. The study aimed to determine whether heavy rainfall increases mosquito species diversity by analyzing data collected from Boulder, Weld, and Denver counties in 2023 and 2024. We hypothesized that the higher precipitation levels in 2023 would lead to greater mosquito diversity compared to 2024. To test this, CDC miniature light traps were baited with carbon dioxide to capture adult female mosquitoes weekly. The collected specimens were then identified at the species level to assess overall diversity and abundance. The findings revealed that while mosquito abundance was significantly higher in 2023 (1,368,313 individuals) than in 2024 (113,150 individuals), species diversity remained nearly identical, with 22 overall species being trapped in both years. The Shannon Diversity Index indicated slightly higher diversity in 2024 (1.547) compared to 2023 (1.385), opposing the hypothesis. Despite the significant increase in rainfall in 2023, 5.24 inches more on average than in 2024, species diversity did not show a corresponding increase. This suggests that while rainfall may boost overall mosquito numbers, it does not necessarily lead to a greater variety of species. These results indicate that other environmental factors, such as temperature fluctuations, habitat availability, and species competition, may have a stronger influence on mosquito diversity than rainfall. Future research should explore these variables in more depth, examining their long-term effects on mosquito populations and the potential implications for mosquito-borne disease transmission in Colorado.

# Potential Influence of Rural versus Urban Habitats and Water Proximity on Salmonella and *E. coli* Shedding in Wild *Thamnophis elegans*

Mackenzie Rogers – Biology Mentor: David Merriam

Poster Presentation, Session III (1:15 – 2:30 pm), Poster #14

Reptile-associated zoonosis remains a major concern in the United States and worldwide, particularly Salmonellosis, and intestinal pathogenic *Escherichia coli* (IPEC). *Salmonella spp*. are part of the normal microbiota for most reptiles, though prevalence is higher among snakes compared to other reptile species as well as among captive snakes compared to wild snakes. This study investigates the prevalence of *Salmonella* and *E. coli* in wild *Thamnophis elegans* (a common terrestrial garter snake) by analyzing bacteria isolated from cloacal swabs. Research suggests that fast-living garter snake ecotypes, typically found in lake shore environments, prioritize innate immunity, while slow-living ecotypes, commonly found in meadow habitats, invest more in adaptive immune responses. This study aims to further investigate potential microbiological differences by examining the effect of proximity to large bodies of

water on the shedding of *Salmonella spp*. and *Escherichia coli* in *Thamnophis elegans*. Wild garter snakes will be captured, branded with a medical grade cauterizing pen to prevent repeat sampling, and several physical parameters, including snout to vent length, location, presence of musk, and internal temperature, will be recorded. After cloacal swabbing, samples will be transported in 1X PBS and they will be plated onto selective and differential media including but not limited to Eosin Methylene Blue (EMB) agar, MacConkey Agar, and Xylose Lysine Deoxycholate (XLD) Agar. Isolates will be identified through PCR, and bacterial resistance profiles will be assessed via Kirby-Bauer assays. Wild snakes will be captured starting in May. To optimize and refine sampling, media and PCR protocols, preliminary sampling will be conducted on captive *Python regius* and *Heterodon nasicus*. These studies aim to explore whether the prevalence of *Salmonella* and *E. coli* is higher in snakes from areas with increased human population density, highlighting the importance of ecosystem conservation to mitigate zoonotic risks.

#### Self-efficacy increases in active learning classrooms to enhance student success

Sarah Rones – Biology Co-Authors: Nana Akua Adu Owusu, Ayden Joshi, Brandon Martinez, and Nick Miller Mentors: Arijana Barun, Cynthia Erickson, and Shalini Srinivasan

#### Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #7

Transformational teaching practices such as active learning have been shown to aid student success in STEM (Science, Technology, Engineering, and Mathematics) courses. One motivational factor that may impact student success and degree completion is self-efficacy. Self-efficacy is the belief that one can obtain one's goals independently. One way to increase self-efficacy is to use a student-focused, active learning teaching approach. This study evaluates students' self-efficacy in a general biology course. This course included active learning teaching styles such as pre-class quizzes and collaborative group work. Students participated in pre- and post-semester surveys administered by research assistants. Participants (N=56) were given these surveys to test the hypothesis that students would report higher levels of selfefficacy in active learning environments. Self-efficacy was measured by evaluating survey responses for questions such as: "It is easy for me to stick to my aims and accomplish my goals," and "I am confident that I could deal efficiently with unexpected events." A paired t-test was used to compare self-efficacy between pre and post-survey responses. Self-efficacy was higher at the end of the semester than at the beginning (t(55) = 3.10, p = .003, d =0.41). The mean self-efficacy score at the start of the semester was M=2.98, SD = 0.43, compared to M = 3.15, SD = 0.46 at the end of the semester. This could be attributed to an active learning environment in the general biology course. Future studies will involve observations of classrooms to confirm the use of transformational teaching practices. In addition, a control will be used to compare self-efficacy between active learning environments and traditional lecture classrooms.

#### **Essential Oil-Based Pesticide for Sustainable Pest Management**

John X. Rutherford – Biology Mentors: Erin Bissell and Christopher Meloche

Poster Presentation, Session III (1:15 – 2:30 pm), Poster #15

Environmental degradation and toxicity caused by synthetic pesticides are driving the search for ecofriendly alternatives. Essential oil-based pesticides offer a sustainable solution by leveraging the natural insecticidal properties of plant-derived compounds, which can control agricultural pests while minimizing ecological harm. My research project aims to develop and evaluate an essential oil-based pesticide that will be formulated from bioactive plant extracts such as peppermint, rosemary, and black pepper oil. My research involves greenhouse trials to assess the efficacy of these essential oils in controlling and eliminating common agricultural pests. The greenhouse trials will also test and measure the mortality rates of invasive pests and the efficacy of essential oils as pest repellants on common greenhouse plants. Essential oil formulations are expected to demonstrate significant pest control efficacy while maintaining soil health and biodiversity. Anticipated outcomes include reducing pest populations compared to synthetically produced pesticides, lowering environmental toxicity, and increasing viability as a sustainable alternative for integrated pest management. These findings will contribute to advancing eco-friendly agricultural practices and reducing reliance on harmful chemical pesticides.

#### Utilizing Simple Technology to Create an Instrument for Improved pH Measurements

Grace Servia – Chemistry and Mathematics Mentors: Shailesh Ambre

Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #15

pH is a metric used to describe the concentration of hydrogen ions present in a solution. This value determines the acidity (or basicity) of a scientific sample and plays a key role in chemical, biological, environmental, and industrial applications. As such, it is important that accurate and precise methods to measure pH are both scientifically and practically available. The two most common methods for pH measurements in undergraduate laboratories are through the use of an electrochemical pH probe or via paper that has been coated with pH responsive dyes that are matched to a scale of corresponding pH values (pH paper). pH probes offer quality pH measurements but are costly, fragile, require a complex and bulky setup, and may be challenging and time-consuming to operate. pH paper is an easier, quicker, and more affordable method, but offers less reliable measurements due to the possibility of dye degradation, chemical interactions within the paper, and differences in human perception; it is also inaccessible to individuals with visual impairments. The aim of this project is to create a simple chemical instrument that produces reliable and standardized pH measurements through the use of spectrophotometry and the direct application of pH indicator dyes. Thus far, a prototype of the instrument has been assembled using Adafruit components, a 3D printed enclosure, Python coding, computer-aided design, and simple circuity techniques. In this next phase, a series of pH values gathered in lab will be used to develop a calibration model that allows the instrument to accurately determine a pH value for a provided sample. The complete assembly will be affordable, durable, easy to use, and include an accessible output. This project also serves as an example of multidisciplinary research and proof-of-concept that effective and impactful instrumentation can be developed on small scales.

The Effects of Elevated CO2 Levels on Mummy Development in *an Aphidius colemani-Rhopalosiphum padi* Banker Plant Biological Control Pest Management System

Kaylyn Shearer – Biology Mentor: Jennifer Bousselot

Poster Presentation, Session III (1:15 – 2:30 pm), Poster #16

As natural alternatives to pesticides grow in popularity, many growers have begun to implement biological control as a form of pest management in controlled environment agriculture. One of the most widely employed techniques is the parasitoid wasp-aphid banker plant system. In this system, the banker plant, common barley (Hordeum vulgare), is infested with bird cherry-oat aphids (Rhopalosiphum padi), and the parasitoid wasp, Aphidius colemani, is introduced into the surrounding environment. The wasps oviposit their eggs into the aphids, the larvae develop by feeding on the aphids' internal tissues, and the adult wasps feed on aphid honeydew. Though this system is well-documented for its effectiveness in pest control, there is question about how it will perform as atmospheric CO<sub>2</sub> levels rise. Previous research shows that the developmental rate of A. colemani from oviposition to emergence is accelerated when exposed to elevated  $CO_2$  (eCO<sub>2</sub>) and temperature. In our study, we evaluated the presence of mummies with eCO<sub>2</sub> and ambient temperatures. Our study occurred over 18 days in which 2 banker plants were introduced to two growth chambers, both containing 20 strawberry plants that were unexpectedly infested with a pest species of aphid (*Myzus persicae*). One chamber maintained ambient CO<sub>2</sub> levels ( $^{450}$  ppm) and the other maintained eCO<sub>2</sub> levels ( $^{900}$  ppm). Three locations were monitored for the number of aphids and mummies per seedling, as well as mummy developmental stage; 1) a 2x2 inch triangle section of the banker plant 2) half of each banker plant, and 3) 2 randomly selected leaves on 4 strawberry plants per chamber. In all locations, we found that mummies developed earlier in eCO<sub>2</sub> than in ambient conditions, which is confirmed by prior research that eCO<sub>2</sub> accelerates A. colemani mummy development. In future studies, we will examine the duration of each developmental stage from oviposition to emergence.

#### Investigating the Impact of Osteoporosis on Skeletal Age-At-Death Estimation in the Os Coxa

Krista E. Sherman – Anthropology Mentor: Michala Stock

Poster Presentation, Session II (10:00 – 11:15 am), Poster #12

**Objectives:** Accurate skeletal age estimation is crucial in forensic and bioarcheological contexts, yet the impact of osteoporosis on pelvic age estimation sites in males remains largely unstudied. This research investigates the relationship between osteoporosis and skeletal age at death estimations in the os coxa, particularly in the acetabulum and pubic symphysis. I hypothesize that bone degradation caused by osteoporosis in these regions affects age estimation methods, leading to discrepancies in the accuracy of these assessments.

**Methods:** This study analyzed a sample of 60 adult males (age range 19 to 91 yrs.). Bone mineral density (BMD) measurements were obtained using computed tomography (CT) scans from the New Mexico Decedent Image Database. BMD was assessed using transverse slices in ImageJ (Fiji) at the posterior margin of the acetabulum and the pubic symphyseal body. T-scores based on BMD measurements were calculated to estimate bone health in this sample, sorting individuals into osteoporotic and non-

osteoporotic groups (osteoporosis is defined as  $\leq$  -2.5 BMD). Of the 60 total individuals, 10 demonstrated osteoporosis based on pubic symphyseal sites and 8 based on acetabular sites. To assess the effects of osteoporosis on age estimation accuracy, t-tests and regression analyses were performed using "R". Age estimates derived from established morphological methods (Hartnett 2010) were compared to known ages-at-death to assess the impact of osteoporosis on skeletal age estimation. **Results:** Two distributions were examined: 50 healthy individuals and 10 osteoporotic individuals, based on t-scores from the pubic symphysis. T-tests demonstrated that the osteoporotic group was significantly older than the healthy group (p<0.01) and regression analyses revealed that osteoporosis does impact age estimation from the pubic symphysis.

**Discussion:** Identifying over-aging in individuals with skeletal pathological conditions such as osteoporosis is crucial for improving age estimation methods. By accounting for osteoporosis-related bone changes, the accuracy of age assessments can be enhanced, aiding in the identification of unknown individuals.

# Cognitive Fusion, Resiliency, Sexual Orientation Microaggressions, and Mental Health in LGBTQIA+ Individuals

Julia Sickrey – Psychology Mentor: Jovan Hernandez

Oral Presentation, Session I (10:00 – 11:15 am), JSSB Room 202

Meyers's (2003) minority stress model is a well-researched paradigm that details the relation between discrimination-based stress and lower psychological well-being in LGBTQIA+ individuals. Within this model, Meyers discussed the role of distal stressors, which were defined as "objective stressors in that they do not depend on an individual's perceptions or appraisals" (p. 676). Examples of distal stressors may include overt discrimination and more subtle forms of discrimination such as microaggressions. Nadal (2016) defined microaggressions as "behaviors and statements, often unconscious or unintentional, that communicate hostile derogatory messages, particularly to members of targeted social groups" (p. 488), such as the LGBTQIA+ community. While the relation between sexual orientation microaggressions and poorer mental health has been well established (Nadal, 2016), little research has examined the roles that resiliency and cognitive fusion play in influencing this relationship. Our study extends prior research on perceived discrimination in LGBTQIA+ individuals by quantitatively examining the effect of sexual orientation microaggressions on depression, anxiety, and stress after controlling for resiliency and cognitive fusion. In the current study, the final sample consisted of 225 LGBTQIA+ identifying individuals. The survey included measures of resiliency, cognitive fusion, depression, anxiety, stress, and sexual orientation microaggressions. We found higher levels of cognitive fusion were associated with lower resiliency and higher perceived discrimination. Higher levels of cognitive fusion and perceived discrimination were associated with higher levels of depression, anxiety, and stress. Following additional data collection, we plan on running a hierarchical regression analysis to further understand the role of cognitive fusion and resiliency on perceived discrimination and mental health outcomes. Our conference presentation will discuss the results of continued data collection, regression analyses, limitations, and clinical implications for working with LGBTQIA+ individuals.

#### Low-tech AAC intervention for teens with moderate to high support autism

Nikola Skurzok – Speech, Language, Hearing Sciences Mentor: Marcia Walsh-Aziz

Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 200

For my Senior Experience I observed Speech Language Pathologists (SLPs) from a private practice called SquarePeg. In this internship I would travel with the SLPs to the clients' homes. In this presentation I will introduce different types of Augmentative and Alternative Communication (AAC) observed in my internship. AAC is used by people with non-typical speech and can be utilized for alteration or substitution of communication at home, work and in the community. I will consider aided and unaided materials used for communication and contrast low and high-tech options of AAC. Next, I will provide ideas of accommodating attitudes that typical-speaking people can utilize to create a welcoming environment for people with different types of communication. Finally, my supervisor gave me a hypothetical client who needed a low-tech communication system. In my decision-making process I used an EBP approach, meaning exploring current research, my expertise that comes from my studies and the internship, and the hypothetical client's background and preferences. The client presents with moderatesupport autism. She is 14 years old and due to personal reasons no longer has access to a high-tech AAC option. Communication breakdown is often a source of frustration for her and the caregivers. It can also lead to the feeling of isolation. Looking for a possible therapy approach, I searched for primary and secondary research with terms 'autism', 'AAC', 'intervention'. I found multiple sources showing that AAC vocabulary cards can be beneficial. Based on my knowledge of the client, she is a visual learner and is able to read short words. From my experience the cards are clear and effective in communication, therefore I would recommend AAC vocabulary cards as her communication option.

# Evaluating AI Fairly: A Transparent Framework for Comparing Large Language Models

Tristan Speer – Computer Science Co-Authors: Angela Fleenor and Emma Tran Mentors: Daniel Pittman and Alyssa Williams

# Oral Presentation, Session I (8:30 – 9:45 am), JSSB Room 205

The Sustainability Hub is a web application designed to make sustainability data in Colorado more accessible and useful by creating a centralized platform for informed decision-making. To help users explore this data more effectively, we are developing Bili, an open-source framework designed to compare and evaluate Large Language Models (LLMs) for their ability to provide clear, accurate, and unbiased sustainability insights. Since different LLMs vary in how they understand language, respond to questions, and handle complex topics, selecting the best model for a given task is a challenge. To address this, we are conducting a literature review to create a structured evaluate AI models, looking at key factors such as language comprehension, training data quality, biases in responses, how much information a model can remember, and the balance between accuracy and efficiency. Through this analysis, we have identified gaps in current evaluation methods, including the limitations of existing benchmarks, sensitivity to how questions are asked, and difficulty in measuring nuanced or subjective responses. While automated tests provide useful comparisons, human evaluations are also necessary to

understand whether a model truly provides helpful and fair answers. Once we establish a reliable evaluation framework, we will use Bili to systematically compare different LLMs and identify the most effective models for use within the Sustainability Hub. This approach not only improves how sustainability data is accessed and understood but also contributes to broader efforts in ensuring AI systems are evaluated fairly and transparently across different fields.

# Maternal PRKAA1 protects fetal growth and uterine artery blood flow in high altitude Colorado residents

Skylar Stefonowicz – Biology Mentors: Colleen Julian, Julie A. Houck, Ramon A. Lorca, and Lorna G. Moore, CU Anschutz

Poster Presentation, Session III (1:15 – 2:30 pm), Poster #17

Hypoxia, or insufficient oxygenation, is central to the pathophysiology of fetal growth restriction (FGR), a leading cause of infant mortality worldwide. The chronic hypoxia of high altitudes (> 2500 m) increases FGR incidence by, in part, reducing uteroplacental blood flow. In Andean highlanders, we previously identified a putatively adaptive single nucleotide polymorphism near PRKAA1 (rs1345778) positively associated with fetal growth and uterine artery (UA) diameter, a determinant of uteroplacental blood flow. Since the adaptive rs1345778 variant is present at moderate frequency in ancestrally diverse populations such as those represented by the TOPMed cohort, we sought to determine whether rs1345778-phenotype associations were present in a Colorado cohort. Our cohort included 95 maternalinfant pairs at moderate (Denver, 1609 m) or high altitude (Summit County, 2700 m) in Colorado. Maternal PBMC genomic DNA was extracted and genotyped using TaqMan Primers for rs1345778. Maternal genotypes were coded as 0, 1 or 2, with the latter being homozygous for the adaptive allele. Bilateral UA diameter measurements were obtained by Doppler ultrasound at 34 weeks of pregnancy and averaged. Birth weight was recorded from delivery records. Birth weight and UA diameter were contrasted between maternal genotype (0/1 vs. 2) using a Student's T-test. Statistical significance was defined as a 2-tailed p-value < 0.05 and trends considered as 0.10 . Women with 2 copies ofthe putatively advantageous rs1345778 allele had larger UA diameters (p<0.01) and tended to deliver infants of greater birth weight (p=0.07) than those with 0 or 1 copy. The positive relationship between the maternal rs1345778 adaptive genotype, UA diameter during pregnancy, and birth weight in a Colorado-based cohort suggests rs1345778 may be relevant for pregnancy outcomes at high altitudes more broadly. Fetal genotyping and PRKAA1 protein expression studies are on-going.

# Synthesis of a Library of Mycobacterial Glycopeptidolipid Fragments for the Development of Aptamer-Based Diagnostic Tools

Isabel Thomas – Biochemistry Co-Author: Ernesto Saenz Rascon Mentors: Shailesh Ambre and Andrew Bonham

Poster Presentation, Session II (10:00 – 11:15 am), Poster #3

Mycobacterium avium complex (MAC) consists of non-tuberculosis mycobacteria (NTM) that cause a range of clinical manifestations, including disseminated infections in immunocompromised individuals.

Glycopeptidolipids (GPLs) are complex molecules composed of lipid, protein, and sugar components that are found on the outside of the bacterial cell of NTM species. These molecules contribute to the bacteria's infectivity and pathogenicity. Typically, to discern MAC infection, current technologies require either invasive procedures such as bronchoscopies or time intensive genetic testing, highlighting the current struggle in detection and diagnosis. GPLs help diAerentiate NTM species into serovars through specific sugar patterns that are attached to the core tetrapeptide and recognized by the immune system. These unique sugar patterns can be exploited to develop technologies for detection. However, the difficulty in isolating pure samples of GPL in necessary quantities is a significant bottleneck. Advances made in the chemical synthesis of oligosaccharides provide an avenue to access pure, well-characterized sugar molecules in workable quantities. We are developing synthetic protocols to prepare a library of GPL oligosaccharides variants for further studies to create aptamer-binding diagnostics. Our library will contain non-specific and serovar-specific bacterial sugars with variations in methylation and acetylation patterns. These detailed sugar fragments will not only provide deeper insights into the structure-activity relationships (SAR) of the GPL molecule but also improve the specificity of aptamer-based diagnostics for serovars, enabling strain-specific diagnostics.

# The Expansion of Gender and Sex; Sociosexual Indexing of Transgender and Gender Expansive People

Ezra Toledo – Psychology Mentors: Chad Mortensen

#### Oral Presentation, Session I (8:30 – 9:45 am), JSSB Room 202

Sociosexual orientation indexing measures the extent to which individuals engage in sexual behaviors with non-committed partners or without emotional connection. While extensively studied, little research has explored transgender and gender-expansive (TGNC) individuals within this spectrum (Frankenbach et al., 2022). In Brazil, de Menezes et al. (2020) they examined sociosexuality among transgender individuals but only included those who transitioned within a binary framework (male to female or female to male) and identified as heterosexual. This limited approach fails to capture the full range of TGNC experiences. Additionally, the study inaccurately diagnosed participants using outdated criteria from the American Psychological Association (2016) despite updated guidelines in 2018. Another study examined gender identity, gender fluidity, and sex drive as influences on sociosexuality among gender-expansive individuals (Bakker & Walker, 2020). Findings indicated that gender identity did not directly impact sociosexual orientation, but sex drive did. However, gender fluidity moderated the relationship between sex drive and sociosexuality, suggesting that individuals comfortable with their gender identity are more likely to express their sex drive across multiple partners regardless of their assigned gender at birth. The current study seeks to expand on these findings while addressing prior research limitations. Additionally, this research aims to explore the relationship between TGNC sociosexual orientation and acceptance or engagement in polyamory. Prior studies indicate that LGBTQIA+ individuals are more accepting of polyamory (Balarini et al., 2019), but no research focuses solely on TGNC individuals to examine nuanced relationships. Finally, given the study's focus on a marginalized group, a gender-inclusive demographic survey is implemented to ensure respectful and accurate data collection. Using an improved methodology designed to capture diverse gender identities while maintaining statistical reliability (Herman et al., 2024), this study seeks to provide a more comprehensive understanding of TGNC sociosexual behaviors.

#### Enhancing Writing Center Accessibility: Strategies for neurodiverse students and Staff Development

Eva Torres – Psychology: Concentration in Clinical and Counseling Mentor: Elizabeth Kleinfeld

Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 200

Writing centers play an important role in supporting student success, yet neurodivergent writers often face unique challenges that require adjusted approaches. Through my experiences both as an intern and as a staff member at the MSU Denver Writing Center, I have observed recurring patterns in how neurodivergent students navigate writing consultations including difficulties with traditional tutoring methods, different needs for structure and flexibility, and challenges with verbal processing during sessions. These observations highlight that writing centers need to implement more inclusive strategies that better accommodate neurodiverse students. This research explores ways to make writing center services more accessible, such as offering multiple engagement (e.g., asynchronous feedback and reduced stimulation spaces), training tutors on neurodiversity-inclusive practices, and integrating Universal Design for Learning (UDL) principles into tutoring approaches. Additionally, I examine how to foster greater awareness and appreciation of among students, staff, and faculty by shifting the narrative from deficit-based perspective to strength-based approaches. By reflecting on past writing center sessions and reviewing literature on writing center accessibility, this study seeks to identify practical strategies that can be implemented to enhance support for neurodivergent writers. Creating a more inclusive writing center benefits all students by ensuring a flexible, student-centered approach to writing support while also reinforcing MSU Denver's Writing Center commitment to diversity and equity.

# Effective approach in preventing sexually transmitted infections (STI's) – a systematic analysis

Mira Towns – Public Health Co-Authors: Elisabeth Lichti and Linda Riebel Mentors: Garvita Thareja

Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #2

The debate between comprehensive sexual education and abstinence-only education remains a critical focus in discussions about youth development and public health policy. This study examines the effectiveness of each approach by comparing outcomes related to sexual health, including rates of sexually transmitted infections (STIs), pregnancy, and sexual activity. Through a systematic review of recent studies and meta-analyses, this paper aims to provide evidence-based insights to inform educators, policymakers, and community leaders about the most effective strategies for promoting healthy sexual behaviors among adolescents. We have inclusion and exclusion criteria. Comprehensive sexual education is beneficial when compared with abstinence only approach. To be discussed in poster in detail. Comprehensive sexual education equips young people with a broad understanding of human development, relationships, and sexual health. This help adolescents make informed decisions, adopt safe practices, potentially reducing the rates of teen pregnancies and sexually transmitted infections (STIs). In contrast, abstinence-only programs focus solely on promoting celibacy until marriage and often exclude critical information on contraception, safe sex practices, and healthy interpersonal relationships. These programs have been criticized for not preparing young people adequately for real-life situations, potentially leading to higher risks of STIs and unintended pregnancies.

#### Troubling the Model Minority Myth: Hmong Incarceration & Anti-Blackness

Sara Vang – Gender, Women, & Sexualities Studies Mentor: Sonny Dhoot

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 200

This project examines the impact of the model minority myth on Hmong Americans, particularly in relation to incarceration and anti-Blackness. As a Southeast Asian refugee group with a history shaped by U.S. military involvement, the Hmong experience racialization in ways that both align with and challenge dominant narratives about Asian Americans. The model minority myth, which portrays Asian Americans as a uniformly successful and assimilated group, obscures the struggles of the Hmong and reinforces anti-Blackness by positioning Asian success in contrast to Black oppression. I argue that Hmong Americans trouble the model minority narrative, which simultaneously marks them for mass incarceration and into the service of national anti-blackness. This research explores how Hmong Americans are disproportionately targeted by the carceral system while also being mobilized in service of state violence. By analyzing media representations, news coverage, and personal testimonials, this project highlights the contradictions of Hmong racial positioning. On one hand, Hmong Americans face economic hardship, educational barriers, and heightened rates of incarceration, making them disposable within the U.S. racial order. On the other hand, they are selectively granted proximity to whiteness when used to uphold anti-Black narratives, as seen in cases of Hmong participation in policing and state violence. The model minority myth not only erases these realities but also reinforces the notion that success is attainable through assimilation, further oppressing those who do not fit this mold. By challenging the dominant narrative of the model minority myth, this research reveals the precarious and conditional nature of Hmong racial identity. It calls for a more critical understanding of how Southeast Asian Americans navigate racial hierarchies and emphasizes the need for cross-racial solidarity against systemic oppression and incarceration.

# Electrochemical DNA-Based Biosensor to Detect HPV/Cervical Cancer Protein E6

Zoe Ward – Biochemistry Mentor: Andrew Bonham

Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #11

Human papillomavirus (HPV) is a common sexually transmitted disease, and infection that dramatically increases the risk of cancer; nearly all cervical cancer is HPV-induced. During infection, HPV secretes the E6 protein into the blood stream, presenting a novel biomarker for early and routine diagnosis of HPV. In response to this, we are developing and evaluating an electrochemical DNA aptamer-based (E-AB) biosensor that should be capable of binding to the protein E6 in a rapid, sensitive manner in very small sample volumes. We believe that such a biosensor offers a feasible route to rapidly detect the presence of HPV in a finger lancet blood sample. This contrasts with the current gold-standard test for HPV, which is an invasive pap smear test which requires about 20 mL of cervicovaginal fluid. Given that, an E-AB biosensor would make testing for HPV more routine and done more frequently, which is crucial because most patients with HPV are asymptomatic for the first few months. To evaluate our biosensor, we are utilizing recombinant and non-infectious E6 protein expressed in an E. coli bacterial host as a positive control. To develop the E-AB biosensor, an existing DNA aptamer sequence known to bind to E6 protein

for HPV-16 was computationally modeled for the energy of folded states, optimizing towards a conformational switching mechanism. Briefly, the biosensor consists of a modified aptamer attached to a gold electrode in a voltametric potentiostat system. When E6 protein is bound, the aptamer changes shape, creating a change in the electrical current in the system. This current response should vary with the presence and concentration of protein E6, acting as a proxy for the presence of HPV in the sample. We expect to observe a reproducible change in electric signal when protein E6 is present, and a constant signal when there is no E6 protein present. In the future, we plan to collaborate with clinicians to collect real human data to further support the research of quantification of protein E6 in a concentration dependent manner.

#### **Voting Insights: Navigating Student Electoral Participation**

Lara Widger – Political Science Mentor: Shayla Bischoff

Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #9

Auraria Votes is a nonpartisan committee that encompasses three institutions: Metropolitan State University of Denver, University of Colorado Denver, and the Community College of Denver, with the purpose of bolstering civic engagement and electoral participation. The research conducted is to explore and understand the habits of students reached by the Auraria Votes project. Students were surveyed on their participation in activities in the community, their ingestion of news relating to the election, and if they voted in the 2024 General Election. As a nonpartisan organization, Auraria Votes did not ask students how they are voting, but merely their intention to vote for each specific section of the ballot. Further, the implementation and efforts of the Auraria Votes project to promote civic education and engagement are discussed. Questions explored in the presentation include: Are nontraditional students more or less likely to be civically engaged than traditional students? Does Auraria Votes have greater reach over one institution than the rest? Are engaged community members also engaged in the democratic process? Did students vote for the presidential election only, or did they vote down the entire ballot? How many students on the Auraria campus are ineligible to vote, and remain informed in the electoral process? By answering these questions, Auraria Votes can evolve its techniques of outreach to better engage the tri-institutional Auraria community and pass the information on to other organizations with similar goals.

# APOBR Is Downregulated in EBV+ Tonsils of Children with Obstructive Sleep-Disordered Breathing

Kiera Willford – Biology Mentor: Regie Santos-Cortez, CU Anschutz

# Poster Presentation, Session III (1:15 – 2:30 pm), Poster #17

Background: Obstructive sleep-disordered breathing (oSDB) is a heterogeneous phenotype that is increasing in prevalence worldwide and has many potential comorbidities that could severely affect quality of life. There is a need to identify biomarkers for oSDB and its comorbidities to improve clinical management, particularly in children. Methods: We performed bulk mRNA-sequencing, differential expression analysis, and qPCR replication of selected differentially expressed genes (DEGs) using RNA

samples extracted from tonsils of children with oSDB. Two variables were used as classifier, namely, detection of Epstein–Barr virus (EBV) in tonsils and need for continuous positive airway pressure (CPAP) treatment. Standard statistical tests were used to determine associations across clinical, EBV, and DEG variables. Results: Nineteen genes were dysregulated in tonsils that are EBV+ or from children needing CPAP. Of these genes, APOBR was downregulated in both EBV+ and CPAP+ tonsils, and this downregulation was replicated by qPCR in an independent set of pediatric samples. In the tonsils of adult patients with oSDB, APOBR was positively correlated with age, and potentially with diastolic blood pressure. Conclusions: Taken together, APOBR and DEGs in tonsillar tissues may be useful as potential biomarkers of oSDB severity and comorbidity across the lifespan, with APOBR levels being dependent on latent EBV infection.

#### Aiptasia symbiosis Model System

Khalif Williams – Biology Mentor: Maria Cattell

#### Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #16

In our lab we focused on studying the genome of Aiptasia to grasp a more advance understanding of dinoflagellate algae and reef-building corals symbiotic relationship. For this research our lab developed and initiated a plan for establishing live Aiptasia sea anemones for use as a model organism to analyze symbiosis and the molecular mechanisms involved in reef-building coral symbiosis foundations. While maintaining the integration of our Aiptasia colonies our lab also tested published protocols for DNA extraction, PCR amplification, cloning and sequencing from Aiptasia tissue to verify their effectiveness for use in the CURE course. A CURE course for BIO 3610 was finalized. These protocols were tested for modifications necessary to help design and write specific protocols for student use in the course. Students were able to engage in the research by performing direct protocols generated in our lab. Additionally, our lab conducted bioinformatic analyses of the Aiptasia genome, tested established Aiptasia molecular genetic protocols which included the set up and maintenance of the Aiptasia system. The most influential portion of this research was observing and examining the husbandry of our sea anemones. Overall, Aiptasia colonies were established, and molecular genetic protocols were properly tested to be fully applicable in student research. Our lab was able to properly extract and precipitate DNA while successfully completing amplification and vector or plasmid cloning protocols. Growing up clones for the study and sequencing of *Aiptasia* genome allowed us to observe genetic variations. These genetic variations can be key markers in identifying remarkable findings and can be progressive for research opportunities. Developing Aiptasia colonies for molecular genetics can essentially be a vital model system for the analysis of symbiosis establishment in cnidarians or coral.

# Photography and Objects: How the Photography Illustrates the Nature of Aesthetic Properties

Whitney Wygant – Philosophy Mentor: Caleb Cohoe

Oral Presentation, Session III (1:15 – 2:15 pm), JSSB Room 202

This presentation demonstrates how the medium of photography possesses unique aesthetic properties. The aspect that separates photography from other aesthetic objects is the ontological link between the subject of photography. The photograph shows that the objects inside a photo can carry aesthetic properties into the final artwork that are not of the work itself but of the object being photographed. Because of this ontological link between the two, there emerge two issues with photography and its aesthetic properties. The question is of two parts, one being: how do some photographs provoke an aesthetic reaction while others do not, and the second being: how is it possible that two photographs of the same object can have different or opposite aesthetic properties? If there exists a direct ontological link between the subject of a photograph and the photograph itself, then it should not be possible for said object to have contradictory aesthetic properties. This presentation argues that there are two kinds of aesthetic properties that emerge in the photo. One kind of property is carried through from the object and into the final photograph, while the other must emerge from the photograph itself. This explains how photography can retain the ontological link between the subject of the photograph and the photo itself while also holding that two photos of the same object can produce conflicting aesthetic properties. In addition, this presentation posits that photography cannot be an objective reproduction or representation of objects because of the possibility of conflicting aesthetic properties which retain the same ontological link to the subject of a photo.

# Does Size Matter? An analysis of cryptic oviposition site choices observed in highly invasive *Aedes aegypti* mosquitoes in the Laboratory

Isabella Young – Biology Mentor: Robert Hancock

Poster Presentation, Session IV (2:45 – 4:00 pm), Poster #17

*Aedes aegypti* is a highly invasive mosquito species and a prominent vector of several diseases including Yellow Fever, Dengue, Zika, and Chikungunya viruses. They are container-breeding mosquitoes that have been observed participating in cryptic oviposition. This means that they may lay their eggs in hard-todetect and hard-to-reach places. This laboratory study aims to determine the minimal acceptable entry hole size into an oviposition container. After receiving a blood meal, gravid females were placed into isolated cages and presented with black ovicups. Each ovicup had a different sized entry hole in order to simulate different potential breeding sites found in nature such as tree holes, pots in urban environments, or anywhere else that might contain standing water. Powdered Tetramin fish food was mixed into aged tap water at a concentration of 0.13 mg/ml and placed in the ovicups to attract the mosquitoes and encourage egg-laying. Our results suggest that *Ae. aegypti* will enter and lay eggs in openings as small as 0.2 cm. However, there did appear to be a preference for larger entry sizes, which did receive more eggs consistently when they were given the choice. This emphasizes the mosquito's capacity for extreme cryptic oviposition, further complicating control efforts due to their ability to exploit an extremely wide range of habitats. Understanding these behaviors is crucial for developing more effective strategies to control the rapid spread of this invasive species.

#### Youth Liberation: Understanding bodily Autonomy and Agency

Veronica Zepeda – Gender, Women, & Sexualities Studies Mentors: Sonny Dhoot

Oral Presentation, Session II (10:00 – 11:15 am), JSSB Room 200

Youths' spirits are broken down to confirm to societal standards. Adults make assumptions on what is right for the youth; rarely do such assumptions align with youths' desire. This project asks, how are youth's bodily autonomy and agency neglected in the context of their well-being and desire? This project extends the work of Caribbean transnational feminists on agency and autonomy. The best way to understand youth liberation and these concepts is look at two seemingly disparate youth groups. First, trans youth who are seeking to live as their authentic selves are faced with obstacles from parents, medical professionals, and legislators to achieve gender affirming care. And second, child marriages where children are being coerced into marriages before 18 by family members. This project focuses on the contemporary United States, analyzing the denial of agency and autonomy of children in the 21<sup>st</sup> century. For this project, to analyze child marriages, I focus on young teen girls forced into marriages. I analyze different narratives from the youth who resisted the denial of their agency and autonomy in resisting child marriages and in asserting their right to gender affirming care. I contend, one key component of how youth liberation is achieved is through the affirmation of youth's right to exercise their own bodily autonomy and agency to make decisions regarding their lives. Youth deserve to live in a world where their desires and wants are respected.



