



MULTICULTURAL UNDERGRADUATE RESEARCH  
ART AND LEADERSHIP SYMPOSIUM

**March 29, 2024**  
**Lory Student Center**



**COLORADO STATE  
UNIVERSITY**

Office for Inclusive Excellence

# MURALS Schedule

7:30 - 8:15a	Registration and check in with breakfast	LSC Lobby & Ballroom C&D
8:30 - 9:00	Welcome	LSC Ballroom C&D
9:00	High School Student Welcome	Longs Peak (LSC 302)
9:15 - 10:20	Presentation <b>GREEN</b>	LSC 1 <sup>st</sup> -3 <sup>rd</sup> Floors
10:30 - 11:30	Presentation <b>GOLD</b>	LSC 1 <sup>st</sup> -3 <sup>rd</sup> Floors
11:30	MURALS Alumni Arrive	LSC 304
11:45 - 1:00	Official University Welcome/Luncheon Alumnus Keynote	LSC Ballroom C&D
1:30 - 2:45	Poster Gallery	LSC Ballroom A&B
3:00 - 3:45	MURALS Alumni Panel	LSC Ballroom C&D
4:00 - 4:30	Awards Ceremony	LSC Ballroom C&D



2023 MURALS Participants

# Welcome!

Welcome to the ninth annual Multicultural Undergraduate Research, Art, and Leadership Symposium (MURALS). We truly appreciate your presence. MURALS exposes students across a variety of disciplines to undergraduate research opportunities. MURALS, in its 9th year, has become a true student success campus-wide collaborative initiative that is made possible through efforts across campus. These efforts have demonstrated dedication and measurable outcomes that ensure historically underrepresented marginalized students are affirmed in their educational journey by providing support to ensure success.

## **MURALS participants will be able to:**

Increase their interaction and collaboration with students from diverse populations.

Communicate confidently and constructively about their research/scholarly work with their peers, faculty, and staff.

Independently synthesize and extrapolate information pertaining to their own research/scholarly work, including lessons learned, strengths, and ways to improve.

Articulate significance of independent research interests as it pertains to their field, community, nation and/or world.

Increase professional interaction through interpersonal skills with peers, faculty, and staff.

Understand the fundamental characteristics needed to become a successful multicultural leader.

## **Acknowledgements and Special Thanks to:**

### **MURALS Graduate Coordinators**

Kayl Ecton

Kellin Slater

Alyssa Matthews

Chaturya Katragadda

### **Campus Partner Sponsors**

Morgan Library

Office for Undergraduate Research & Artistry

Alumni Association

Office of Admissions

College of Natural Sciences

College of Veterinary

Warner College of Natural Resources

College of Health and Human Sciences

College of Liberal Arts

College of Agricultural and Sciences

A sincere thank you to all graduate students who served as Graduate Student Evaluators, and to all Faculty Guides, Judges, and our Day of Volunteers! Of course, the Lory Student Staff is always great to work with...IT, Catering, EPO, etc!

### ***Bridgette Johnson***

Assistant Vice President

Office of Inclusive Excellence



3rd MURALS First Year Scholars Cohort 2023-24

## **Schedule of Presentations**

## **Presentation GREEN 9:15-10:20**

### **116 (Career Center Office 120)**

12- C. Lindsey (SSH)  
38- G. Magana (SSH)  
89- J. Gomez (STEM)  
100- F. Miller (STEM)

### **134 (Campus Activities)**

130- A. Holzer (STEM)  
146- M. Judson (STEM)  
63- K. Ivey (SSH)  
67- J. Litzau (SSH)

### **144 (Fraternity & Sorority Life)**

44- T. Dardis (STEM)  
141- H. Nini (SSH)  
138- P. Jesik (STEM)  
142- N. Celis (STEM)

### **175 (ASCSU Chambers)**

108- S. Villanueva (STEM)  
110- M. Lynd (STEM)  
56- M. Rodriguez (SSH)  
112- R. Morales-Villalva, G. Fuentes Georgieva,  
N. Chhetry, M. Bruce, E. Ocampo-Lara,  
J. Erickson, J. Gyamfi & J. Mikhail (STEM)

### **226-28**

95- L. Lini (STEM)  
42- B. Sanchez (SSH)  
80- J. Collins (STEM)  
16- M. Lopez (SSH)

### **300**

29- L. Benfield (STEM)  
1- E. Smith & D. Rumer (SSH)  
  
117- A. Lomme-Broderick (STEM)  
126- A. Tabib (STEM)

## **Presentation GOLD 10:30-11:30**

94- R. Meireis & A. Rangel (STEM)  
91- C. Mejia Mazariegos (STEM)  
97- M. Matthew (STEM)  
46- G. Guerrero (SSH)

133- M. Vasquez (STEM)  
66- H. Gilliard (SSH)  
106- E. Wheeler (STEM)  
52- L. Fox (SSH)

27- L. Osterhoudt (STEM)  
140- M. Gonzalez (SSH)  
145- R. Ceisel (STEM)  
7- M Aryan (SSH)

121- S. Wagon (STEM)  
122- L. Maristela (STEM)  
99- A. Diaz (STEM)

64- J. Christensen (STEM)  
70- J. Oganeku (STEM)  
13- E. Diederichs (SSH)  
79- H. Shelton (STEM)

36- L. Guerrero (STEM)  
75- A. Casper, M. Miller, E. Smith, J. Nedeljkovic, A.  
A. Francis, A. Rember, H. Obuna, H. Hall, S. Molina, &  
R. Winston  
127- E. Montes Ramos (STEM)  
134- E. Tran (STEM)

## **Schedule of Presentations (Continued)**

## **Presentation GREEN 9:15-10:20**

## **Presentation GOLD 10:30-11:30**

### **304**

58- J. Porter (IE)  
76- A. Dickerson & P. Zhang (STEM)  
11- M. Burton (STEM)  
20- S. Tousignant (CA)

116- M. Zeerak (IE)  
2- I. Vontoure (CA)  
47- K. Salazar-Martinez (SSH)  
18- J. Lang (STEM)

### **306**

28- J. Day (CA)  
120- K. Hernandez & O. Nunez (STEM)  
24- A. Siby, V. Sanchez & G. Sidhu (STEM)  
35- A. Ott (SSH)

123- J. Yost (IE)  
33- J. Soto (CA)  
32- M. Alicea (STEM)  
37- J. Montoya, X. Paredes &  
K. Hernandez Delacruz (STEM)

### **308**

149- Y. Rivera (IE)  
45- G. Sepanik & D. Lopez (CA)  
40- O. Kreutzer (STEM)  
59- S. Bond & S. Nuncio-Cagle (SSH)

4- T. LoCascio (STEM)  
43- A. Oshiro (CA)  
51- M. Hassen (STEM)  
34- N. Willhoit & S. Cardiel (SSH)

### **310**

71- H. Warfield (SSH)  
55- T. Porter (CA)  
57- A. Medina (STEM)  
65- M. Valencia (STEM)

6- E. Kim (STEM)  
69- B. Sherwood (STEM)  
39- L. Cardenas (CA)  
22- E. Buschow & L. Nono (SSH)

### **312**

30- M. Martinez (STEM)  
73- I. Jackson (SSH)  
54- B. Pierce, C. Grussendorf &  
J. Rukhina (STEM)  
115- N. Sheptov (STEM)

72- L. Banas (SSH)  
62- B. Ibarra (CA)  
14- J. Ortiz Santos (STEM)  
48- A. Crownover (STEM)

### **322**

9- E. Billow (STEM)  
77- M. Gomez (STEM)  
102- B. Saliu (CA)  
132- J. Akintola (IE)

60- S. Vasquez (SSH)  
8- L. Li (STEM)  
23- R. Brooke, R. Mohamed & A. Vasquez (STEM)  
68- M. Boyd & S. Gouverneur Torres (SSH)

## **Schedule of Presentations (Continued)**

### **Presentation GREEN 9:15-10:20**

#### **324:**

26- J. Duenas (SLL)

### **Presentation GOLD 10:30-11:30**

78- J. Ewing (SSH)

10- M. Espinoza Diaz (STEM)  
82- L. Valdez (STEM)  
3- R. Nieves (SSH)

**328-330**

49- R. Winter (STEM)  
137- T. Teegardin (SSH)  
101- S. Collins (STEM)  
84- S. Buckmire (STEM)

**372**

61- A. Bui (SLL)  
17- I. Prosceno (STEM)  
87- T. Beesely & A. De La Chica (STEM)  
111- D. Angeles Marquez (SSH)

**374**

96- P. Niyogusengwa (SLL)  
88- A. Wates (SSH)  
93- M. Ngo, R. Valdes & M. Nettelnd (STEM)  
150- M. Stockman (STEM)

**376**

105- M. Snyder (SSH)  
129- M. Ellerbrook (SLL)  
118- S. Moo (STEM)  
25- T. Chartier (STEM)

**378**

74- E. Lutz & D. Edwards (STEM)  
125- T. Ramirez (SSH)  
128- Y. González (STEM)  
136- N. Bickham (STEM)

**396**

31- C. Grixby (STEM)  
5- T. Sopkin (SSH)  
103- A. Alamedia (STEM)  
109- O. Achmatowicz (STEM)

15- B. Maxwell (STEM)  
81- L. Gleckler & B. Baer (STEM)  
104- M. Kruckenberg, E. Valenzuela, C. Ozor & L. Valdez (SLL)

50- H. Medina (STEM)  
139- K. Lane (SSH)  
151- Z. Yahuma Amany (STEM)  
85- M. Papantonio (STEM)

90- L. Warren & I. Edwards-Clancy (SLL)  
19- S. Deitch (STEM)  
92- M. Etcheto, B. Seabury & L. Gutierrez (STEM)  
131- A. Mercado (SSH)

86- A. Pereida Flores (SSH)  
21- I. Flores (STEM)  
114- A. Vigil (STEM)  
147- M. Perez (CA)

148- N. Hatch (SLL)  
107- E. Sandoval (SSH)  
83- A. Hall (STEM)  
124- S. Lahlali (STEM)

53- B. Nugroho (STEM)  
113- M. Kamberg (SSH)  
143- K. Doyle & A. Bitter (STEM)  
35- N. Bickham (STEM)

98- K. Sutton (STEM)  
(Private Session)



VISUAL, CREATIVE AND PERFORMANCE ART ABSTRACTS



**1<sup>st</sup> Place Winner- Kyla Ballard**



**2<sup>nd</sup> Place Winner- Alex Hey**



**Rising Star -Roy Luo**

**Social Justice and Inclusion Awardee- Gerson Flores Rojas**

### **Alyssa Oshiro**

#### ***Redefining Inclusive Healthcare Design: Trauma-Informed Solutions for Amputee Patients' Recovery***

This design project, Ka Amputation & Rehabilitation Center caters to the needs of amputee patients, families, and healthcare professionals. The amputee community has been underserved within the healthcare domains, not always receiving the adequate level of attention and care necessary for recovery. Trauma-informed design research led to stimulating features aimed at creating moments of positive distraction, helping patients accept their new reality. This project's Art Deco style is inspired by the Egyptian concept, Ka (soul), to emulate the process of rebirth. The center offers patients a place to go through this transition while feeling prioritized through the functions this facility offers, the inclusive design considerations. Furthermore, the center provides a place for holistic healthcare (e.g., limb amputation, recovery, and rehabilitation) and offers patients and their families space to stay. Spatial adjacencies were an essential consideration. Including physical therapy space adjacent to family units provides amputee patients with easily accessible space for rehabilitation. In the design process, diverse user groups and design specialists provided insight into important features for an amputation and rehabilitation center and accommodations for patients, doctors, and visitors. Overall, the project aims to create an inclusive and equitable environment for amputees to recover feeling encouraged to confront this journey with strength and dignity.

**Benjamin Ibarra*****A Deep Dive into the Impact of Different Automatic Speech Segmentation Methods on AI Applications in Collaborative Learning Environments***

Identifying the most consistent segmentation method is important for enhancing the accuracy and reliability of ASR systems. Figuring out which method is the most reliable helps make voice recognition technology better and more useful in everyday situations where understanding what's being said really matters. We started by transcribing some CPS task data to create timelines for Whisper, Google, and Oracle's ways of breaking down speech. We used a labeling schema from Sun's paper to tag these timelines. We processed these labeled transcripts through the BERT model, which extracted unique verbal features by enhancing the model's understanding of the sentence structures. We further applied openSmile to extract prosodic features from the transcripts, further augmenting our dataset. With the verbal and prosodic features now in place for each segmentation method, we applied a variety of classical machine learning models to classify the data. This allowed us to assess the consistency of the Google, Whisper, and Oracle methods in our context, aiming to determine which method offers the most reliable segmentation for our purposes. Our findings offer valuable insights into the application of these AI technologies in educational settings, highlighting their potential to enhance the detection and understanding of collaborative learning experiences.

**Bradon Goral*****Tapestry of Conversance***

For this project I would like to demonstrate how the intersection of identities and how mentorship can lead to a better understanding of interpersonal relationships and how this can be a valuable perspective in working to help other. For the project I'm hoping to be able to convey this by writing a small collection of creative writings in different genres of non-fiction and poetry to show how my experience and how identities as well as privileges intersect to give me more perspective on wanting to dedicate my life to helping people through my future profession as a psychological counselor.

**Boluwaji Saliu*****A trip to Ghana- Reimagining the African Diaspora***

How can travel abroad bring about a new global perspective? How can it change the way we interact with other students/ people from different cultures? this is a video that chronicles the journey of 10 American CSU students as they embarked on an immersive exploration of Ghana's rich cultural landscape in December 2023. Against the backdrop of global powers and gender dynamics, this video delves deep into the intricate tapestry of Ghanaian society and rich culture through the eyes of CSU students and faculty offering profound insights.

For this project, data collection involved conducting interviews with students who participated in the trip. In addition to gathering brief reflections from each student on how the trip impacted them personally, I conducted more in-depth interviews with two students to explore what they learned and how their perspectives have shifted in relation to their interactions with the Ghanaian locals and culture.

Furthermore, I analyzed pictures and videos from the trip to identify the activities undertaken and the historical significance behind them. These visuals were then incorporated into the video, along with relevant historical context, to provide a comprehensive learning experience for all viewers.

My objective is to bring greater awareness to West African/ Ghanaian culture here at CSU by breaking down stereotypes and barriers. By emphasizing the importance of presenting an unfiltered perspective, I aim to challenge the stereotypical portrayals in mainstream media, fostering a more nuanced understanding of the African diaspora. My initiative seeks to cultivate empathy, appreciation, and respect for cultural diversity.



**Gavin Sepanik, Darren Begay & Delilah Lopez**

***Coming to Know Indigenous Knowledges***

The goal of this presentation is to educate audience members who are unfamiliar with Indigenous Epistemologies on the basis of cultural understandings of the traditions, survivance, and radical resurgent practices of Native Nations. These are fundamental tenets of Indigenous Knowledges and existence. We will accomplish our goal through an oral presentation and artwork that details and expresses how these principles form the basis of Indigenous learning and understanding. These are vital topics for Indigenous Peoples because they are the basis of existence. Each of us will present a topic that we find particularly important to us.

Traditions like storytelling, ceremonies, creation stories, teachings, beliefs, wisdoms and languages inform a sense of self, responsibility and belonging. These traditions center Indigenous knowledges, understanding and create nationhood for Indigenous peoples.

Survivance is not merely surviving forced assimilation and genocide, but rather resistance and a dedication to sovereignty and resilience. Ergo, it is not a state of victimhood. Native nations have always had agency and will continue to do so through rewriting narratives.

Radical Resurgent Practices (re)vive traditional understandings and practices in a contemporary setting that not only ensures survivance but also (re)vitalizes and (re)claims tradition.

**Imani Vontoure**

***A Girl Like***

This is a creative writing project that has taken the form of a collection of short stories about female-hood. My goal with the collection was to explore how various other identities (such as race, age, economic class, sexuality, etc) intersect with our expression of the feminine/ womanhood. This collection follows nine stories told to me through interviews from various people in my life. I hope that by reading this collection people are able to learn about and appreciate the different aspects of womanhood and how it shapes us in life.

**Jimmy Day**

***Equity, Diversity, and Inclusion through Healthcare Design: The Healing Center for Humanity***

It is one of the most disregarded entities present in day-to-day humanity. Healthcare facilities such as hospitals, clinics, and specialized care centers are avoided because of the anxiety-related effects and discrimination that users experience in these spaces. This avoidance of healthcare centers has caused an increase in preventable health issues and many other potentially fatal diseases, especially in people of color (POC) populations. The Healing Center for Humanity (HCH) is a 105,251 square foot research-based inclusive design proposal to provide POC populations easy access to services such as counseling, healthcare, fitness, and support.

Guided by psychological research, precedent analysis, and evidence-based healthcare design implementation, the driving purpose of the HCH design proposal is to reconceptualize the design of optimal healthcare spaces. Drawing inspiration from ancient eastern practices rooted in holistic healing, this design aimed to converge all aspects of human health and wellness under a single roof, redefining the conventional hospital model. In the form of "Kanjiru," a term meaning the ability to sense or feel from within, the design concept embodies a biophilic, immersive experience for its users as felt through the senses. This is meticulously applied into the

space planning through the rhythmic interplay of colors, forms, and textures found in nature to immerse users into a nurturing environment conducive to health and wellness. The Healing Center for Humanity is not just about creating a space for treatment but laying the foundation for a brighter, healthier future for all through the healing power of the natural world.

### **Leticia Cardenas**

#### ***Uncovering the Racial Bias in Artificial Intelligence within Chat GPT***

As our world becomes largely technology-based and growing daily and growing yearly. Artificial intelligence's purpose is starting to grow and take over in helping run new and daily tasks in our society. Accordingly, the purpose of my study was to find any sort of bias in artificial intelligence and determine patterns and ideas that support the algorithm that spews the racial bias any further. This was a carefully controlled, non-bias formed study. I ran multiple test prompts asking the software to give character profiles on people and characteristics about them like race, cultural backgrounds and socioeconomic status. 10 test prompts were run for about 8 weeks (about 2 months). The bias in the AI chat (that being chat GPT) is very prominent but one can only reach so far in finding bias before data saturation. Nonetheless there seems to be bias within the software of the AI and these patterns are shown in search engines powered by AI in apps such as chat GPT.

### **Joana Soto**

#### ***Empowering Women: Unveiling Insights and Innovations in Design for Monarch Women's Center***

The Monarch Women's Center (MWC) is a space created to provide a variety of resources specialized in serving women. One of the main goals of the space was to serve as a hub for advocacy and activism, empowering women to take action by providing public and private spaces to create an individualized experience by encouraging the facility to be run by women. This was accomplished through the use of color, light, and biophilic design which are all factors that affect mental health and mood. Three main components make up the heart of the MWC which include a safe gathering space, resources related to women's issues, and a space that can provide the setting to encourage community involvement to build a support system for users by providing education opportunities. The MWC is located in the Power House Energy Campus which is a 100,105-square-foot building located in Fort Collins Colorado composed of relaxation, recreation, and work spaces. The primary motivation behind the redesign and re-branding of the building is to provide women, specifically college students gender-conscious support to break down systematic barriers through the different resources provided in the space that may not be easily attainable. The butterfly effect played a major role in the design of the space. This effect explains how a simple act can have a bigger effect somewhere else on the other side of the world. The MWC was created to act as the pushing factor to create change.

### **Mikayla Perez**

#### ***Buzzing Through Data: Learning the Basics of Bee Species Identification and Analysis***

In my MURALS project under the guidance of graduate student mentor Jessie Dodge, I worked on data collection from various cavity-nest boxes throughout Boulder County. The goal was to assess how habitat variations affect cavity-nesting bee communities, bee emergence patterns, and parasitism rates. For this project, my tasks involved fundamental laboratory duties such as data entry, categorizing and identifying species within straws, and pinning insects from the cavities. Drawing on previous research, the expected results were to uncover endemic bee species in each habitat, observe a community overlap between control

and treated sites, note unaffected bee emergence due to lab development, and identify increased parasitism in disturbed habitats. I manually documented approximately 200 straw cavities containing diverse species native to Colorado, transferred observations into Excel, then sorted, pinned, and labeled specimens. This led to assisting in species identification. Though distinct from other research-focused MURALS projects, this experience was extremely valuable to my learning experience. It not only expanded my understanding of scientific methods but also honed my attention to detail and prepared me for future research, broadening my interest in laboratory work.

## **Susanne Tousignant**

### ***Trauma-Informed-Design Approach for LGBTQ+ Survivors of Intimate Partner Violence***

The Inner Vibrancy Center (IVC) aims to provide a refuge for survivors of Intimate Partner Violence (IPV), with an emphasis on LGBTQ+ users, by nurturing individual agency, while fostering a sense of community. The project procedures consist of a building analysis, precedent studies for end user research, and design development. The process was based on the symbolic interaction framework and Trauma-Informed-Design (TID) principles, focusing on safety, community, comfort, and choice. The design concept, 'Existencia' draws inspiration from the fluidity of human experiences that are shaped by our perspectives and perceptions. The three-story building provides reserved spaces for clinics, counseling, resource centers and short and long term housing options that are well-lit with clear sightlines to egress and staff contributing to perceived and physical safety. The main level features opposing entry points with the center of the building an open community lounge where staff and survivors can socialize or find solitude. Occupants have control over features like dimmable lighting and movable furniture, contributing to a sense of autonomy. Additionally, all levels are visually connected to daylight and community through surrounding light wells in the atrium space. This project illustrates how the physical environment can address users' psychological and social needs, empowering one's existence.

## **Twoax (Tim) Porter**

### ***Ethical Research & Tribal Engagement***

This project aims to address the existing gaps in agricultural research and partnership with Tribal Nations. Historically, exploitative research methodologies have contributed to the erosion of trust among Tribes. Despite the significant involvement of many Tribal Nations in agriculture, including farming and ranching, there are limited relevant health and safety resources. This Tribal outreach project seeks to implement an informed process promoting trust, collaboration, and meaningful partnerships and to create strategies to address the unique needs of Tribes. My framework evolved from a literature review of ethics, partnerships, and research within Tribal communities, where I identified Fisher and Ball's (2003) Tribal Participatory Research model, which prioritizes Tribal sovereignty and cultural context. I adapted this research model to a four-stage recursive framework for non-research institutions prioritizing contextualization, through Tribal oversight, community liaisons, community-driven prioritization, and framing challenges. Implementation involved identifying relationships, gaining Tribal Council approval for oversight, and engaging in meetings with Tribal agricultural stakeholders. Currently at the second stage, these interactions mark the initial phase of relationship-building. Outcomes include a growing network of agricultural stakeholders within Tribes and extension agents connected to these communities. Additionally, I have begun early communications with community leaders involved in training. Through ongoing development and collaboration, I anticipate further growth in our network and a deeper understanding of how to best reach underserved communities. In contrast to reductionist methodologies, this framework emphasizes a relational perspective prioritizing the contextualization of challenges.

# MURALS

SERVICE LEARNING & LEADERSHIP ABSTRACTS



**1<sup>st</sup> Winner - Victoria Silva**



**2<sup>nd</sup> Place Winner- Alejandra Quesada-Stoner**



**Rising Star - Bemnet Tefera**



**Social Justice & Inclusion Awardee  
- Abi Tekeste**

## **Anh Bui**

### ***Mentorship and Education Support for Low-Socioeconomic Students***

The underfunding gap across the public schools affects millions of students all across America, especially students coming from marginalized backgrounds. This creates a disparity in the quality of education that differs from district to district impacting students coming from low-socioeconomic backgrounds hindering their access to higher education. During my time in K-12 I was experiencing this inequality in the resources I was receiving in school. After surveying students and analyzing my own experience I wanted to combat the needs that were missing for Denver Public School (DPS) students. This initiative is being done through a website that I created that has information about scholarship, pre-college programs, internship, mentorship, and community resources. The mentors a part of the website are alumni of DPS or hold similar identities to students from the community currently attending college in Colorado. It's important that students are able to connect with people that hold similar identities and share similar stories to help encourage them towards higher education. The last

initiative is bringing juniors and seniors from two schools, a part of the DPS district, onto CSU campus for a tour showing various resources on campus that can help them succeed during their time in college. In addition, to a question and answering panel by current CSU students that attended the same high school. Ultimately, by giving all students the chance to realize their full potential, investing in mentorship and educational assistance for low-socioeconomic schools can contribute to more students attending college from low-income backgrounds.

### **Mason Kruckenberg, Lilliana Valdez, Edith Valenzuela & Chigozie Ozor**

#### ***College of Business Diversity Audit***

The Student-Led Guide to Connecting with College of Business (COB) student organizations. Theoretically designed case study to help evaluate diversity, equity, and inclusion initiatives that are used to evaluate the organizations in the COB. This study helps find the gaps and issues in order to be addressed from a student perspective, especially amongst First Generation, people of color students pursuing post secondary education. Social identity theory is a framework that explains how individuals identify with certain groups and the effects it has on their behavior of others. We used it as a framework to gain an understanding of the COB organization by also hypothesizing potential findings to interpret how DEI practices influence student culture and engagement within the COB. After reaching out all the clubs in COB, it was revealed that 18 out of 24 organizations in the COB were somewhat accessible, some with information including emails, meeting details, and socials. While others only included an email. Some clubs failed to respond to these emails and lacked information while 13 out of 24 clubs had the right information. Influenced by social identity theory, this study aims to highlight the need for improvements within the COB. Providing solutions to the information we gained which makes it available and inclusive. The expected outcomes will offer future research opportunities that will help shape the educational experience for business students

### **Nizhoni Hatch**

#### ***Actualizing a Solution to the Navajo Nation's Water Contamination***

The Navajo Nation faces severe water contamination due to over 524 abandoned uranium mines, affecting water, homes, and soil with toxic substances like uranium and arsenic, and leaving approximately 26,050 residents without access to clean water. In 2019, the University of Arizona and Diné College, with National Science Foundation funding, developed a solution through the Indigenous Food, Energy, Water Security, and

Sovereignty program. They created mobile, solar-powered water filtration systems, costing \$25,000 each, capable of purifying 1,500 gallons of water daily and removing nearly 100% of contaminants. To address water contamination, equipping the Navajo Nation with 216 systems at a total cost of \$5.4 million would offer a cost-effective and immediate solution to provide clean water to 6,500 households daily, compared to the \$700 million required for extensive infrastructure projects. The discussion will focus on the challenges of implementing these systems, developed by Diné College engineering students, and explore the differences in biomedical engineering guidelines and healthcare practices between the United States and the Navajo Nation.

### **Jose Duenas**

#### ***El Sueño Inalcanzable: Redefining the College Journey for Latine Youth***

Predominantly white institutions of education do not properly serve the broader population of Black, Indigenous, and People of Color. From the journey to and attendance at these institutions, BIPOC individuals often face a plethora of systemic issues that damage their experiences with higher institutes of education. Delving deeper into this broad issue by examining the journey to college in Latine students, we can gain a deeper understanding of the scope of this issue. Discrimination takes on many different forms and many Latine

individuals find themselves in the face of it during their journey to and through college. From lacking proper outlets for information to unsafe environments, many Latine individuals often face a systemic pushout from academia. Guided by my experience as a first-generation Latine student, the opportunity to work on a research team focused on this topic, and first-hand experience working with these students, I will guide an exploration of this issue and the work I have contributed to combat it in our local community within the past year. Additionally, I will lead the discussion on some of the current setbacks of these efforts and what could be done to overcome those obstacles. This will all be done to work to redefine the journey to college for Latine students by targeting the core underlying issues that exacerbate this issue. Furthermore, with the information and guidance gained through these experiences, I hope to support further and advance the current movements being made to combat this issue. The systems have worked against marginalized communities since their inception and it is time to make a change.

### **Link Warren & Ian Edwards-Clancy**

#### ***Growing Food Security at Colorado State University***

As inflation and food prices have soared over the past few years, food banks are becoming a necessity for more Americans than ever before. From the summer of 2022 to the summer of 2023, Food Bank of the Rockies, Colorado and Wyoming's largest food bank, has seen a 40% increase in the number of people they serve. At CSU, the food pantry has also seen a similar increase in the number of students it serves. During the fall semester of 2021, the food bank served more than 1,500 students, faculty, and staff each month, almost double the number of people supported before the pandemic. Growing Food Security is an organization of students and faculty that has partnered with ARDEC South (a research plot at CSU), supportive farmers, and researchers to help those in our community that are struggling with food insecurity have access to fresh and delicious produce. Each year over the winter and spring, student volunteers work to plan and prepare for the growing season at ARDEC by purchasing seeds, growing seedlings, and transplanting them into the field. Throughout the summer, volunteers work on field maintenance and harvest produce to send directly to the Rams Against Hunger food pantry. Throughout the past four years, 24,000 lbs of produce (84,000 servings) have been donated to the food pantry through Growing Food Security. 20 to 50 volunteers help out with this program during the summer that supports about 9,000 (30% of our student body) food insecure students on campus.

### **Milan Ellerbrook**

#### ***Investigating the Impact of Diverse Antibiotics on Bacteria and Health Implications***

Investigating the Impact of Diverse Antibiotics on Bacteria and Health Implications The rise of antibiotic resistance poses an issue for global health and demands continual research on different treatments Prior research has used cinnamon as a natural antibiotic to see how bacteria grew around it over a period of time (Silverhart, 2016) Ibuprofen has also shown significant results with preventing bacteria growth and has an antibacterial effect (Al-Janabi, 2010) Some other great antimicrobial substances include low pH acids such as acetic acid, silver nitrate, and monoprotic weak acid (Kundukad, 2020) This study focuses on the efficiency of different antibiotics in combating common types of bacteria and eradicating bacterial growth Through laboratory experimentation, natural (cinnamon), acidic (acetic acid), and NSAIDS (ibuprofen) antibiotics will be used to reveal varying weaknesses of bacteria One source of bacteria will be grown and then placed on various agar plates with a soaked paper disk to see the effects of the antibiotics The proposed outcome of this experiment is that the low pH antibiotics will be the most effective at killing bacteria (Kundukad, 2020) The insights gained from this study can be furthered to refine antibiotic formulations and to develop answers to microbial resistance This ultimately sheds light on potential treatments to mitigate antibiotic resistance and ultimately preserve human health.

**Pastor Niyogusengwa**

***Engagement in Learning***

Sustainability has been described as, “meeting the needs of the present without compromising the ability of the future generations to meet their own needs.”

My project focuses on the importance of having students being actively engaged in the work they do and helping students become confident in their everyday skills. With my project I want to create a classroom for high school students to teach and learn from their peers to strengthen community relationships.

As a business student we are taught about the importance of sustainability as it considers the long-term success of environment, social, and economic development. Most importantly, I would add, embracing sustainability challenges and prepares students to make informed decisions about their future.

To acquire an actively engaged learning style takes many steps and requires everyone to be open to the relationships around them. For example, in grade school we had a home room that you grew with and got closer with simply by seeing each other every day. I think a good first day step is taking various personality and style quizzes to understand how the people around you operate. Getting to know the people around us gives us the opportunity to create a social support group that can offer encouragement, assistance, and can reduce stress and anxiety knowing you have a common face to turn to.



SCIENCE, TECHNOLOGY, ENGINEERING, & MATHEMATICS ABSTRACTS



**1<sup>st</sup> Place Winner - Sreeya Kairamkonda**



**2<sup>nd</sup> Place Winner - Elizabeth Carlsen**



**Rising Star - Mya Voigtsberger**



**Social Justice & Inclusion Awardee  
- Keanu Kaibetoney**

### **Abduladeem Tabib**

#### ***Evaluating Disease States through Microbiome Analysis: A Functional Approach***

The human organism is an intricate assembly of approximately a trillion cells that engage in complex communication, interaction, and cooperative functioning to maintain vitality. Beyond the realm of human cells, our bodies are home to a vast array of non-human cells, including bacteria, viruses, fungi, and other microorganisms. These entities predominantly reside in areas exposed to the external environment and collectively form what is known as the microbiota or microbiome. The intricate interplay between human and non-human cellular entities gains profound significance upon examining the composition of the human body. A pivotal study by Sender et al. in 2016 illuminated that non-human cells constitute over half of the total cell count within the human body. This revelation underscores the fundamental role of symbiotic relationships in establishing our physiological norm. Any alteration in this delicate equilibrium, whether an increase or decrease in the presence of non-human cells, can lead to a departure from the established "normal" physiological state.



**Aiseta Siby, Valeria Sanchez & Gagandeep Sidhu**

***Quantifying the Aspect-dependent Impact of Wildfires on Snow Accumulation and Melt in Northern Colorado***

Increases in wildfire extent across the western United States presents a significant impact on the snow water resources. Previous work has shown post-fire impacts including earlier peak snow water equivalent (SWE) timing, faster snow melt rates and earlier snow disappearance dates. Our study evaluates the impact of wildfires on these parameters within the Cameron Peak wildfire in Northern Colorado. We studied seven different sites across a range of burn conditions and aspects (for example, burned north aspect vs unburned north aspect). The burned sites accumulated approximately 6% more SWE than unburned sites, but peak SWE occurred 14 days earlier on average in the burned area. The burned sites melted 64% faster than unburned sites ( 2.1 cm per day vs 1.3 cm per day), resulting in a snow-off date that occurred 11 days earlier on average (May 27 vs June 7). Our results provide additional evidence documenting how wildfires impact snowpacks. Given projected increases in wildfire activity through this century, additional research should be conducted to help inform the effective management of this critical resource in a changing climate.

**Alannah Crownover**

***Determining optimal storage temperatures for field collected blood samples of Kentucky Warblers***

In conservation genomics, blood plays a fundamental role in providing adequate DNA for creating genoscapes, which are essential in protecting endangered species. Blood stored at low temperatures can limit the exposure of the sample to bacteria and preserve the amount (and quality) of DNA contained in the sample. However, this is not always possible with field work or in locations without access to these extremely low storage temperatures. To determine the effectiveness of different storage temperatures, we used DNA extracted from blood samples of the Kentucky Warbler stored at room temperature (n=20) and in long-term storage at -80°C (n=20) and calculated the total DNA yielded from each sample. The mean DNA yield for each sample was 21.426 µm for blood stored at room temperature and 24.372 µm for blood stored at -80°C. The DNA yield between treatments was not statistically significantly different, but a study with a larger sample size is needed to accurately detect any large differences in DNA yield. Determining an optimal storage temperature allows for better DNA yield from blood samples. In this study, both storage methods seem effective in maximizing the DNA yield, but it is important to study the effects of long term storage at room temperature.

**Alia Lomme-Broderick**

***Examining the Effects of Beta-Alanine on Exercise Performance***

Examining the Effects of Beta-Alanine on Exercise Performance.

Several studies have shown that adjusting beta-alanine, an amino acid that is sometimes taken before or after a workout, reduces the “burning” sensation in the muscles. Beta-alanine is widely used by athletes and bodybuilders to help increase exercise performance and duration over 60 seconds(Trexler, et al) The main usage of beta-alanine is to help increase carnosine concentrations in the body, which increases exercise performance in aerobic and anaerobic conditions. An exercise study that was done by the National Institute of Health showed that when people consumed Beta-Alanine, the number of repetitions and weight both increased. There are very few studies published about the effects of Beta-Alanine on resistance training. Because of this, I decided to do a study focused on measuring blood lactate levels before and after resistance training to see if the consumption of Beta-Alanine affected muscle fatigue or difference in lactate levels. Three physiological measurements were used to collect data before and after exercise. Them being, heart rate, blood lactate level, and RPE taken after every set. With the consumption of Beta-Alanine, I believe that weight and repetitions will increase due to the muscles being less fatigued. Beta-alanine also stimulates the release of carnosine causing blood lactate levels to decrease and exercise performance to go up.

## **Anaya Alameida**

### ***Literature Review: Worm Biodegradation Rates on Paper Waste***

The biodegradation efficiency of composting worms is crucial for optimizing organic waste management. This study aims to compare the biodegradation rates of Red Wiggler Worms and Blue Worms on newspaper, paper bags, and cardboard through controlled experiments by measuring the weight loss of organic material more rapidly. Research including 'Vermicomposting: The role of earthworms in recycling organic waste' (Singh and Sinha, 2022) and 'Earthworms in Waste and Environmental Management' (Ndegwa and Thompson, 2001), suggest species-specific decomposition rates. In conducting this experiment, two five-gallon plastic buckets are filled with ACE Organic Compost Manure, with 18lbs of soil which fills half the bucket. Bucket 1 receives ¼lb of the Red Wiggler Worms while Bucket 2 receives ¼lb of the Blue Worms. The paper waste is distributed evenly between the two buckets leaving both conditions constant. Collecting data consists of measuring the weight of the bucket every 3 days and measuring the temperature and moisture levels to ensure they stay consistent. The research question is – which species, red wiggler worms or blue worms, demonstrate a faster rate of biodegradation when exposed to paper waste? Though they are both able to serve the same purpose, Red Wigglers have the ability to eat their body weight daily while Blue Worms are more prolific and reproduce at faster rates (Thomsen, 2002). We can predict that Red Wiggler Worms will have a faster biodegradation rate of paper waste compared to Blue Worms. The outcomes of this research could inform best practices for vermicomposting applications in sustainable agriculture.

## **Andie Hall**

### ***Bacteria Interactions with Food Decomposition***

This study will aim to investigate how bacteria interact with organic matter at different temperatures and identify the strains of bacteria that are most influential in the decomposition process. Around the world, there are large masses of decomposing food waste that produce large amounts of methane, a greenhouse gas that contributes to climate change. Pseudomonas bacteria are naturally occurring microorganisms that can break down food matter into simple components that can be distributed back into the environment, which can aid in increasing environmental sustainability efforts. By collecting samples of food waste taken from each of CSU's Dining Hall composting bins, various types of bacteria present in the decomposition of organic matter can be observed through specified tests. Over five weeks, samples will be collected and monitored at three different temperatures: incubator, room temperature, and refrigerator. They will be watched for bacteria growth and other significant developments. At the end of each week, common strains of decomposing bacteria will be identified; data will be compiled to determine the bacteria most capable of decomposition. Pseudomonas are most likely to appear in the masses of food waste. This genus is fairly large, and so the results will strive to identify specific bacteria under this genus, along with discovering any other active bacteria. Through this, identification of these bacteria strains may allow for further investigation into a solution to methane and food waste pollution.

**Andrew Medina, Matthew West, Ashley Knight & Robyn Roberts**

***Discovering and investigating potential new disease resistance against wheat viruses***

Colorado has nearly 2 million planted acres of wheat fields, making it the state's most planted crop. About 20% of the yield is lost to diseases, especially the Wheat Streak Mosaic (WSM) complex, which causes mosaic and yellowing symptoms and is caused by a co-infection of one or more of the following viruses: Wheat streak mosaic virus (WSMV), Triticum mosaic virus (TriMV), and/or High plains wheat mosaic virus (HPMoV). Three loci (Wsm1, Wsm2, Wsm3) have been identified that carry resistance against some of the WSM complex viruses, but effectiveness decreases as temperatures increase. Therefore, our goal is to identify wheat lines that resist both WSMV and TriMV at a high range of temperatures. To test this, 64 wheat varieties and/or breeding lines were mechanically inoculated with WSMV, or a WSMV and TriMV coinfection, at 18°, 22°, and 28°C in 14-day-old seedlings. At 28 days post-infection, extensive phenotypic examination was conducted, and viral RNA transcripts were identified and quantified using qRT-PCR. Of the initial 64 candidate lines, four promising lines were experimentally repeated to test the reliability of the resistance. We found one breeding line that potentially carried reliable resistance to both WSMV and the TriMV+WSMV coinfection at all temperatures tested (up to 28°C). This line displayed fewer disease symptoms and had lower viral RNA transcript levels compared to the susceptible controls. Further investigation into the potential resistance, including mapping the genetic trait and incorporating it into wheat breeding lines, will reduce crop losses due to disease, aid farmers economically, and will help prevent potential global food shortages.

**April Diaz**

***Exploring fungal growth preferences with delignified wood***

Lignicolous fungi, like *Pleurotus ostreatus*, decompose wood through enzymatic processes. The enzymes simultaneously degrade structural components of wood including cellulose and lignin. Lignin can be removed chemically through a treatment of acetic acid and sodium chlorite. This project tested the growth rate and preferences of *Pleurotus ostreatus* when given the opportunity of normal wood and delignified wood. A piece of myceliated agar was placed on agar in the center, either on top of a piece of wood or in between two pieces of wood, and the concentric growth was measured, using markings on the agar plates. Pictures of the growth were taken manually twice daily, and then collected and analyzed. Unfortunately, the results are unclear and too inconsistent to draw any conclusions. This project has large implications when it comes to predicting the dynamics of the forest and understanding how fungi interact with the ecosystem that they are in. Future directions include the use of different types of wood or food sources, as well, because we lack a robust understanding why fungi selectively inhabit the location that they do. A more concrete understanding would be essential for ecosystem conservation and restoration.

**Arianna Dickerson & Peter Zhang**

***Aluminium "Can" Do Better***

The goal of this project was to conduct research to address the ever-growing need and demand for energy storage. To accomplish this, this project sought to create safer and more efficient batteries utilizing aqueous aluminum ion cells, as most batteries today utilize organic solvents and lithium, which tend to be more flammable and dangerous. Aluminum contains three times the charge than lithium and is much more readily available, making manufacturing much cheaper as a result. Furthermore, the aqueous cell is also much less prone to flammability due to water being the solvent. Nb<sub>14</sub>W<sub>3</sub>O<sub>44</sub> and Nb<sub>12</sub>W<sub>3</sub>O<sub>33</sub> (niobium-tungsten oxides) are commonly used in lithium cells and efficiently allow ions to travel within their structure. Hence, these will be used in the creation of the aqueous aluminum batteries. To construct these cells, Nb<sub>14</sub>W<sub>3</sub>O<sub>44</sub> and Nb<sub>12</sub>W<sub>3</sub>O<sub>33</sub> were synthesized via high-temperature solid-state reactions. Physical characterization via powder X-ray diffraction were used to determine the crystallographic structure and chemical composition of the structure. Raman Spectroscopy was then performed on both compounds to further investigate their structural

identity. Finally, to elucidate the performance of these cells, we performed electrochemical experimentation on these electrodes. We have successfully showed that aluminum can be inserted into these materials. In future work, we will fabricate these batteries and continue electrochemical testing.

### **Ashlyne Wagon**

#### ***Equity in Agriculture: Empowering Indigenous Cattle Producers Through Quality Certification***

Indigenous cultures deeply value caring for the soil and animals, regardless of their environment. We can strengthen our community by incorporating knowledge and education, upholding our traditional teachings. As a fourth-generation Indigenous cattle producer, I believe knowledge empowers my community to protect themselves. I want to challenge the current agricultural industry and empower indigenous agriculture to meet quality standards within cattle production.

Agriculture is a part of our communities, customs, and traditions. Moving forward, we should work with the United States Department of Agriculture (USDA) and current livestock technologies to help indigenous communities and livestock producers exceed white-dominated industry standards. I will design a certification process like Beef Quality Assurance and Certified Angus Beef to improve animal and product quality that limits agricultural bias. After studying cattle, consumer standards, and certification. Analysis shows that the sector is embracing sustainable practices and focusing on consumers. My certification process aims to prioritize sustainability, quality, and community values. Can we assist in gaining equity in the livestock industry and educating tribal communities about cattle quality, reproductive technologies, and land use? After comparing different aspects of non-indigenous and indigenous cultures regarding cattle and livestock practices, I am to answer the question: What is the fate of indigenous cattle producers and what is the rationale behind requiring certification?

### **Ava Holzer**

#### ***Cellular Stress Responses Following Wildfire Smoke Exposure in *Caenorhabditis Elegans****

Environmental stressors like wildfire smoke (WFS) pose an escalating threat to global health, particularly with the exacerbation of climate change. WFS comprises various chemicals, primarily particulate matter (PM 2.5), known to cause pulmonary damage and increasingly linked to extrapulmonary effects, including on the central nervous system (CNS). While epidemiological studies have associated PM 2.5 exposure with cognitive impairment and neuroinflammatory responses, the specific impact of WFS-derived PM 2.5 on the brain remains unclear. This research employs *C. elegans*, a model organism, to investigate this association. Exposure to ambient air PM 2.5 induces oxidative stress and disrupts protein homeostasis, yet its effects on brain cellular stress responses are insufficiently explored. Our study aims to elucidate these mechanisms. Wild-type *C. elegans* exposed to WFS exhibit heightened reactive oxygen species generation and oxidative stress, coupled with diminished mitochondrial organelle content, indicative of mitochondrial dysfunction. Further investigations using the NeuroPAL strain, which maps all neurons, will facilitate the assessment of WFS-induced neuronal damage. This study contributes crucial insights into the cellular-level impacts of WFS exposure, shedding light on its potential neurological consequences and underlining the urgency of addressing environmental stressors for global health protection.

### **Ava Vigil**

#### ***Analyzing the Effect of Wildfires on Wild Bee and Flower Interactions in Colorado***

Wildfires are known to be a destructive force that decimates both the habitat and the populations of organisms that would call the forest home, but with this destruction is also the ability to revitalize these communities

based upon factors such as increased diversity. The goal of this study was to analyze the effect these wildfires had by looking at the diversity of wild bee and flower interactions 3 years, 13 years, and 23 years post wildfire to determine if there was an improvement in diversity due to the fires, using an unburned control group as comparison for this measure. Using material presented and amassed by teams at the Colorado State University Forestry labs, wild bees were identified and sorted based on the flowers they landed on and the plots of burn severity they were collected from. From this data, analysis could be run on the bee and flower interaction diversity. This analysis concluded that bees in post wildfire areas were far more diverse both in species and in flower selection than bees from unburned plots, with Shannon's diversity index identifying the most recent burn site as having an average of 3.2, and unburned plots as having an average of 2.4.

### **Balqis Nugroho**

#### ***The Use of St. John's Wort and Major Depressive Disorder***

Natural mood supplements have been used to improve the mental wellbeing of many individuals. Supplements such as St. John's Wort has been researched by many to investigate whether or not they are effective in fighting against mental illnesses such as Major Depressive Disorder. St John's wort has been suggested to act similar as Selective Serotonin Reuptake Inhibitors (SSRI). SSRIs increase the availability of neurotransmitters such as serotonin, dopamine, and norepinephrine. The deficit of these neurotransmitters are associated with Major Depressive Disorder. This research project focuses on pre-existing research on St. John's Wort intervention with Major Depressive Disorder. According to the research done, St. John's Wort is effective in treating mild to moderate Major Depressive Disorder just as effectively as prescription SSRIs such as Sertraline and Fluoxetine. This project also dives into the sociological impacts of prescription SSRIs and how the future of St. John's Worts can be used to help communities where prescription SSRIs are not as common.

### **Brandon Pierce, Chelsea Grussendorf & Jacq Rukhina**

#### ***Shifting Foundations: Sustainable Solutions for Concrete Production and Environmental Impact***

Concrete, a ubiquitous material in everyday life, serves as a cornerstone of global infrastructure. However, its production enacts significant environmental costs, notably contributing to global warming. Cement, a key component of concrete, exhibits high energy intensity, demanding around 2,800 megajoules for its manufacture and emitting substantial levels of CO<sub>2</sub>, exacerbating climate change. Approximately 0.8 lbs. of CO<sub>2</sub> are generated per pound of cement produced. This study seeks to address these environmental impacts by exploring alternative materials, specifically corn stover ash and landfilled fly ash, as partial replacements for cement in concrete production. Our research aims to assess their potential to enhance concrete properties while reducing its carbon footprint. Experimental procedures involve decarbonizing corn stover, processing fly ash, and analyzing their corrosive reactions using techniques such as thermogravimetric analysis and isothermal calorimetry. Furthermore, we investigate the resulting concrete samples' potential corrosion resistance. This research is pivotal for advancing sustainable construction practices and mitigating

the environmental impact of concrete production. By contributing to the development of environmentally friendly construction materials and practices, we align with ongoing efforts to promote sustainability in the construction industry.

### **Brianna Maxwell**

#### ***Understanding Our Plant and Animal Relatives Through an Indigenous Lens***

The Colorado State University Native American Cultural Center is being gifted a property near Livermore, Colorado. Since little is recorded about the location, this research aims to gather baseline data on riparian

(river/stream) plant communities and wildlife that are a part of the landscape. As many traditional foods and medicines grow along bodies of water, the study focused on the riparian corridor (streambed). In doing so, we aimed to develop a protocol for data collection which supports engagement with Indigenous knowledges.

Methods for summer fieldwork were informed by my Michif-Anishinaabe cultural understandings in regard to seasonal timing (phenology) and 'honorable harvest' practices. Honorable harvest represents a widespread Indigenous practice that offers a model of receiving the gifts given by other living beings with respect and reciprocity. The landscape's knowledge was documented through numerous methods, including recording new blooms, GPS data, photos, site descriptions, plant harvests, and researching Indigenous names (Arapaho, Ute, Cheyenne, Lakota, etc.) available in public databases. Additionally, four camera traps were set up near the stream to document related wildlife activity.

Data findings presently include an herbarium of thirty-three unique plant individuals, along with a draft description of honorable harvest protocol for future researchers. Building from this, we are in the process of consulting regional Indigenous knowledge keepers to verify and further contextualize Indigenous ecological knowledge and language understandings. I hope that the insights gained through this project can inform local ecological restoration efforts and provide education regarding Indigenous relationships with our plant and animal relatives.

## **Brooklyn Sherwood**

### ***Coral Is The Cure***

Coral has been able to make medications for cancer, cardiovascular, and many other issues, so why not a neurological one? Parkinson's disease is a neurodegenerative condition. Parkinsons affect people's motor symptoms, and this is due to the degeneration of dopamine. If we can chemically make our own dopamine, and then extract/make a nor-epinephrine out of coral, scientists can make a medicine out of coral that will help with Parkinson's motor control. The steps taken are; one, buy coral and break down its particles. Then, turn the remaining particles into a nor-epinephrine. After that, the chemically made dopamine (because dopamine is not something that can be extracted). Afterwards, by mixing both the dopamine and then nor-epinephrine, the solution will turn into a physical property or a liquid that can be injected.

The tools used throughout this process are (in no order) a microscope, incubator, centrifuges, autoclaves, spectrophotometers, PCR machines, Lab glassware, liquid chromatography-mass, spectrometry (LC-MS), coral samples, genetic tools, chemicals, buffers to maintain pH levels, enzymes, preservatives, and extraction tools. This research can lead to other scientific findings in not only Parkinson's but also coral medicine.

## **Cameron Badger**

### ***The cutest frog in the swamp: How to be delicious to a mate and not a predator***

Communication styles differ across species and are used to convey important information for things like reproduction and predation. Therefore, being understood is imperative to the continuation of a species. How humans and other animals use language and modify speech patterns to convey different meanings is sufficiently understood. But the vocal repertoire of a little south American tree frog, *Boana pulchella* remains a mystery. Male tree frogs use a vocalization method to attract females whilst using strategy to avoid the detection of a predator. Call behavior strategies adjust corresponding to their environment. Changes such as habitat structure, body size, climate change, or even ambient noise can instigate a male to modify his behavior. We are interested in *B. pulchella*'s modifications as his social environment changes. Here, we investigate how the frog's local community impacts male calling behavior changes when responding to a neighboring frog. Pre-recorded calls were played to males captured from the field. The call response behavior of five male *B.*

pulchella tree frogs were recorded. Using Raven software each male's acoustic patterns were analyzed. Our analysis unearthed a new call type (triplet). Furthermore, comparing bioacoustics behavior of focal males showed a greater variety of call types when hearing recorded calls of increasing complexity. The level of flexibility in vocalization offers immediate implications for rapid adaptation of signal within the local social structure. In a greater context, the signal adaptation implies strategy for sexual selection and therefore, speciation.

**Catalina Mejia Mazariegos, Manon Themelin, Kathleen M. Dudzsinski, & Shane B. Kanatous**  
***Analyzing Dolphin Behavior in Pregnant and Not-pregnant Adults***

1Dolphin Communication Project, Port Saint Lucie, FL, United States

A managed-care population of bottlenose dolphins (*Tursiops truncatus*) is part of a long-term behavioral study in Roatan, Honduras. Underwater video of dolphins is collected annually using a mobile video-acoustic system. Video was analyzed to calculate the on-screen time for each individual. These times allow rates and proportions with behavioral data to better understand individual variabilities. On-screen time between dolphins could vary by sex, age, and reproductive status. Here, we seek to determine if there is a difference in on-screen time between adult pregnant females and adult non-pregnant females. The non-pregnant females are separated into two sub-categories: lactating-not-pregnant and not-lactating-not-pregnant. Our hypothesis is that adult pregnant females will have less on-screen time than adult not-pregnant females. We do not expect differences between the two categories of not-pregnant females. To answer our question, data collected by DCP in 2019, 2020, and 2021 were used, which includes 9 adult females, 6 of which were pregnant at various times. The results show that pregnant females represent only 39.6% of the total on-screen time compared to not-pregnant females (60.4%). Also, lactating-not-pregnant females correspond to 88.8% of the non-pregnant females, while not-lactating-not-pregnant females correspond to 11.2%. These results suggest pregnancy could influence female visibility in view of the camera, since pregnant females spend less time on screen. More research is needed to investigate individual variabilities, but population studies should consider reproductive status when examining social species.

**Charissa Grixby**

***Understanding Pathogen Spread in Nutrient Film Technique (NFT) Setups***

A cursory exploration of the CDC's or National Institute of Health's websites elicits concerns regarding consuming contaminated leafy greens. Understanding the transmission of human pathogens within a Controlled Agricultural System (CAS) like the Nutrient Film Technique (NFT) is imperative to mitigate future outbreaks. NFT systems operate by delivering a continuous water flow through shallow gutter trays. Their dispersion can be documented by introducing *Salmonella enterica*, pathogenic *E. coli*, and *Listeria monocytogenes* to samples. Inoculation involves spraying a concentration of bacteria onto individual plants. The experiment is comprised of 12 tables, each containing 3 strains of pathogens and a control table. Swabs will be utilized for sample collection. The study aims to determine the speed of pathogen dissemination and identify components with the highest pathogen concentrations. Key objectives include assessing contamination levels in downstream plants and identifying areas prone to higher contamination (e.g., tanks, bends, small parts). Ultimately, the collected data will aid in establishing food safety standards and raising awareness among CAS growers. The widespread adoption of NFT systems in commercial agriculture underscores the significance of documenting bacterial spread.

**Elena Tran**

***Indicative pH Dressing for Bacterial Wound Surveillance***

Wounds are prone to bacterial infection which can cause complications in the healing process, and in some cases can develop into more serious diseases. Monitoring bacterial activity on a wound can be beneficial to the person afflicted and can be an indication if the individual should consult further medical attention. In recent studies done on the influence bacteria has on pH, it was found that a by-product of bacterial metabolism is ammonia which therefore raises the surrounding skin pH. Thus, it is hypothesized that a technique to monitor bacterial infection can be correlated to a pH indicator. Common pH indicators, namely pH strips can contain substances such as phenolphthalein, methyl red, bromothymol blue, thymol blue and methyl orange which can be toxic or irritate the skin further, making it unideal to use on a wound. Natural pH indicators such as red cabbage juice can be used as a safe alternative and can even be beneficial to wound healing. In this experiment, by creating a bandage dressing that contains cabbage juice, the effectiveness of visualizing bacterial growth on a pH indicating bandage can be monitored with the goal of finding approaches to surveillance bacterial growth on injuries.

**Ella Kim**

***Synthesis and Characterization of Schiff-Base Vanadium Catecholate Complexes for Intratumoral Cancer Treatment***

Cancer cells, like brain and pancreatic cancer cells, are of considerable interest to scientists to develop anti-cancer therapeutics due to their difficulty to treat and/or aggressive nature. Vanadium is a first-row transition metal well-known for its diverse biological roles and their potential medical applications including anti-cancer and anti-diabetic treatment. Recent work published by the Crans group has shown that hydrophobic Schiff-base catecholate complexes have anti-cancer properties suitable for chemotherapy, and superior activity to cis-platin. Currently, we are designing and exploring novel complexes, the three of most interest being the Schiff-base catecholate complexes from the [VO(3-OMeSHED)], [VO(SALIMP)], and [VO(3-OMeSALIMP)] series. Optimization experiments for these complexes were conducted by changing solvents, temperature,

and stoichiometries, resulting in 35% increased yields compared to reported methods. The optimized method was used to synthesize seven novel [VO(3-OMeSHED)] complexes, one known [VO(3-OMeSALIMP)] complex, and one novel [VO(3-OMeSALIMP)] complex. These compounds were characterized by <sup>1</sup>H NMR, <sup>51</sup>V NMR, and 2D NMR, and their hydrolytic stability was determined. Several compounds from each of the three series had preliminary anti-cancer results on T98G glioma cell lines.

**Ellie Lutz & Dillen Edwards**

***A Conversation of Conservation: Perception Analysis and Redefining of Conservation Towards Holistic Collaborative Thinking***

The US's version of conservation was built during a utilitarian era a century ago. It stayed stagnant even as national sentiments changed. Our field seeks unity in diversity, while under ideals that purposefully keep people out of the conversation. We are at a pivotal era where a definition that represents the current ideals and perceptions of all sides of conservation is essential to successful practice. We seek to uncover and analyze the dissonance between modern conservation values and the current formal/academic ideology. In our study Colorado State students will be surveyed about previous knowledge, personal relationships, and future of conservation. The data will be analyzed looking for prominent concerns and ideas. These will be compared alongside demographical components to gain an equitable view of values. Interviews will be done with



professionals in resource management seeking the current dissatisfaction with the field. We want to use these results to rethink the entire world of conservation. By gathering these perceptions of professionals and the future professionals across disciplines and peoples, we hope to illuminate the modern view of conservation and for the first time bring forth as close to a complete view as possible. If we find the dissonance we expect in Colorado, we will expand the study nationwide, and eventually write up a proposal for a new model ideology. If we don't find the dissonance, then we will switch to a meta-analysis of the current earth crisis holistically to paint a full image under the lense of interconnected crisis.

### **Emily Billow**

#### ***The Effect of Plant Growth Regulator Treatments on Embryo Generation in Doubled Haploid Breeding***

Doubled haploid technology is a revolutionary technique implemented to reduce the time required to develop a wheat cultivar. Genetic uniformity is obtained by the rescue of embryos containing only one set of parental chromosomes followed by chromosome doubling, effectively producing predictable genomes that can easily be manipulated in breeding programs. The efficiency of doubled haploid wheat production relies on sufficient generation of haploid embryos, posing a challenge to molecular plant breeders. Plant growth regulators are an essential factor in embryo development, influencing cell division and growth. 2,4-D is widely accepted as a hormone that, in low concentrations, improves haploid embryo formation. In combination with 2,4-D, several other plant growth regulators were tested at the Colorado State University Wheat Breeding Lab to determine their effect on the success of embryo production. Three different wheat varieties were treated with several different plant growth regulators then the subsequent seeds, embryos, and regenerated plants were evaluated. Plants treated with silver nitrate produced larger embryos and more plants regenerated, thus a higher rate of embryo induction. Results suggest that the combined effect of 2,4-D and silver nitrate may be more successful than 2,4-D alone. Utilizing this combination of plant growth regulators in doubled haploid wheat breeding can significantly enhance the number of haploid plants recovered and reduce the costs associated

with unsuccessful embryo development. Improving the efficiency of doubled haploid breeding increases the production rate of new varieties of wheat that have increased growing quality and disease-resistance.

### **Eryn Wheeler**

#### ***Discovering Africa's Biodiversity Through Acoustic Data and Machine Learning***

The field of bioacoustics is a branch of science that is used with a variety of applications where the study of animal behavior, diversity, and commercial use is through the sound production of living organisms. A popular usage of bioacoustics is animal identification, especially in birds. However, there is a gap in the field where there are acoustic identification models for other animal species such as mammals. A lack of identification in different animal species and in different locations around the world can lead to less attention to research, and conservation efforts for animal species and ecosystems in need. Addressing the gap in bioacoustics in South Africa is a first step to handling the lack of identification. Africa is facing a rapid loss in biodiversity and cascading effects on its ecosystems. Factors that lead to this rapid loss are deforestation, natural habitat loss, direct exploitation of wildlife, and more. In this ongoing project, our goal is to assist in collaborative research on Africa's biodiversity by training a machine-learning model(s) to identify animal species using their acoustic data. This model will not identify only bird species, but also amphibians, bats, and mammals. We conclude with current works and our next steps in this project.

### **Fiona Miller**

### ***The impact of HEC1 tail contacts with microtubules on kinetochore-microtubule attachment stability***

The essential kinetochore(KT)-associated NDC80 complex mediates proper chromosome segregation during mitosis. Improper segregation of genetic material can contribute, if not corrected, to chromosome instability. The HEC1 protein, a subunit of the NDC80 complex, directly interacts with the cytoskeletal protein, tubulin, in the form of growing and shrinking dynamic microtubules. The HEC1 'tail', a key MT binding structure of the HEC1 protein, is a highly basic 80 amino acid unstructured region on the N-terminus of HEC1 proposed to interact with the highly acidic microtubule lattice. Through this HEC1-MT interaction, chromosomes can congress at the spindle equator in preparation for segregation to each daughter cell.

This work evaluates how predicted HEC1 tail contacts with the MT lattice, which contribute to chromosome alignment later in mitosis, affect KT-MT attachment stability early in mitosis. KT-MT attachments have been previously illustrated as highly labile early in mitosis, resulting from kinase regulator activity. How these predicted HEC1 tail contacts affect attachment stability regulation early in mitosis when kinases/phosphatases are otherwise unaffected is unknown. I hypothesize that predicted contacts between the HEC1 tail and MT lattice do not impact attachment stability regulation in early mitosis. Thus far, I have generated plasmids to express modified HEC1 tail constructs in human cells, which have been successfully expressed, stained, and imaged in human cells. Preliminary quantification has displayed successful expression of control and experimental HEC1 constructs in cells early in mitosis. The next step will be achieving high enough N-values to confidently describe the role of HEC1 tail contacts with the MT lattice early in mitosis.

### **Hanna Medina**

#### ***Speaking into the silence: Using multilingual students' own words through poetic transcription to tell their stories within introductory college mathematics education***

As universities continue to become more multicultural, a growing body of literature recognizes the important role that language plays in students' undergraduate mathematics educational experiences (Hwang et al., 2021; Rios, in press). For example, language mediates how students think, learn, make sense of the world, and socialize (Barwell, 2015). In addition, language, as it intersects with other social identities, positions people within social power hierarchies (Rios, 2023). Driven by these motivations, and within the context of a larger study examining 28 multilingual students' experiences in introductory mathematics, we explore the question: What are the stories of multilingual students in introductory mathematics?

Poetic transcription is used (Glesne, 1997; Prendergast, 2009; Tremaine, 2022) to showcase the stories of multilingual students of color within these courses. Poetic transcription is an arts-based methodological tool that re-presents interviewees' words in the form of a poem; this allows the interviewee's own words to be used to tell their story while also bringing in space for the researcher's interpretation and analysis, which are used to decide how to present the interviewee's words. In this analysis, the focus is on how experiences of "silence" show up within these experiences, both of being silenced by others and how students use silence as a response for navigating the sociopolitical contexts of the classroom (Mills, 2006). The results come in the form of poems from each of the six interviews involved in this analysis, chosen because of their discussion of silence. Here, the excerpt of one poem to illustrate the power of this methodology.

### **Hazel Shelton**

#### ***Impacts of Bird Presence on Insect Herbivory on Guam and Surrounding Islands***

In the 1940s, the brown tree snake (*Boiga irregularis*) was accidentally introduced to Guam, an island in the western Pacific Ocean. In the subsequent years, these snakes have devastated local bird populations. Our goal was to analyze how the absence of birds has impacted insect herbivory levels on native vegetation. To do this, we collected images of randomly selected leaves on native vegetation in Guam and two neighboring islands which still have birds. After collecting these images, the damage on the leaves was marked and the marked photos were analyzed to find the percent of the leaf that was damaged. After this, we analyzed the leaf

damage compared to island and plant type. Initially, we hypothesized that Guam would have higher herbivory than the other two islands due to a lack of predators to eat the insects or that there would be a mesopredator release of spiders. Following our analysis, we found that Guam and Rota had similarly high herbivory while Saipan had significantly lower herbivory. Based on unpublished data collected during this project, we suspect that this difference in predation on insects (and thus the difference in herbivory) is more attributable to reptiles, rather than an absence of birds. It also suggests that food web structure can be more nuanced than expected. This research is valuable for identifying impacts of invasive species. It can also be applied to identify the impact of invasive species on plant herbivory on crop plants, which is a possible next step for this project.

## **Isabella Flores**

### ***Unveiling the Connection Between Cognitive Function and Motor Performance After Stroke?***

**Background:** The goal of the current study is to examine the effects of stroke on cognitive and motor function. **Methods:** Stroke (N = 32) and control (N = 28) participants volunteered to participate in this study. The stroke participants were divided into cognitive normal (N=15) and cognitive impaired (N=17) sub-groups based on extensive neuropsychological testing. Both groups performed a) a divided attention task to measure processing time and b) goal-directed ankle dorsiflexion movements to measure motor accuracy (time error, amplitude error, and overall error) **Results:** The stroke group demonstrated greater processing time in the divided attention task ( $p < 0.01$ ) and a higher overall error ( $p < 0.01$ ) in the goal-directed task as compared with the control group. Furthermore, cognitively impaired stroke participants showed worse performance in the two tasks than cognitively normal stroke and control participants. Importantly, we found a significant positive correlation between processing time and overall error in the stroke group ( $r = 0.52$ ,  $p = 0.01$ ). **Conclusion:** Overall, Stroke is associated with a decline in attentional capacity and increased inaccuracy in goal-directed movements. Cognitive impairment following stroke is linked with a greater decline in cognitive processing speed and motor accuracy. Furthermore, slower processing speed is associated with poor motor accuracy in stroke. These findings may be an indicator that the two mechanisms are directly linked to one another, and thus may be interdependent.

## **Isabella Prosceno**

### ***Cheating death by gambling with chromosomes: karyotypic variation drives the emergence of virulent traits in an opportunistic fungal pathogen.***

How do opportunistic fungi leverage their phenotypic potential to survive in the changing environment of the host? Many canonical adaptation strategies rely on conserved environmental response pathways, which allow a cell to first sense an environmental change, and then induce an appropriate phenotypic response. But cells can also stochastically toggle between phenotypic states, even without a cue from their surroundings. This latter behavior, known as phenotype switching, is thought to function as a bet hedging strategy to boost the adaptive potential of a population by enabling individuals to rapidly and dynamically sample new phenotypic space. This diversification process has been repeatedly observed amongst clonal populations of many opportunistic microbes. In fact, decades of observation suggest that phenotype switching may be one of the few conserved mechanisms used by opportunistic species across the tree of life to generate phenotypic novelty. Our group recently discovered that stochastic alterations in karyotype, driven primarily by whole chromosome gains and losses (i.e., aneuploidy), represented a penetrant mechanism by which an opportunistic isolate of the baker's yeast *Saccharomyces cerevisiae*, a strain called YJM311, switched phenotype. In the present study, we set out to determine whether the karyotypic variants which arose spontaneously within populations of YJM311 displayed differential sensitivities to the antifungal agent fluconazole, a key trait associated with virulence and opportunistic potential.

**Jade Collins**

***Is that blood in the water? The damaging effects of red tides***

Harmful algal blooms called “red tide” are disastrous to natural coastal ecosystems. The blooms in the Gulf of Mexico are caused by a type of algae called *Karenia brevis* which produces a neurotoxin called Brevetoxin. This toxin induces effects similar to inebriation like incoordination and dangerous effects like seizures. This can damage both the aquatic and terrestrial ecosystems. Multiple industries have a vested interest in disposing of these algal blooms including conservation, hospitality and tourism, and health professionals because of the negative impact the blooms have on them. The algal blooms pose a health threat to humans and animals alike with an added economic threat to humans. How can we effectively combat these blooms in the Gulf of Mexico? One possible solution is planting seagrass. This can help reduce or prevent the algal blooms as well as promote biodiversity, decrease pollution, and provide materials for biofuels and biodegradable plastic. Farming the algal blooms for biofuel could also be a solution, as long as the toxins are neutralized and treated with caution. These possible solutions would need to be made cost-effective and widespread, but the implementation could help make the water - which is essential to all life - safe again.

**Janie Christensen**

***Inferring feeding ecology of a newly documented raptor from the lower Eocene (56-52Ma) Willwood Formation, Wyoming***

Cenozoic (66ma-present) birds are understudied due to poor preservation and a field-wide bias towards mammals. However, birds, especially predatory ones, are very important to study as they play important roles in the ecosystem. An unusual locality of the Willwood Formation in Wyoming is likely a predator-caused accumulation of mostly small mammals, and contains a single raptorial bird claw. To better understand this locality and this fossil, two steps were needed: 1. Identifying it, and 2. Reconstructing its ecology. Certain characteristics confirm the fossil is a bird, specifically a raptor, and either an owl or an Accipitrid (hawks, eagles, and kites). Furthermore, it is a different species than one of the known owls of the Willwood, implying a highly diverse bird of prey guild and possible competition or niche partitioning. Comparisons with modern raptor claws tested the hypothesis that prey type correlates claw morphology. As predicted, a larger bony knob involved in claw flexion predicts larger prey, as well as separates out piscivores and insectivores. Applying this to the fossil claw implies it consumed non-insect, non-fish prey, like the animals in the accumulation, but it isn't entirely clear what size of prey it consumed and if this matches the accumulation. Finding more fossil material from this bird in the future will help us better understand it, and investigating a mammalian predator is also warranted. But for now, this research is important as it establishes that our primate ancestors coexisted with multiple types of predatory birds, who very likely preyed upon them.

**Jannai Oganeku**

***Using High-Blood Pressure Drugs to Treat Oral Cancer?***

By using Losartan and Propranolol along with radiation therapy, oral squamous cell carcinomas in mice will improve. Traditionally, Losartan and Propranolol are used as high-blood pressure medications. Losartan is an angiotensin II receptor blocker that prevents blood vessels from constricting, and Propranolol is a beta blocker that slows the heart rate down. If we combine these drugs, along with radiation therapy, there might be a chance that this can improve oral SCC prognosis. Historically, Black men have a higher risk of developing oral squamous cell carcinomas. If this treatment proves to be helpful, this could improve many, especially Black men's prognoses. There are 4 groups of 6 mice. The groups are as follows: control, radiation only, losartan + propranolol only, and losartan + propranolol + radiation. We then inject all the mice with LY2 tumors and inject them every day with their respective drugs or saline for the control groups. Then at Week 2, we radiate while measuring the volume of tumors and body weight every other day to see if there are any improvements. I will be able to use tumor volume measurements to see if they went up or down as treatment went on. I could also use body weight measurements to see how well they were responding to treatments as well. If I got the expected results, I would repeat my experiment but with a different model, like dogs. I would try to test more drug combinations to see if there is an overall effectiveness.

**Jarrold Lang**

***Comparison of ammonia level in the CSU Lagoon and a mountain pond over late fall and early winter.***

The comparison data of research for ammonia levels (mg/L) in different ponds across different locations (CSU Lagoon & mountain pond) during late fall and early winter has come to a conclusion. The purpose of this research was to see if difference in location can affect ammonia level (mg/L), since the mountain would likely to be more populated by wildlife and agricultural activities than cities, the ammonia level (mg/L) should be drastically different, A study shown "Natural waters typically contain little total ammonia, usually in concentrations below 0.1 mg/L. Assuming temperatures of 20°C (typical of times when risk is highest and which are the focus of the risk scenarios) and pHs in the 7-8 range, natural NH<sub>3</sub> levels are in the 0.0004-0.004 mg/L range. Higher concentrations may be an indication of anthropogenic input and organic pollution (CCREM, 1987)." The CSU Lagoon has shown over the span of two weeks that there was not much increase in ammonia level (mg/L), assuming animal's infrequent visit to the pond has resulted in that finding. Testing method

includes choosing out one of the four sides (North, East, South, West) of the lagoon, then everyday roughly at the same time around 6:00 PM. Collect the sample and conduct testing to find the ammonia value (mg/L), using an ammonia testing kit, provided by my faculty to test the water. As for the other pond located in Loveland's mountain region, the experimentation was slightly different. Doing this experiment as stated over the span of two weeks at roughly the same time (3:00 PM) and exact location. For sampling, an ammonia testing stripe (mg/L) was used to test the water, the result was the same as CSU lagoon's findings.

## **Jazmyne Ewing**

### ***Generational Trauma Impact on Black Students***

The effects of generational trauma on black university students impact many aspects of their lives. The goal of my project is to spread awareness surrounding the mental health crisis in the black community, as it is the least talked about topic within this specific racial group. This project discusses information that shows a correlation between impacted academic performance and health wellness data. Research shows 24% of African Americans achieve a bachelor's degree or higher due to disparities. At CSU, black students make up about 2.38% of the student population. Both of these statistics are amongst the lowest racial groups and have a direct connection with one another. From the small demographic of black students that attend college, many don't attend due to hard life factors. Stigma in the black community has made receiving any type of clinical health for mental health disparities challenging. Many students suffer in silence due to guilt of receiving help or not having the best resources for them to be successful. CSU Health Network only has two black-identified counselors currently active in service. In a field that is meant for inclusivity, there aren't many options for certain black students to turn to for help. By bringing awareness to the issue, not only can this demographic of CSU students feel protected, it also creates inclusivity in the campus community. Including a black support group that focuses on generational trauma and mental illness can help students share their experiences and build healthy relationships. Being a black student at a predominantly white institution can have challenges with learning to fit in and adapting to a new environment. These challenges can make having a mental illness harder to work with.

## **Jonathan Ortiz Santos**

### ***The Filtering Power of Wetlands***

Water is an essential natural resource for all life on Earth. Access to clean water affects different aspects of our lifestyle which range from nutritional to sanitary. However, the process of filtering water requires machinery that can have adverse effects on the environment. The goal of this project was to explore the chemical filtering capabilities present in nature. The area selected for this project was the Cattail Chorus natural area in Fort Collins, Colorado. This area has two access points adjacent to the flow of water and an abundant presence of Cattails (*Typha latifolia* and *T. angustifolia*) which are plants capable of filtering nitrates from surface water (Jeke et al., 2018). A sample was collected before water entered the wetland and another sample after the water had flowed through it. A HACH water testing kit was used to analyze the concentration of nitrates in both samples. Once the data was gathered, a t-test that compared the average concentrations of nitrates before and after the water interacted with the wetland was performed. This resulted in a  $p < 0.001$  (95% CI), which indicated that the concentration of nitrates decreased as water flowed through the wetland. This shows evidence that this type of vegetation plays a role in filtering chemicals from water. Future research would include instrumental analysis of the samples to consider what other factors might be related to the decrease of nitrate concentrations in the surface water.

## **Jordi Gomez**

### ***Analyzing the Dynamics of DNA Replication and Cellular Response to DNA Replication Stress Through DNA Fiber Assay***

Precise DNA replication is critical for all living organisms. Every day, our cells divide and undergo semi-conservative DNA replication to generate identical daughter cells. However, many external and internal factors induce replication stress and pose a threat to the accuracy of the genetic material passed down to daughter cells. To overcome DNA replication stress, our cells have adapted mechanisms to maintain precise DNA replication and avoid disease-promoting mutations. To understand how cells respond to DNA replication stress, we must utilize specialized methods.

We use the DNA fiber assay to analyze the dynamics of DNA replication at a single-molecule level. In the DNA fiber assay, exponentially growing human cells are labeled with two thymidine analogs, harvested, dropped on a microscope slide, and lysed. The slide is tilted at a slight angle, and, with the help of gravity, the DNA is then stretched along the slide. Following immunostaining, we can visualize the labeled DNA with fluorescence microscopy. Analysis of the imaged DNA results in a quantification of DNA replication speed and stability. Through this experimental approach, we can compare replication dynamics in various cell types, as well as how different proteins affect replication. Additionally, the DNA fiber assay allows us to analyze the condition of human cells that have been treated with chemotherapeutic drugs, which typically induce replication stress. Our overarching goal is to employ the DNA fiber assay to understand the mechanisms and control of DNA replication, how cells overcome DNA replication stress, and how this translates to human health.

**Jordyn Montoya, Ximena Paredes & Kimy Hernandez Delacruz**

***Expanding Tensegrity Trials: Exploring Crystal Growth from Salt Stock and DNA Strands at 20 Degrees Celsius***

In an endeavor to advance Tensegrity trials, this study explores a novel approach by integrating eight methods to connect Tensegrity structures. The methodology involves heating a mixture of salt stock and DNA strands under ambient conditions (20 degrees Celsius), followed by controlled cooling. This project is based on the capability to predict the nature of DNA self-assembly and its adaptation to temperature changes. The observations revealed that we accurately completed the growth of crystals and the formation of Tensegrity triangles, indicating a successful integration of the proposed methods. The crystallization process facilitated the formation of geometrically precise structures essential for Tensegrity systems. The experiment demonstrates DNA strands' capability to adapt and facilitate crystal growth and the Tensegrity triangle formation under mild conditions. While promising, further experimentation and optimization are necessary to achieve the formation of a DNA super tile. In the future, the findings hold potential implications in various domains, including vaccine development and sustainability efforts. Further research is warranted to explore the scalability and practical applications of DNA-mediated Tensegrity structures in vaccine delivery mechanisms and its application in sustainable materials.

**Kayla Sutton**

***It's Not Easy Being Green: A Literature Review on Green Urbanism and Its Impact on Air Quality***

Many people associate cities with dirty, trash-filled streets, air full of smog, stray animals, and homeless persons loitering on the sidewalks; and in many cases, they're right. Urban areas have had a significant negative impact on air quality since the Industrial Revolution. In our own hometown, Fort Collins was recently rated as the 17th worst city in the U.S. for air pollution, according to the Rocky Mountain Collegiate. Despite decades of policy measures being made, the city's air quality is still not quite what it should be, mostly due to ozone (O<sub>3</sub>). Ground-level ozone pollution causes a host of lung problems, even for healthy individuals with no prior medical issues. Ground-level ozone is also a greenhouse gas, meaning it contributes to climate change. In this literature review, the yearly average AQI at each AQI monitor in the city from 1990-2023 are compiled and analyzed to determine an average trend. Then, using correlation analysis, it will compare the air quality both before and after each policy measure addressing air quality passed in Fort Collins including 1996-98, 1999, 2000-2003, 2004, 2011, and 2019 in order to assess which had the greatest success in improving air

quality and predict what will be most successful in the future. It will then consider air quality policy measures in the United States and Europe, two areas where the layout of their cities differ significantly. My proposed study is to connect air pollution and urban planning, studying how city planning directly and indirectly affects air quality.

**Kenna Doyle & Aaron Bitter**

***Printing the Future in 3D: Design for 3D Printing***

Additive Manufacturing (AM), known as 3D printing, has revolutionized how objects are created. There are several kinds of developments in rapidly evolving technology. A common goal is to create printers and new techniques that can seamlessly print with affordable materials such as thermoplastics polymers, enabling the creation of complex designs and have a higher level of functionality. The additive manufacturing process starts with a digital 3D model created by a Computer Aided Design program. Then the model is sliced into thin layers, which are used to build the object layer by layer through material deposition by the 3D printer machine. This allows for intricate designs and internal features, which are extremely difficult with traditional methods. Designing for additive manufacturing allows designers to create complex objects with internal channels, lattices, or moving parts within the print. However, considerations need to be made for the unsupported areas of the model and tolerances. Tolerances are a key part of 3D printing, as they allow leniency in the dimensions of a part compared to traditional manufacturing methods. If the unsupported areas of a model are not addressed, this can cause a defect during the manufacturing process. This research aims to understand the principles of design for additive manufacturing and how to select optimal parameters for printing parts. We used the design process to better understand the importance of optimization when creating parts with thermoplastic polymers. Through the 3D printing process, we understood the benefits of different AM techniques for efficient manufacturing.

**Kimy Hernandez Delacruz & Oliver Nunez**

***Investigating Water Quality's Impact on Leafy Green Safety in Controlled Environmental Agriculture***

Controlled Environmental Agriculture (CEA) is at the forefront of producing leafy greens sustainably and efficiently, though it's not without its risks, particularly concerning contamination with foodborne pathogens. The CDC attributes 78 outbreaks to leafy greens from 2014-2021, several traced back to CEA grown produce. At the Fresh Produce Safety Laboratory, team efforts focus on the impact of water quality on the safety of leafy greens in open fields and CEA environments. In partnership with the Metropolitan Ag Research Center's (MARC) Food Safety team located at the Spur Campus, we look to evaluate how different sanitizers, pH levels, and temperatures impact leafy green contamination and the potential for finding preventive solutions to pathogen contamination of leafy greens. Our ultimate aim is to forge a combination of data driven with current industry practices in the development of food safety benchmarks and applied food safety plans that can reduce contamination and support MARC's donation efforts to underserved communities. Such an approach based on English and Spanish safety guidelines will enhance the accessibility of this information to a wider audience. This interdisciplinary effort bridges academia and industry, proposing effective strategies to improve food safety and sustainability in CEA-produced leafy greens, contributing significantly to agricultural advancements.

**Lauren Benfield**

***A Review of Climate Adaptation in United States Dairy Farms***

The dairy industry is of great importance in the U.S., with 94% of adults consuming dairy on a daily basis. Since 1982, global temperatures have increased threefold from the historical average, increasing from 0.06° C to 0.20 ° C, each decade. Extreme temperatures and humidity can have a significant impact on dairy cow performance by increasing the risk for heat and cold stress, making the industry vulnerable to meeting future



demands. The goal of this project was to assess changes in management that have occurred in U.S. dairy farms due to increasing temperature and humidity to make recommendations for future adoption of management-intensive practices. We predicted an increase in management-intensive cooling strategies and indoor housing. Compiling regional dry-bulb temperature and relative humidity data, we used the Temperature-Humidity Index (THI) formula to divide the U.S into THI clusters. We then cross referenced these clusters with data collected by the National Animal Health Monitoring System (NAHMS) from 2002 to 2014 on dairy farm management. We found that lactating cows managed under management-intensive cooling methods, such as fans, tunnels, and sprinklers increased from 91% to 100% over time. Additionally, the use of freestalls for lactating cows increased by 20%. This will play a significant role in hotter clusters such as cluster 6, the southernmost cluster, where each cooling method increased in use by about 15%. As global temperatures continue to increase, we expect to see an increase in the use of management-intensive cooling methods and indoor housing.

### **Lea Maristela**

#### ***Profile of the cytokine immune response in the guinea pig model of tuberculosis***

The guinea pig model of *Mycobacterium tuberculosis* (Mtb) offers distinct advantages compared to conventional mouse models. Namely, the guinea pig model develops circumscribed granulomas with central necrosis which most closely resembles that of human granulomas. However, a limitation of this model is the availability of reagents to characterize the Mtb immune response. To better leverage this representative model, we evaluated a set of rabbit monoclonal antibodies produced through molecular cloning of the B cell receptor from antigen-specific B cells in the peripheral blood of rabbits immunized with full length recombinant guinea pig cytokines generated in HEK293 cells. Antibodies were produced through molecular constructs transfected in HEK293 cells. We have established stimulation conditions for primary guinea pig cells, including PBMCs, splenocytes and bone marrow-derived macrophages, capable of producing specific cytokine profiles. Antibody specificity for the detection of native protein was determined by immunoprecipitation followed by MS-MS sequence confirmation, prior to the validation of functional antibody pairs to be used in capture ELISA and ELISpot techniques or evaluated individually as reagents for flow cytometry. Utilized in a low-dose aerosol model of TB in the guinea pig, these reagents will provide a more comprehensive understanding of immune kinetics, vaccine response, and comparative immunology across TB model species.

### **Leala Gleckler & Brecken Baer**

#### ***Copper supplementation increases copper concentrations in liver and duodenum tissues in Rambouillet-crossbred sheep***

Eight Rambouillet-crossbred wethers (approximately 7 months of age) were stratified by body weight into 4 weight blocks to examine the impact of copper (Cu) supplementation on liver, duodenum, jejunum, and ileum tissue Cu concentrations. Each wether was housed in an individual pen and received a total mixed ration (TMR) once daily with their respective dietary treatment for 28 days. Ground corn was used as a carrier for each treatment. Treatments consisted of: 1) 0.0 mg Cu/kg DM (control) and 2) + Cu: 12 mg Cu/kg DM form  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ . The basal diet contained 6.0 mg Cu/kg DM. On day 28, all wethers were transported to an USDA inspected abattoir and the animals were harvested. Following harvest, liver, duodenum, jejunum, and ileum tissue samples were collected and washed with phosphate buffered saline 3 times. Tissue samples were dried at 60 °C and dry-ashed at 600 °C for 12 hours. Ash was then reconstituted in 5 ml of 1.2 M HCl and analyzed for Cu concentrations using an atomic absorption spectrophotometer. Liver ( $P < 0.05$ ) and duodenum ( $P < 0.04$ ) Cu concentrations were greater and ileum Cu concentrations were lesser ( $P < 0.04$ ) in sheep receiving supplemental Cu compared to controls. Jejunum Cu concentrations were similar across treatment. These data suggest that Cu supplementation increases Cu concentration in liver and duodenum but decrease Cu concentration in ileum. Further research examining the molecular mechanisms involved in Cu uptake by intestinal and hepatic tissues is warranted.

## **Lilliana Valdez**

### ***Literacy Review; The Public Bacterial***

Public restrooms, while essential, are often breeding grounds for bacteria. This study will look into the germs that can not be seen with the human eye. Comparing the bacteria accumulated on various surfaces in restrooms across multiple public restrooms on the CSU campus. Aiming to identify what surfaces collect the most bacteria despite time or cleaning procedure of the restroom. Looking at door handles, toilet seats, sinks, toilet paper holders and soap dispensers and faucets we are able to gain an understanding of bacterial distribution. Swabbing a variety of six surfaces in three different locations on campus, Braiden lobby female restroom, first floor Morgan Library all gender restroom and Lory Student Center first floor Male restroom. Using sterile swabs to collect bacteria then gram staining to take a closer look under the microscope to identify the bacteria. The bacteria will sit in an incubator at 37 degrees celsius for 78 consecutive hours. Identifying what kind of bacteria is common in public restrooms and the likelihood they will cause illness, a recent study in The National Library Of Medicine looks at the significance between disease caused by contaminated public restrooms. By collecting and classifying bacteria, this study will cause many to realize the risk they expose themselves to concerning hygienic conditions within high traffic locations that are frequently used by students, staff and visitors at Colorado State University.

## **Lizzy Osterhoudt**

### ***Exploring Riparian Species Diversity in Northern Colorado With Traditional Ecological Knowledge***

Small patches of riparian habitats are vital for species that live in arid landscapes, giving access to otherwise limited resources. Species diversity within small riparian communities has limited documentation, specifically, in regions such as Northern Colorado. Working in collaboration with Colorado State University's Native American Cultural Center, we sought to use camera trapping to create a baseline catalog of small mammals and birds regarding their riparian habitat usage. Four camera traps were set up at a site in Livermore, Colorado to begin documentation of riparian species diversity in Northern Colorado. Conventional camera traps are inherently biased towards taxa. To mitigate this, we also used specialized small mammal camera traps housed within a plastic tub and baited with almond butter and oats. Conventional camera trapping revealed riparian habitat use by a variety of birds and mammals, (e.g., Northern Flicker, American Robins, Stellar Blue Jay, Gray Fox, and Cottontail Rabbits) but failed to detect small mammals that were consistently detected by the specialized small mammal traps (e.g., White Throated Wood Rats, Least Chipmunks, and North American Deer Mice). However, small mammal camera trapping required frequent visits to replenish bait and was prone to interference by mesocarnivores (i.e., striped skunks). Our long-term goal is to maintain the small riparian zone habitat's population catalog and activity fluctuations over time and changes in ambient temperature. Utilizing guidance from Traditional Ecological Knowledge and the Medicine Wheel Theory, we seek to create a partnership between Western and Native Science while exploring climate responses from small mammals and birds in riparian habitats.

## **Lucas Guerrero**

### ***From Rodents to Results: The Value of Animal Models in Gender-Affirming Hormone Therapy Studies***

Transgender and gender diverse (TGD) medicine treats a population with several health disparities, such as an increased risk of HIV infection, a lack of physician knowledge, and a lower likelihood of receiving preventive cancer screenings. Gender-affirming hormone therapy (GAHT) is a common medical intervention for the TGD community, yet there remains a substantial gap in our understanding of the long-term health impacts of such treatments. Current research on GAHT using human subjects is limited by small sample sizes, social bias, and low recruitment rates. Animal models present an alternative method of study to explore the long-term physiological changes and risks associated with GAHT while mitigating challenges typically faced by human

subject research. Animal models provide insight into the long-term impacts due to their easy tractability, short gestation periods and life spans, and low costs. Through animal models, the changes in physiological risks for chronic diseases dependent on sex steroid hormones, such as heart disease, cancer, and reproductive diseases, can be assessed. Recently developed animal models have verified the common changes associated with GAHT in defeminizing masculinizing and de-masculinizing femininizing studies and have discovered novel sex-specific gene expression changes in the affirmed gender. The use of animal models therefore complements our understanding of the underlying mechanisms and long-term effects of GAHT, suggesting their utility in conjunction with human studies to understand the whole TGD experience at the molecular, physiological, and psychosocial levels.

**Luna Li**

***Preliminary Study on the Relationship between Engagement Behavior and Length of Stay in Shelter Cats (Felis catus)***

The shelter is a stressful environment for domestic cats (*Felis catus*), which may negatively influence their social behavior. Understanding the social or engagement behavior in cats is very important because it is cited by potential adopters as the main factor influencing adoptability. The shelter staff also play an important role in determining cats' adoptability based on their behavioral assessments. Currently, shelter cat engagement behavior has not been studied in detail as a factor influencing length of stay (LOS). There also exists a lack of evaluation of the shelter cat behavioral assessment tool; therefore, my study aimed to address both knowledge gaps by understanding how shelter cat engagement behavior correlates to their LOS and by performing a pilot evaluation of the shelter cat behavioral assessment tool. I collected primary data from shelter cats at Animal Friends Alliance animal shelter through the Human-Approach Test as well as obtained the LOS and color-coded behavior category data from internal shelter records. I found a weak, negative, non-significant correlation between shelter cat engagement behavior and LOS. Even though the cats that exhibited affiliative behavior had a shorter mean LOS than those that don't exhibit any affiliative behavior, the mean LOS difference between the two groups was not statistically significant. I also found that cats in the green behavioral category had a higher average length of affiliative behavior compared to cats in the blue behavioral category, but the difference between these two averages was not statistically significant either. Overall, I found mostly non-statistically significant results, which led me to conclude that I cannot say with confidence that my study has generated enough evidence to support my hypothesis or to accurately evaluate the shelter cat behavioral

assessment tool. However, my inconclusive evidence does provide some interesting indications that deserve further study in the future.

**Lyssa Lini**

***Understanding trophic interactions between feral cats, introduced rats, and endangered forest birds on Kaua'i: morphometric analysis of feral cat diets from scat***

Domestic cats are one of the most invasive species globally, threatening vertebrate species through predation. Invasive rats pose an even bigger threat to native biodiversity, threatening nearly 300 bird species worldwide. In Hawai'i, invasive cats and rats are responsible for the decline and extinction of numerous native bird species. However, control of feral cats, which prey on invasive rats and mice, could cause rodent predation on native birds to increase. This research aims to delineate the effect of feral cats on native bird populations by using morphometric analysis of cat scats to determine if they are feeding primarily on native birds (direct negative effect), on introduced birds (neutral or indirect positive effect), and/or on non-native rodents (indirect positive effect). Twenty-seven cat scats were collected from the high-elevation Alaka'i Swamp in Kaua'i, where feral cats, invasive rodents, non-native birds, and native endangered birds coexist. After oven-drying to kill

potential pathogens, each scat was manually dissected to identify evidence of rodent consumption (i.e. hair) or bird consumption (i.e. feathers). Of the 27 cat scats, 24 contained solely hair, 0 contained solely feathers, and 4 contained hair and feathers. Additionally, 20 scats contained teeth and/or jaws, which are diagnostic mammal bones. Preliminary morphometric results suggest that feral cats in the Alaka'i Swamp are primarily consuming invasive rodents. Because feral cats remove invasive rats and mice, removing cats from the ecosystem may have unintended negative consequences on native bird populations if rat and mouse predation on birds increases. Moving forward, DNA metabarcoding analysis of the cat scats will be used to identify the exact species consumed by the cats.

## **Madeline Judson**

### ***Testing the Aerosolization of Bacteria From an Inoculating Loop***

The flaming of an inoculation loop is an essential step in several microbiology laboratories and procedures. However, the exact process is not uniform with some individuals 'flaming' a loop in different orientations. This study aims to test whether the sterilization of an inoculation loop is more effective when the loop enters a flame from the tip or when it enters from the base. It is our belief that given how common this technique is in microbiology procedures, it is vital to understand the difference the direction has of flaming a loop, as well as the potential implications of said direction. We tested this by flaming a loop containing a known bacterial isolate in both orientation over a large agar plate, or 'Mega plate' to check for potential growth from the aerosolization of the bacteria on the loop. These 'Mega plates' are square plates, 23 inches each side, and have a hole in the middle of them for where the bunsen burner will be placed. We additionally tested the effect of flaming an inoculating loop from a liquid culture vs. a bacterial colony, and the Gram stain identity of the bacteria growing that is being sterilized. We believe that the orientation of the inoculation loop when entering a bunsen burner will not have an effect on the aerosolization of bacteria regardless of said bacterias Gram identity. Through the results of this study we aim to contribute to a further understanding of everyday microbiology laboratory techniques, to better the laboratory experience for researchers, students, professors, and others.

## **Madison Stockman**

### ***Impact of positive reinforcement on salivary cortisol concentrations in rumen cannulated steers during halter training***

To determine whether positive reinforcement influences salivary cortisol concentrations during haltering, eight ruminal cannulated steers were utilized. We hypothesized that offering the steers positive reinforcements, such as a small feed sample after being haltered would decrease salivary cortisol concentrations when compared to cattle not being offered a food reward at the time of haltering. The feed offered was a ground corn-sun cured alfalfa pellet. To retrieve a baseline cortisol concentrations for each steer, the steers were randomly moved through the cattle squeeze chute. As each steer went through the chute, a saliva sample was collected by inserting a sterile cotton swab in their mouth between the upper jaw and right cheek for 2-3 seconds. The swabs were then placed in sealed test tubes and stored at -20 °C. After baseline saliva sample were collected, steers were placed in one of four pens in an alternating pattern. Two of the pens were for steers that received the positive reinforcement and the other two pens were for the steers in the control group. Once all the steers were in their appropriate pens, each steer was haltered to the fence. At the time of haltering the each treatment steer was offered one handful (approximately 36 3g) of feed. After ten minutes, saliva samples were collected from each haltered animals as previously described. This process was repeated for all steers. Samples were analyzed for cortisol concentrations using an ELISA. Data was statistically analyzed as a randomized complete block design using the MIXED procedure of SAS. Our results indicate that salivary cortisol concentrations were

not influenced by the use of feed as a positive reinforcement tool during haltering. These data indicate that there is no statistical difference between haltering steers with or without feed and their salivary cortisol concentrations.

**Mali Gomez**

***Identifying Microplastics in Bottled Beverages and the Effects on the Human Digestive System: A Literature Review***

This integrative literature review focuses on analyzing the research pertinent to microplastics found within the materials of plastic bottled beverages that will then be applied to the quality of affected humans digestive systems. The literature at the basis of this personalized research focused on the identification of microplastics in particular bottled beverages, and the potential side effects on the digestive system. To further contribute to this literature, this research plans to answer the question of harmful side effects of microplastics, and how that directly affects digestion in the human body. Reusable plastic water bottles and other plastic bottled beverages are known to be FDA-approved and tested yearly for the safety of consumers. What is not tested by the FDA however, is potential risks of microplastics from both the plastic bottle and cap that circulate in the water and therefore in the human body after consumption. In this laboratory study, the specific microplastics found in bottled liquids were extracted and identified in order to test the body's digestive response to the consumption of microplastics. Specifically, methods of reproducing models of digestive systems through stomach-acid replication were set in place, and the identified microplastics were placed into said model to measure concentrations before and after digestion. Microplastics concentrations were expected to be found moderately high even after digestion, along with changes in human parietal cells put into the stomach acid replication to find whether or not microplastics found in bottled water and other fluids really do affect the human body's digestive system.

**Maggie Ngo, Ricky Valdez & Morrison Netteland**

***The interaction of blueberry polyphenols with plant and dairy proteins and their effect on cardiovascular health***

Polyphenols are structurally-diverse, naturally-occurring chemicals found in plants, known to have positive effects on human health such as anti-inflammatory, antioxidative, and cardiovascular benefits. Polyphenols are difficult for humans to absorb because of low bioavailability in the gastrointestinal tract. We investigated the interaction of blueberry polyphenols with plant and dairy proteins to see which protein may improve bioavailability and cardiovascular health. Specifically, we explored the effects of blueberry polyphenols on measures of cardiovascular health including blood pressure and blood concentrations of nitrites and nitrates (i.e., metabolites of the vasodilator nitric oxide). We performed a randomized controlled crossover clinical trial where at each visit, participants were given a shake with 22 g freeze-dried blueberry powder and 15 g of either whey, hemp, or pea protein or blueberry powder alone. Blood samples were taken at 0, 1-, 2-, 4-, and 6-hours. Each test day was separated by a 1-week washout. Participants were asked to maintain their regular lifestyle outside of the lab and collect urine and stool samples throughout the week. We measured anthropometrics and conducted a 7-day physical activity and sleep questionnaire. Blood samples were centrifuged to obtain plasma and serum. Nitrate/nitrite assay results indicate the blueberry + pea treatment had a higher concentration of nitric oxide metabolites compared to the other treatments, but it was not statistically significant. Each treatment followed similar trends in blood pressure. The slight increase in nitric oxide metabolites from the blueberry +

pea treatment may suggest an improvement in cardiovascular health due to the protein-polyphenol interaction.

### **Marcelo Espinoza Diaz**

#### ***Modulating Expression of Genes Involved in the Cutin Biosynthesis Pathway of Tomatoes***

World hunger is an issue thought to be correlated to the lack of food production, however, the world produces enough food to feed everyone around the globe 1.5 times. Food scarcity isn't the issue, rather it is food waste. Food products, especially organic ones, are susceptible to external damage and bacterial growth that lead to decay. To combat this, we aim to learn more about how the outer layer of certain foods are produced. This outer layer is called the cuticle, and it helps to protect foods from external stress like the environment and pathogens. In the Khakhar lab, we are using the tomato plant to study how the cuticle is formed by looking at how cutin, the primary molecule found in the cuticle, is produced. Cutin is a polymer of fatty acids, and its complete biosynthesis is something still being researched. To better understand how cutin is produced, the Moghe lab at Cornell University identified genes that could have an impact on the formation of the cuticle. Using viral vectors and a modified Cas-9 system, we can change the expression of these important genes to learn more about how they impact the cuticle. By having a better understanding of how these genes function, we might be able to engineer tomatoes in the future to have thicker, more disease tolerant cuticles.

### **Mariana Valencia**

#### ***The Impact of Circadian Misalignment on Subjective Hunger and Appetite***

Night shift work is associated with metabolic dysfunction and an increased risk for obesity. Dietary choices are an important factor in metabolic health and obesity risk. Indeed, night shift work is associated with poor dietary choices. However, less is known regarding the impact of night shift work on hunger and appetite. The objective of this study, therefore, was to investigate the impact of simulated night shift work in an inpatient setting on hunger and appetite.

Fifteen healthy adults (10F, 23.9±4.9y, BMI:22.5±2.3kg/m<sup>2</sup>; mean±SD) participated in an ongoing 6d inpatient simulated night shift protocol. Participants lived at the Sleep and Metabolism Laboratory for 2d to simulate day shift work followed by 2d of simulated night shift work. Visual analogue scales (100mm in length) were administered hourly across scheduled wake to assess subjective hunger and appetite.

Simulated night shift work was associated with a significant decrease in average 24h desire to eat, compared with simulated day shift work ( $p=0.039$ ). Furthermore, simulated night shift work was associated with trends for reductions in desire to eat vegetables ( $p=0.058$ ) and salty foods ( $p=0.066$ ) when compared with simulated day shift work.

Our findings support the idea that elevated hunger and appetite are not a mechanism by which night shift work increases the risk for obesity. Ongoing work in the lab will next examine whether the timing of food intake plays a role in the increased risk for obesity during night shift work.

### **Marianna Etcheto & Ly Gutierrez**

#### ***Impact of Intersex Discussions in Biology Classes on Queer Students***

Biological course material about intersex individuals often lacks diverse and accurate information, resulting in bias that creates misconceptions. The objective of this study is to highlight the diversity of sexual configurations and explore the challenges and barriers that people with intersex identities experience in the scientific community.

We performed a reflexive thematic analysis of f interviews with queer students in biology-related majors. We used master narrative theory to guide our analysis of what queer students were experiencing in biological courses. We looked specifically at how their identities related to discussions and lectures about intersex individuals. We also reviewed a variety of scientific articles to identify the trends in how intersex identities are discussed in biology and academia. We found that when intersex identities were spoken about accurately and in a humanized way, queer and intersex individuals felt more welcome and more secure that knowledge of their identities was being passed onto future generations of people, especially those seeking medical professions. We also found that when intersex identities were ignored, brushed over, or spoken about negatively, such as using dismissive language like disorder, queer students felt diminished. Scientific articles demonstrated a contrast of humanizing those who are intersex and treating intersexuality as a strange medical disorder. Misinformation reveals where biases develop while proper knowledge and handling of the topic makes students feel more welcome and educated, demonstrating that including factual representation of intersexuality and using non-exclusionary language instead of generalizing is vital to improving inclusivity in the field of biology.

### **Marissa Martinez**

#### ***Effectiveness of Blood Preservation Techniques for Maximum Yield of Genomic DNA in Avian Blood***

Understanding a species genomic variation can provide insight to its ability to adapt to challenging environmental factors that may reduce its population size and genetic diversity. One of the leading issues in genomics, specifically with blood preservation of animals, is storing blood samples for long periods of time without degrading the DNA sequence. For genomes to be sequenced, a complete set of DNA must be present and intact. In this study we tested two methods of preservation in blood samples of a single individual Hermit

Thrush (*Catharus guttatus*) — room temperature liquid blood samples and blood stored on FTA cards. The FTA preservation technique yielded a lower DNA concentration when compared to the liquid room temperature blood samples. These results suggest that using liquid blood samples preserves a greater quantity of extractable DNA as compared to dry blood on FTA cards. Comparing methods of storing blood samples is crucial because room temperature blood has a limited shelf life and requires greater storage capacity. The results from our study help us make informed decisions about the way our lab should store avian blood samples. In the broader picture, this information can help inform other researchers about ideal blood collection methods for preserving the greatest concentration of extractable DNA to sequence complete genomes of wildlife and gain a better understanding of their ability to adapt to challenging environmental factors.

### **Matthew Maloney**

#### ***Outperforming the best financial asset***

This research delves into the relationship between varying moving average lengths and market cycles concerning Bitcoin's historical price movements. Moving averages, a fundamental tool in financial analysis, serve as vital indicators for identifying trends and potential buy or sell signals within the market. Our study applies moving averages of different lengths to Bitcoin's extensive historical price data, aiming to find their efficacy in capturing trends and facilitating informed trading decisions with a focus on optimizing moving average lengths in bullish market periods. By subjecting these moving averages to brute-force statistical analysis, we aim to evaluate their performance across multiple dimensions, including accuracy, sensitivity to market fluctuations, and predictive power. Through examination, we seek to discern the optimal moving average length that proves most effective in analyzing Bitcoin price movements. Additionally, our research endeavors to uncover nuanced insights into the dynamics of cryptocurrency markets, shedding light on the underlying factors of investor emotions driving price movements. This study contributes to the advancement of

technical analysis methodologies within the realm of cryptocurrency trading. By offering empirical evidence and valuable insights, our findings enhance the understanding of trending market dynamics and provide practical implications for investors and market analysts alike. Armed with this knowledge, stakeholders can make more informed decisions, thereby navigating the volatile landscape of cryptocurrency markets with greater confidence and precision. Active investors alike can attempt to beat traditional buy-and-hold strategies via simple trending following algorithms.

### **Matthew Lynd**

#### ***Biochemistry: SARS-CoV-2 Antibody Capture on Nucleocapsid-Functionalized Silicon Nitride***

The SARS-CoV-2 virus hit the world hard, it is important to effectively know whether someone has the virus. The common swab method takes a while to analyze, it cannot be used anywhere, and it can give false readings. A better method of detection would involve a biosensor since it is compact, able to be used anywhere, and can get meaningful results. This biosensor using a local evanescent array coupling device combined with a silicon nitride surface chemistry. For preparing the surface chemistry, the binding occurred in the following order: an aminosilane, nucleocapsid protein with coupling buffer, then antibody with dye. The nucleocapsid protein with the antibody and dye, and that solution was analyzed in a plate reader to analyze the fluorescence of the dye that is attached to the antibody and the nucleocapsid protein. The presence of fluorescence was indicated by if the presence of nucleocapsid and the virus. A serial dilution was used to make a calibration curve to help determine the concentration of the nucleocapsid protein from the cleaved solution assay. Results show that the nucleocapsid protein was removed though the use of a cleavage buffer. From the data collected, a concentration was obtained for the assay in the range of  $1E-3$  to  $2E-3$  mg/ml, the mass per area was calculated in the range of  $4E-3$  to  $2E-2$  ug/mm<sup>2</sup>. The biochemistry of the LEAC biosensor is able to accurately measure not only the presence of the nucleocapsid protein but the concentration of it as well for a person.

### **Melanie Lauren Alicea**

#### ***Glass Oxygen Factories***

Aquatic animals such as fish and insect larva require dissolved oxygen in order to maintain regular biological processes (CRETU, 2021). Microbes contribute greatly to their habitats, such as diatoms' supplementation of dissolved oxygen into water (Harvey, 1933), or the role in the food chain microbes play (Liao, Hartikainen, Buser, 2023). Diatoms are single celled photosynthetic algae that are responsible for producing ~30% of our atmosphere's oxygen (Spaulding et al, 2021). The goal of this research was to assess the water quality of spring creek, and determine how environmental changes can impact the microbiome of spring creek. On a weekly basis, measurements were taken at multiple testing sites along spring creek. These measurements included dissolved oxygen testing, temperature recording, and detergent testing. Microbial samples taken from sediment were also analyzed under a microscope and had specific species of microbe identified. The resultant average dissolved oxygen levels recorded was 8.3 mg/L, with a range of 2 mg/L to 15 mg/L. The average detergent level was found to be 0.51 ppm- this detergent concentration is low enough to not affect aquatic animals nor microbes, thus ruling out water contamination affecting microbial populations. This research found a correlation between dissolved oxygen levels and average daily temperature; this agrees with previously established findings of diatom population growth decreasing at lower temperatures (Montagnes, 2001). By understanding how changes to the environment affect microbiomes of natural areas such as Spring Creek, we can develop a more holistic approach to conservation.

### **Mia Burton**



### ***Exploring the Relationship Between pH Level and Water Temperature in the CSU Lagoon***

My goal for this research was to determine the relationship between pH level and water temperature during changes in the weather within an ecosystem. I formulated two hypotheses for this study. My first hypothesis was that as temperature increases, the pH level also increases. My second hypothesis was that as temperature increases, the pH level will decrease. This study was significant because it may help individuals understand the best weather conditions for pH levels that can protect and ensure safety for wildlife and humans. Mostly, the pH level can determine the amount of nutrients, chemicals, organismal activity, and biological functions that are necessary for productive life in the system (EPA). Therefore, if an individual has a body of water that needs regulation, they will be able to understand the best conditions for the health of their water. Every Monday from October 9, 2023 to December 4, 2023 I collected data from the Lory Student Center Lagoon here at Colorado State University. By doing so, I collected sufficient data that can help support or reject my claim that temperature does in fact affect the change in pH level. There was no substantial difference between the temperature change and pH level that was found. During the weather fluctuation, the pH level had an average of 8.57, and stayed within the range of +/- 8 for all tests. My research has established that regardless of changes in temperature, both outside and within the water, the pH level will remain consistent at the CSU Lagoon. The lagoon is shallow, thus the outside temperature does not affect the equilibrium of the pH level. Therefore, temperature has little to no effect on the pH level.

### **Mia Papantonio**

#### ***Literature Review: Water Contamination Parameter and Implication Assessment***

Due to the prioritization of convenience and the average consumer utilizing reusable water bottles in recent years, water bottle refilling stations are becoming more apparent, as it provides a means of attaining safe drinking water, increasing environmental sustainability by reducing plastic waste, and upholding cost effectiveness. Contamination and lack of enforced safety codes can compromise health; this study aims to assess the overall quality and safety of various water refilling stations around the Colorado State University campus. Presence of bacteria, nitrates, total dissolved solids, and pH levels, according to the National Library of Medicine and U.S. Environmental Protection Agency, should remain between 100mL and 500mL per bacteria colony-forming unit, under 10(mg/L)<sup>2</sup> of nitrates, under 500mg/L of total dissolved solids, and a pH between 6.5 and 8.5. Locations of collection sites that have high student activity mid-day, as noted during observation, include the Recreation Center, Moby Arena, Lory Student Center, and Morgan Library. Water samples are to be collected in sterile bottles from multiple filter statuses; specimens are compared to a null control of distilled, deionized water in the OURA Lab and a positive control of bottled Smartwater. These findings are likely to suggest that water filters will need to be replaced frequently, as the expected leading containment is bacteria. Therefore, CSU should consider changing out the filters of water refilling stations routinely, with the intention of adhering to standard E.P.A. water safety codes. Cognizance of potentially harmful drinking water is essential in protecting the health of the student body.

### **Michelle Vasquez**

#### ***Understanding Cognitive Load in Emergency Health Records: A Study Using Eye Tracking***

This study aims to increase the accuracy of electronic health records (EHR) and decrease the cognitive load of clinicians in emergency departments utilizing eye tracking data and Artificial intelligence (AI) aided analysis. Clinicians face high cognitive loads while providing patient care. Documentation can add to this load, particularly when sections are confusing or poorly placed. Cognitive overload can contribute to mistakes in records, which is detrimental to patient healthcare quality. Eye tracking can be used to estimate and detect

patterns in cognitive loading by measuring indicators such as saccades and fixations. To examine EHR data entry, participants interact with a simulation for a prescription order set. Eye tracking data is collected with the Tobii Nano Eye Tracker or Tobii Spark Eye Tracker. Each eye-tracking data set captures metrics on over thirty indicators for every participant simulation including: gaze point coordinates, pupil diameters, validity, precision, and eye movement classification. With participant simulations lasting around ten minutes, the eye tracker collects large raw datasets that require condensing, filtering, and preparation. To streamline the data analysis workload, areas of interest (AOIs) from the on-screen simulation are determined and used to separate analysis groups based on on-screen location. Patterns in eye-tracking data from each AOI will help correlate attentionality to the EHR fields. AI can assist with identifying critical data entry fields. The success of the pilot study will be an indicator of the viability of using AI to automate EHR documentation and support clinicians in completing their tasks.

## **Mussa Hassen**

### ***Device Fingerprinting: IoT Device-type identification***

The Internet-of-Things (IoT) devices have become an integral part of modern-day home and organizational networks. Weak security controls on these devices have significantly complicated the duties of network security administrators. A critical necessity in network security is device-type identification, which not only serves as a security baseline but also helps in identifying intrusions. This research project aims to tackle the challenges associated with IoT device-type fingerprinting. Three primary challenges were encountered in our approaches. Firstly, due to the diversity of IoT devices, identifying the boundaries of device behaviors within a traffic trace was difficult. To address this, we performed a sliding-window packet analysis. Secondly, preserving data privacy while collecting enough traffic was difficult, so we employed a distributed learning protocol, which allowed multiple observers to collaborate without compromising data privacy. Lastly, we had limited datasets which posed an issue, particularly for devices with low traffic volume, so we used an adversarial autoencoder to generate synthetic IoT fingerprints. Experimental results demonstrate the efficacy of these methods, with distributed learning achieving an accuracy of 94-99% in device-type fingerprinting. This achievement is particularly significant given the challenge of accurately identifying device types with limited data and showcases the potential of distributed learning in advancing IoT device-type identification. Further research is needed to scale these techniques across diverse device types and adapt them to evolving IoT security requirements. The proposed innovations show potential in enhancing device identification and authentication within the expanding IoT ecosystem.

## **Natalie Celis**

### ***Indoor air quality - a literary review***

Poor indoor air quality can lead to several health issues that may greatly impact an undergraduate student's ability to learn and do work (Wolkoff) Poor air quality in a space where students spend the majority of their time will lead to short term health impacts such as eye, nose, or throat irritation Meanwhile, the long term impacts of poor air quality include respiratory diseases, heart diseases, or in extreme cases cancer Based on these literature reviews, a study is proposed to determine how air quality of dorms may affect students' quality of life on campus In this study, students would first be asked through a survey if they had experienced any of the prior mentioned short term impacts of poor indoor air quality Based on those results, the air quality in a variety of different dorms would then be tested to see if one) it was up to par with the IEQ (indoor environmental quality) standard and two) it contained any harmful pollutants such as particulate matter (PM) or carbon dioxide Dorm rooms were also visually assessed to look for any signs of mold, poor ventilation, and visible pollutants such as dust.

## **Nicole Sheptov**

## ***Clinical or Quantitative Balance Test: What Is More Effective in Identifying Cognitive Decline Post-Stroke?***

After a stroke, around 60% of individuals experience cognitive impairment and 73% of individuals experience a decline in mobility, leading to falls<sup>1</sup>. Studies have shown individuals with cognitive impairment after stroke experience higher incidents of falls and impaired balance<sup>2</sup>. Despite this, present clinical balance tests are often not sensitive enough to highlight the cognitive contribution to balance impairment following stroke. The Come-drive study aims to examine whether clinical or quantitative measures of balance distinguish cognitively impaired individuals from cognitively normal individuals after stroke. Thirty-one stroke survivors (cognitively impaired; N=16, and cognitively normal; N=15) completed a clinical balance test: Berg Balance Scale, and a quantitative balance test which measured sway area ( $m/s^2$ ), centroidal frequency (Hz), and sway jerk area ( $m^2/s^5$ ) in anterior-posterior and medio-lateral directions under three conditions: standing with eyes open and closed on a firm surface and eyes open on a foam surface. Centroidal frequency was found to be significantly lower in the anterior/posterior direction among the cognitively impaired stroke group compared to the cognitively normal stroke group among all three conditions of sway ( $p < 0.05$ ), with lower variability among cognitively impaired individuals in two of three conditions. However, the Berg Balance Scale did not emerge to be significantly different between the two groups ( $p = 0.243$ ). These results are important for identifying screening tools that may be more sensitive in identifying cognitive impairment and facilitate safe mobility after stroke.

### **Nyla Bickham**

#### ***Exploring the Insulin-Regulating Potential of Reishi and Turkey Tail Mushrooms***

Reishi (*Ganoderma lucidum*) and Turkey tail (*Trametes versicolor*) have garnered considerable interest for their insulin-resistance properties. This literature review aims to evaluate and compare the evidence supporting the effectiveness of these mushrooms. I hope takeaways will guide the creation of precise treatments and bring advantages to those suffering from inflammation-related illnesses. This literature review involves analysis of relevant studies relating to the insulin-inhibiting effects and b-glucan content of Reishi and Turkey tail mushrooms. Research was done among credible databases including PubMed to explore relevant articles and clinical trials. Key search terms that were used were "Reishi", "Turkey tail", "b-glucan", and related synonyms. Studies were reviewed based on their relevance to the data and the subject. A clinical study of the effects of Ganopoly (Reishi mushroom) in 2004 states, "It was given to 71 adults with confirmed type 2 diabetes. They received 1800 mg of Ganopoly orally thrice daily for 12 weeks. (HbA1C) was analyzed and plasma glucose levels were significantly reduced after 12 weeks of taking Ganopoly" In addition the article, "Edible Mushrooms: improving human health and promoting quality life" states "A. blazei...produces various bioactive compounds...and has been used as a medicinal food for the prevention of cancer, diabetes. Analysis of the data and synthesis of current evidence, shows trends, disparities, and potential avenues for future research in mushroom-based insulin-resistance therapeutics.

### **Nyla Bickham**

#### ***Navigating Adolescent Mental Health Preferences: Exploring the Appeal of Cognitive Behavioral Therapy versus Mindfulness-Based Interventions***

Cognitive Behavioral Therapy (CBT), which is more talk-therapy based, and Mindfulness-based therapy (MBI), which is activity-based observational tool, are both effective tools in the behavioral health field, yet, there is a lack of understanding as to which adolescent participants prefer. This review synthesizes information to determine how acceptability, engagement, and perceived effectiveness affect teenagers' CBT or MBI preferences. The ultimate goal is to better understand adolescents' mental health treatment preferences to help design more targeted and effective therapies for this demographic.

In this literature review, I searched six trustworthy peer-reviewed databases from 2010 to 2023, including PubMed and Google Scholar. Studies were also chosen based on their diverse sample of adolescents from a lower-misrepresented ethnic group and higher depression risk, as well as study questions that emphasized

adolescents' choices for CBT or MBI. Some studies demonstrate that adolescents prefer CBT owing to its structure and focus on practical skills (citation), while others emphasize present-moment awareness and acceptance (cite). Personal coping styles, therapy history, and mental health issues affect these preferences. Adolescent preferences for intervention modality are influenced by various factors, showing that while some adolescents may prefer CBT, others may resonate more with MBI. Moreover, efforts should be directed towards increasing awareness and access to a more diverse range of mental health interventions in order to accommodate the diverse needs and preferences of adolescents.

### **Olga Achmatowicz**

#### ***Literature Review: An Investigation of Microplastic Leachates from Teabags***

Microplastics are an emerging environmental and health concern due to their pervasiveness in air, water, and food. These  $\leq 5$ -mm particles have high chemical stability with half-lives of hundreds of years—lacking biodegradability, they degrade into continuously smaller particles by erosion, heat, UV-radiation oxidation, etc. The effects of microplastics on the human body stem from accumulation in the intestine, liver, and kidney, causing cytotoxicity, inflammation, oxidative stress, cell damage, etc. The accumulation of these particles occurs from the ingestion of food contaminated either by the environment and/or direct contact with plastic packaging materials. This literature review discusses how teabags leach microplastics due to the conditions in which tea is prepared in allowing “food-grade” plastics to release these toxic substances. Based on the literature, after treating the teabags with the common procedure for brewing tea (heating in water at  $\sim 95$  degrees Celsius), the brewing solution should contain microplastics due to the degradation of the teabag material, as the temperature of degradation is  $\sim 40$  degrees Celsius. The expected number of particles per unit area is  $\sim 1200$  micro-sized particles/mm<sup>2</sup>, which projects to  $\sim 2.3$  million micro-sized particles being ingested from one plastic teabag. Since tea is a part of many cultures and is recognized as a part of healthy lifestyles due to its numerous benefits, large populations are at risk of exposure to immense amounts of microplastics on a daily basis and, consequently, are prone to developing harmful symptoms.

### **Olivia Kreutzer**

#### ***Lipid and Mineral Composition of Bison Milk***

The objective of this study was to determine the lipid and mineral composition of bison milk samples to better formulate milk replacer for bison calves. Opportunistic bison milk samples ( $n=9$ ; approximately 10 ml/sample) were obtained from commercial bison operations. Milk samples were analyzed for total fat composition using a 2:1 chloroform to methanol extraction procedure. Total fat was then saponified and methylated using BF<sub>3</sub> procedure followed by separation and identification of individual fatty acids via gas chromatography. Mineral composition of milk samples were determined by drying 1 ml of each sample at 60 °C for 24 hours and then dry-ashing at 600 °C for 12 hours. Ash was then reconstituted in 5 ml of 1.2 M HCl and analyzed for mineral composition using an atomic absorption spectrophotometer. Data were analyzed using descriptive statistics (minimum, maximum, mean and standard deviation) for each analyte. Total fat composition ranged from 0.95-11.71% with a mean of  $4.38 \pm 3.09$ . Overall, mineral composition of milk samples was similar to the published mineral composition of cow's milk. The saturated:unsaturated fatty acid ratio was  $12.59 \pm 7.90$ . These data display unique nutrient compositions that would be considered when formulating an improved milk replacer.

**Peter Jesik**

***Applications of White-rot Fungi in Soil Bioremediation: Literature Review***

The purpose of this literature review is to explore how White-rot fungi can be used for the bioremediation of xenobiotic factors in soil. Xenobiotic factors are non-natural compounds present in ecosystems that commonly impact the biological functions of biotic organisms.

Although there are many proposed solutions to remove these xenobiotic factors from soil, bioremediation is one of the most cost-efficient and eco-friendly solutions. Particularly, bioremediation through various White-rot fungi strains is efficient in degrading multiple xenobiotic factors. In this literature review, three articles were

analyzed, all of which support the efficiency of white-rot fungi as a means for bioremediation. White-rot fungi can degrade synthetic dyes through a variety of enzymes they produce to decompose lignin and other naturally occurring compounds. The unique morphology of White-rot strands allows for the production of various enzymes, each with its own metabolic capabilities that can be applied to specific dyes. In particular, extracellular laccase produced by the fungus is capable of decolorizing synthetic dyes in less than 96 hours. Building on this research, a study was conducted in which liquid white-rot cultures were introduced to plastics containing synthetic dyes isolated from soil samples. The samples were then monitored in petri dishes for a week. Degradation was recorded and tracked by daily photographs. The predicted outcome of this study is marked decolorization of various plastic samples in less than a week.

**Rachel Winter**

***Haplorhine Nocturnality: Comparative Selection in Two Exceptional Primates***

Tarsiers have historically been categorized alongside the earliest confirmed primates - Omomyoidea - in the Suborder Haplorhini. Due to their shared adaptive characteristics, this proposed lineage is collectively referred to as Tarsiiformes. One similarity has provoked particular intrigue in their origins – nocturnality. While nocturnality is standard within the Suborder Strepsirhini (lemurs, lorises, and galagos), it is only observed in two species of Haplorhines, tarsiers and owl monkeys. The comparison of similarities and differences between these two species may provide context for the evolutionary processes that they have undergone. Tarsiers are the only-known nocturnal mammal equipped with full color vision (trichromatic). Alternatively, the owl monkey is the only-known primate lacking color perception (monochromatic). My comparative examination of the two nocturnal haplorhines is concentrated on a central component of modern evolutionary theory – why would natural selection favor the retention of nocturnal adaptations in one species and the secondary development of nocturnality in another? This project will draw from theoretical perspectives from biological anthropology, primate paleontology, vertebrate paleontology, primatology, and evolutionary biology. The final results will aim to place adaptations within a temporal context to determine the emergent conditions of nocturnal primate behaviors and adaptations.

**Rebecca Ceisel**

***Red Dye, Blue Dye: How Ants Behave on Food Dyes***

The presence of food dyes has increased significantly in the last century. According to “Food Dyes: A Rainbow of Risks” —an article discussing artificial coloring toxicity in common foods—, “the FDA’s data show a dramatic five-fold increase in consumption of dyes since 1955” with red #40, yellow #5, and blue #1 food dyes leading within foods across the United States (Kobylewski and Jacobson). While their prevalence continues to rise, studies documenting any adverse effects of artificial food dyes are needed. Given the vital role of garden ants in the ecosystem and their close proximity to humans, it is important to understand if the prevalence of food

dyes negatively impacts ant behavior. This study aims to document differential behavior of *Lasius niger* ants following consumption of artificial food dyes. Each colony will be exposed to either no dyes, red #40, yellow #5, or blue #1 food dye in their daily diet. Behavioral patterns such as feeding time, trail-laying intensity and percent of consumed food, will be monitored. The proposed hypothesis is that the colonies with red #40 dye in their diet will exhibit the most behavioral pattern differences from those that experience the control diet because it has been linked to displaying ADHD symptoms in children (Stevens). Given the strikingly high presence within popular foods, this study aims to demonstrate any potential significant effects of food dyes on ant behavior, encourage needed future research on behavior, and enable people to make informed choices about which chemicals they choose to consume.

**Richard Morales-Villalva, Gabriela Fuentes Georgieva, Nisha Chhetry, Mikayla Bruce, Emily Ocampo-Lara, Jaellyn Erickson, Joselle Gyamfi, Charissa Grixby & Jazmyn Mikhail**

***Mind Over Matter: An in-depth exploration of anxiety, identity, and academic performance***

The Innovation Experience 3.0 research initiative stemmed from challenges that science, technology, engineering, math, and medicine (STEMM) discipline students face in a competitive academic environment and how their personal identities and anxiety levels impacted their performance. Over 14 weeks starting in Fall 2023, we delved into literature examining the connections between anxiety, identity, and academic achievement. After completing a pilot survey (n=78), we created a final survey instrument consisting of open-ended and Likert scale items designed to measure identity salience, academic performance and their relationship to self-reported levels of anxiety. Data collection concluded in February 2024 through collaboration with colleges to disseminate the survey, intercept students, advertise in classrooms, and table near high-traffic areas resulting in (n=1,091) responses over three weeks. Of the respondents approximately 80% were STEMM students. When asked 756 students (79.25%) agreed that they were a STEMM student. Of the students who self-identified as STEMM students (n=756), 65.40% of those respondents (n=604) experienced anxiety often or all the time. 613 of those participants consider being a STEMM student integral to their identity. Compared to their non-STEMM peers, STEMM students are more likely to report worrying about their academic performance in a classroom setting. Our goal is to identify ways in which CSU STEMM students can receive enhanced support for their academic success and mental well-being. By shedding light on these connections, we aim to foster a more supportive and conducive learning environment for CSU STEMM students, ultimately empowering them to thrive academically and maintain good mental health.

**Riley Brooke, Razan Mohamed, Alejandra Vasquez & Cormac Wallace**

***Testing the Effects of Proving Time on Sourdough Bread***

Sourdough is a fermented bread made using a starter culture. What makes sourdough unique is its open crumb structure, use of a starter culture, and sour flavor from the organic acids produced by the microorganisms. Something unknown about sourdough is the effect of proving time on the sensory qualities of the finished loaf. The objective of this study was to examine if proving time affected sensory qualities. Our hypothesis was that increasing the proving time would lead to a larger loaf volume, darker color, and more acidic sourdough than a shorter proving time. We tested this hypothesis by forming three doughs from the same starter culture and a control dough made from instant yeast that was proven for 2 hours. The doughs were then proved for either 2, 4, or 24 hours and then baked at 350F. After baking, we examined the effect of proving time on the titration, pH, Brix, loaf volume, and color.

**Robert Meireis & Angel Rangel**

***A Scoping Review of Artificial Intelligence Technology Uses and Implications on the Current Workforce in Agriculture***

The issue with AI is the increasing automation, causing a change in labor demands from low-skilled to higher-skilled jobs. Entry-level or minimal-wage positions will be the most at risk from AI-driven automated technology. This topic is significant for companies, employees, customers, and the economy. We did a scoping analysis on the impact of artificial intelligence (AI) on employment for agricultural laborers. Our research reviewed the literature on various issues including the health of agricultural laborers, education, economics, and practical applications of artificial intelligence. Some keywords used involved artificial intelligence, agriculture, impacts, implementation, and workforce. The literature reviewed involved 15 sources comprised of research papers, peer-reviewed articles, and articles. All the literature was found either through the CSU library or a regular search engine. The purpose of collecting information in these areas is to better understand the present internal position of the agriculture industry and external stakeholders to justify future results. After reviewing the literature, we confidently advocate increasing access to higher education for agricultural workers. I propose establishing a link between farm internships and higher education institutions as the optimal solution. Establishing a link between occupational education and institutional education to cultivate personal motivation for pursuing higher education. We discovered a labor demand gap that will grow rapidly as automated technologies become more prevalent. If there is a demand for work in the agriculture industry, there will be ample prospects for growth and employment.

**Sabrina Lahlali**

***Bee Wing Wear (Ecology of Wild Bees)***

This study aims to determine the extent to which bee wing wear ratios are directly correlated to the bee species and their foraging locations. Bee wing wear is identified as the natural degeneration of bees' wings that takes place with increased flight and activity within the bees' environment. Most of the data used in this study comes from observational qualitative data collection methods. The bee's wings were observed and the wear was measured on a Likert scale from one to six, to operationalize the findings. Each bee was assigned a number, bees with the worst wear were assigned a six, and bees with no wear were assigned a one. The data was collected and transferred to graphing programs where the bee's location of capture was noted and the data sets were then analyzed. It was found that a correlation between bee wing wear and bee species was present although varying in significance. In some bee species, it was more apparent that there was a grand similarity in wing wear that spanned across the entire species group, whereas in other species it was present but the ratio was less evident. The bee species foraging locations were similar across their respective species' and thus maintained a rather insignificant relationship with the bee's wing wear ratios. These results imply that while there is a significant relationship between bee wing wear and a bee species it heavily depends on the species to determine the extent to which the bee wing wear is made perceptible.

**Shelby Collins**

***Environmental Changes on Isopod Reproduction Rates, A Literature Review***

Isopods play a key role in soil fertility and decomposition leading to nutrient cycling which are extremely helpful to the environment (Souty-Grosset, et al, 2018). Ensuring that there are plenty of isopods available and that they are able to reproduce can be key to maintaining ecosystems especially those dependent on the nutrient cycle. But what kind of temperature and humidity levels will have an impact on isopod reproduction rates?

This literature review will be investigating research on how environmental factors impact terrestrial isopods and their reproduction rates. Isopods have been found to have unique responses given certain environmental factors such as temperature, moisture, and etc (Sfenthourakis, et al, 2018). After these specific conditions and responses are analyzed, that will then be applied to a physical experiment aiming to see what factors allow isopods to thrive in a given environment. This will be done by using different substrates and heating pads for temperature and humidity control in a plastic terrarium. There will be three different set ups containing a high

temp and low humidity, a lower temp and high humidity, high temp and high humidity. It is hypothesized that the best conditions will be high humidity and moderate temperature(Waloff, 1941). The results of this experiment will show the preferred conditions for isopods so their numbers can be maintained in the wild and nutrient cycling can be consistent.



## **Sher Moo**

### ***The production and development of fermented foods***

Our research aimed to investigate the process of producing fermented foods. The first phase of our project included the researching and pitching of the fermented products. Individual members of our department selected two to three fermented goods to concentrate on. My topic, thus this paper, is on the production of Kimchi and Miso. To begin, extensive study was conducted to gain a complete understanding of the ingredients and the fermenting process that constitutes kimchi and miso. The safety of the fermenting process was especially emphasized. Temperature, pH, and other food safety concerns were addressed. A vital step in food production is the pitching of ideas. A pitch meeting was held with an appropriate audience to make a persuasive case for kimchi and miso production. Marketing tactics, market values, and usage of the fermented goods were highlighted. The second portion of product development involved the hands-on construction and fermentation of the Kimchi and Miso. Every step of the construction process was documented, and data was collected over several weeks and months while the products were fermenting. The endeavor was concluded by determining the success rate of the fermentations.

## **Sophie Deitch**

### ***Local Adaptation in the Feather Microstructures of Gray-crowned Rosy Finches***

Studying local adaptation, or when a population is better adapted to its local environment than another population might be, can be important to understanding how populations may respond differently to climate change in their environment. Local adaptation is especially relevant in alpine species where the potential for undergoing range shifts to maintain their ideal conditions is constrained. To study this, we used an elevationally-constrained species, the Gray-crowned Rosy Finch (*Leucosticte tephrocotis dawsoni*) as a model to compare body feather microstructures (traits important for avian thermoregulation) between two populations. We predicted that feathers from colder climates would have a higher density and longer length of plumulaceous barbules and nodes for increased warmth. The feathers were photographed under a microscope and then measured using ImageJ. We measured the length and density of barbules and nodes in the pennaceous and plumulaceous regions of each feather. Our statistical analyses revealed significant variation in barbule length and node density between the two populations, with no significant difference in barbule density. These results imply that local adaptation is occurring in these populations, with barbule length and node density more important for adapting to local environmental conditions than barbule density. We hope to apply our results from this model to other species, especially those at risk from climate change.

## **Sinder Buckmire**

### ***Literacy Review: Soil Health of Native Versus Non-native Planting Sites***

The soil health of ecosystems are important indicators of overall ecosystem well-being. Soil health is greatly affected by many anthropogenic factors like planting non-native species of plants in native soils that cannot support them. To test the health of the soil, pH tests, soil porosity tests, and nutrient tests (measuring Nitrogen, Phosphorus, and Sulfur) will be done, with an analysis of the soil microbes present in the system. Soil samples of both native and non-native plants will be taken from multiple sites on CSU's campus, and will each be tested on these conditions. pH testing will be done by saturating the soil in DI water and using a pH strip. Porosity will be tested through saturation of the soil samples and measurements of volume. Nutrient levels will be tested using chemical analysis of the samples, and microbe populations will be measured using a microscope. Based on a healthy soil profile of Colorado, the soil where the non-native plants grow will have higher porosity, lower levels of Phosphorus and Sulfur, a pH of over 6.8 or lower than 6.5, a lower ratio of Nitrogen to Sulfur, and less species of microorganisms present in the soil samples, indicating instability of the soil. The results of this study aim to understand the effect that plants have on the soil that they are planted in, specifically if the plant is not suited to the ecosystem it is placed in, and the implications that this has on the health of the ecosystem.

## **Stephanie Villanueva**

### ***Using fluorescence microscopy to image anatomy in live plant tissue***

Stephanie Villanueva, Heidi D. Kreckel, Albert Ochoa-Castillo and Nancy E. Levinger

The subcellular anatomy of a plant cell is important when considering stress and movement in plants. Due to the challenges of staining live plant cells, imaging of plant organelles and structures has typically been conducted on dead or “fixed” cells. *W Mentha x piperita* (peppermint) shoot tips. To visualize shoot tip anatomy, we use various biological stains while preserving the vitality of our samples during imaging. We used a cross-section of a peppermint shoot tip at 50  $\mu\text{m}$  thick for our experiments. Autofluorescence shows the ways biomolecules such as carotenes, lignin, and chlorophyll absorb and emit light. However, not all structures and organelles can be seen through this fluorescence. Fluorescence dyes are needed to visualize structures of interest such as the nucleus, cells walls, mitochondria and other components. These dyes bind to different components in the plant material to allow for visualization. We compare the intensity of the fluorescence from the dyes to the autofluorescence on a sample without dye to determine the shoot tip anatomy. This presentation will report the effectiveness of imaging subcellular anatomy in live peppermint shoot tips through fluorescence microscopy.

## **Tiarnan LoCascio**

### ***A Review of Literature: Improving Plants Via Quorum Sensing Molecules***

Quorum sensing (QS), discovered in the 1970s, serves as the primary mode of communication amongst bacteria. It utilizes interspecies and intraspecies signaling molecules paired with complementary receptors to complete tasks impossible for a single bacterium. With the discovery of this complex system, symbiotic relationships between bacteria and plants are being further reviewed, driving the question: how do these molecules affect plants? And how can horticulture be improved using them? By attempting to answer and better understand these questions, more sustainable horticulture practices can be created, leading to larger problems being solved. This research project explores and reviews literature characterizing the effect of QS molecules on plants, as well as literature defining how these molecules could be used in sustainable agriculture. In reviewing literature, it was found that treatment with certain QS molecules have shown differential regulation in specific gene families. Furthermore, studies have found that different genotypes are affected differently by these molecules. This creates a major limitation to research, as it makes it unclear why plants are or are not being affected. Further investigation of this topic will provide insight into the prospects of the utilization of symbiotic relationships in agriculture.

## **Tobias Beesley & Alex De La Chica**

### ***Cybersecurity Research Assistance***

During our experience in MURALS both Tobias and I worked on several different projects all related to cyber security. At the beginning of the year both Tobias and I worked on the same project for Eric Martin, where we entered email data into a database by hand for his research on phishing scams over email. This project’s goal was to differentiate between warranted (corporate communication) and unwarranted (phishing/illegal) spam. As the year progressed, we worked on different projects that ranged from document searches and annotating data sets to writing python code using a Natural Language Processing tool in a library called spaCy. This extracts subjects, attributes of those subjects, and actions performed to and by the subject from natural language text. This was done for research conducted by Mahmoud Abdelgawad on specifying missions for machines such as drones. Both of us aided other researchers by combing through databases of academic papers to find relevant research. Although the work itself was not directly related to computer programming, seeing the huge quantity of research being done in this field by others was inspiring for future projects. Near the end of the experience, we worked together on one final project where we drew out diagrams based on specifications given by a

researcher. All of this was valuable research experience, and even though we were not able to work on any one project for a long time, being able to participate in different kinds of research as an undergraduate was a lot of fun and provided us with diverse ways of looking at computer science.

### **Tomas Dardis**

#### ***Investigating the Migration Routes of Hermit Thrushes***

Understanding where birds are coming from and where they are going during migration is often critical information for researchers working at bird monitoring stations. However, this information is often very difficult to attain using bird banding or observational methods. We can now answer these questions using genetic tools designed to identify the breeding origin of birds migrating anywhere outside their breeding range. For my thesis, I worked with Al Sherkow from the Riveredge Nature Center in Wisconsin to help him find out where Hermit Thrushes migrating through his banding station came from. To achieve this goal, I extracted DNA from

feather samples collected during the Fall migration and then implemented a SNP-based genetic assay to assign individuals to genetic populations. Our results showed Hermit Thrushes migrating through Riveredge Nature Center were part of the eastern Taiga breeding population of Hermit Thrushes and likely breed in Southwestern and Southeastern Canada. This suggests that most of the birds likely migrated upwards of 1000 miles before stopping over in Wisconsin. Al and his team will be using this information to both improve their understanding of the biology of migrating Hermit Thrushes and can use this resulting information to help educate the local community about bird movement.

### **Trevor Chartier**

#### ***Automatically Identifying the Human Sense of Familiarity using Eye Gaze Features***

Familiarity is a cognitive state that is widely experienced. The feeling of familiarity may arise when an individual senses a connection to a person's face or a particular place, as if they have experienced it before. The source of familiarity may be obvious to an individual, as in the case of recollection, it may be unknown, or the experience may actually be new, as in the case of déjà vu. Despite its commonality, there have been few attempts to automatically detect the internal state of familiarity. Here, we test the feasibility of classifying instances of familiarity from eye gaze features. This study utilized an existing paradigm from cognitive psychology to elicit familiarity from configurally similar virtual scenes, including some in virtual reality environments. A dataset was built consisting of eye gaze features directly prior to both positive and negative reports of familiarity. The data was applied to various machine learning algorithms, and the best performing models were selected. The ability to automatically detect the internal state of familiarity would allow for its implementation in applications like intelligent virtual tutoring systems. These systems could use the presence of familiarity to gauge a student's level of curiosity and information-seeking, adapting accordingly to optimize learning potential.

**Yoselyn González**

***Unraveling Cognitive Decline: Comparing Canine Cognitive Dysfunction with Alzheimer's Disease***

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by memory loss, cognitive decline, and changes in behavior. It gradually impairs daily functioning and ultimately affects one's ability to carry out even basic tasks. Canine cognitive disorder (CCD) shares similarities with Alzheimer's disease in humans. It manifests in older dogs with symptoms like disorientation, changes in sleep patterns, and loss of previously learned behaviors, significantly impacting their quality of life. This makes CCD a good model for AD studies. The volunteer canines in the study undergo comprehensive behavioral assessments, followed by routine physical examinations until the patient deceases. We can utilize immunohistochemistry (IHC) to identify markers of inflammation within these brains to identify possible biomarkers of canine cognitive disorder. Utilizing CCD as a model for AD offers distinct advantages due to shared pathology and comparative anatomy between dogs and humans. CCD's natural disease progression in aging dogs allows researchers to observe cognitive decline over time and identify potential biomarkers. Intervention studies in CCD-affected dogs can validate treatments before human trials, expediting drug development while addressing ethical concerns. Overall, studying CCD provides valuable insights into AD mechanisms and therapeutic strategies with potential benefits for both human and animal health. A valuable development from this research could be to expand on imaging practices as a diagnosis for CCD to potentially aid in the development of more effective treatments. In turn this would aid in AD research due to the similarities of these two diseases.



SOCIAL SCIENCES & HUMANITIES ABSTRACTS



**Overall Winner- Jocelyn Lapham**



**1<sup>st</sup> Place Winner- Abrao Soares Pereira**



**2<sup>nd</sup> Place Winner- Garrett Poitra**



**Rising Star- Caley Vadez**



**Social Justice & Inclusion  
Emily Ocampo-Lara**



**Social Justice & Inclusion  
Jasmine Retland**

**Aida Wates**

***What does transdisciplinary research look like in practice?: Partnering with Indigenous rights-holders and decision-makers for climate adaptation in the Southwest***

The goal of this project is to apply Indigenous self-determined research in partnership with Indigenous rights-holders and decision-makers to guide the application of Indigenous knowledge and practices in Southwest Tribal climate adaptation strategies. Despite a growing recognition of Indigenous knowledges and sciences for climate adaptation, Indigenous Peoples are often not engaged towards this effort. Indigenous-led research offers awareness regarding cultural contexts and local needs. Transdisciplinary research (collaborative research with non-academic partners to generate knowledge) offers methods for partnering with Indigenous rights-holders, knowledge-holders, and decision-makers. Our project works to apply these methods, specifically engaging Indigenous leaders involved in Indigenous climate rights, knowledge stewardship, and decision-making to co-develop a Southwest Climate Adaptation Science Center grant project. Their knowledge as shared through stories, experiences, and culturally relevant frameworks guided our project design and methods. Based on these insights, we are conducting a scoping review of literature focused on how climate research, adaptation plans, hazard mitigation plans, etc. are engaging Indigenous knowledges. We are also planning for an Inter-Tribal Exchange that aims to facilitate story sharing and document case studies of Indigenous self-determined research and climate initiatives as an alternative to a dominant extractive model of research approaches for engaging Indigenous knowledges. Findings from our transdisciplinary, Indigenous-led research process, scoping review, and Inter-Tribal exchange will help to identify wise practices, protocols and processes for Indigenous self-determined research and data governance. Findings will also inform the development of training materials for researchers, Indigenous decision-makers, and institutions involved in climate adaptation initiatives that engage Indigenous knowledges.

**Alexia Ott**

***Observational Methods for Researching Parent-Child Communications***

Parents and their children form close attachment bonds that are critical to the child's emotional and social development as well as learning development (Frosch et al., 2019). In order to adequately study dyadic communication between parents and their children, it is important to include observations of their communications (Aspland & Gardner, 2033). Trained observers, known as "coders," assign scores to dyads based on their observable behaviors. In this study, parent-child dyads participated in a data collection visit in a laboratory setting where their communications were audio/video recorded so that they could be analyzed later by a team of coders. I watched the videos from the study to observe general limit-setting and limit-setting specific to food. My team and I are currently working to achieve interrater reliability so that data we produce is considered valid. These videos consist of watching a parent and child go through a mock grocery shopping experience to track the behaviors they exhibit. We are watching for parental warmth, involvement, and strictness and rating them on a scale of 0 to 7. This rating system can be used to gauge the strictness and involvement of a parent in this store setting. I expect this study will find that parents are generally slightly uninvolved with their children in a grocery store setting which would indicate that the children have more free reign over the foods they eat, which could lead to an unhealthier diet.

**Alicia Mercado**

***Exploring Non-Hispanic Perspectives on Colorado State University's Transition to Hispanic-Serving Institution Status***

As universities across the United States strive to attain Hispanic-Serving Institution (HSI) status, understanding the perceptions of all members of the university community is paramount. This research investigates the perspectives of non-Hispanic faculty, staff, and students at Colorado State University (CSU) regarding the institution's mission of becoming an HSI. Through qualitative methods such as interviews and focus groups,

this study delves into the attitudes, beliefs, and experiences of non-Hispanic stakeholders towards CSU's transition to HSI status.

The findings aim to illuminate a diverse array of perspectives among non-Hispanic members of the CSU community. From expressions of support for diversity and inclusion initiatives to concerns about potential shifts in institutional culture and resource allocation, this research explores the nuanced responses of non-Hispanic stakeholders to CSU's evolving identity as an HSI. Additionally, the study underscores the importance of effective communication and transparency in fostering understanding and engagement among non-Hispanic members during the transition process.

By shedding light on these perspectives, this research contributes to the broader discourse on diversity and inclusion in higher education. It informs strategies for navigating the complexities of transitioning to HSI status while maintaining a cohesive and inclusive campus environment. Ultimately, this study seeks to facilitate CSU's mission of providing an equitable and supportive educational experience for all members of its community, regardless of ethnicity or background.

### **Andrea Pereida Flores**

#### ***Gun Prevention at CSU***

Gun violence, in particular, mass shootings has become more frequent, especially in schools. For this reason, I became interested in finding preventive measures that can be implemented here at CSU in order to prevent any unsafe situation from happening on our campus. Since 1966, there have been a total of 13 college shootings; the largest being Virginia Tech where 32 students lost their lives. Nationally there is an average of 20 gun homicides occurring on college campuses every year. This can be attributed to the 37 states that allow their students to carry guns in school. Specifically, here in the state of Colorado, CSU allows students to carry guns but it is only under the concealed carry policy. In fact, about 30% of CSU students own a gun under the concealed carry policy. In a student survey collected from 350 CSU students, 19.6% of the respondents reported feeling safe on campus at all times. This means, that around 80% of CSU students do not feel safe while being on campus. This project is aimed at developing measures at CSU that will increase campus safety as a preventive measure for gun violence. This would look like spreading CSU's active shooter protocol around the student body, developing an app that connects all the existing safety measures at CSU, letting people know and be informed about the recently introduced Colorado Senate Bill 24-131, that looks to prohibit firearms from sensitive places including universities, and House Bill 23-1230, that looks to prohibit firearms that are most commonly used in public mass shootings, and expanding the knowledge of blue lights.

### **Archer Casper, Maia Miller, Ella Smith, Josif Nedeljkovic, Abigail Francis, Anna Rember, Helen Obuna, Harper Hall, Sandrín Molina & Ricky Winston**

#### ***Being Trans in Public: A CSU case study***

How do transgender students navigate public spaces on campus?

What institutional actions are taken in response to the presence of transgender students at Colorado State University (CSU)?

The national debate on transgender rights – particularly for gender-nonconforming (GNC) youth – questions the legitimacy of gender affirmation. Transgender and GNC students at CSU face various forms of discrimination such as racial, cultural, ableist, classist, gendered, religious, sexual, and xenophobic biases. These biases compound the difficulties of being open about their gender identity.

Our research investigates the experiences of transgender students at CSU, focusing on the challenges they face in public campus spaces and the University's response. Utilizing community-based, participatory research methods, we examine the negotiation of gender at CSU and assess institutional responses to the transgender community. Preliminary content analysis of twenty documents – official CSU publications and media from The Rocky Mountain Collegian about transgender and queer topics – was conducted to provide a foundation for our semi-structured interview process. We then interviewed a sample of twenty CSU students who identify differently from their assigned gender at birth and cross-referenced their responses with institutional discourse regarding the gendered environment at the university. CSU is an ideal location to study these challenges and triumphs, develop viable and actionable recommendations, and improve support for transgender and GNC students on campus. By amplifying voices and highlighting unmet needs, we aim to advocate for inclusive campus policies and practices that respect and uphold their diverse identities and lived experiences.

**Beatriz Sanchez**

***Engaging Paternal Relative Engagement in Child Welfare Cases***

"It Takes a Village: Engaging the Paternal Side"

Introduction: Our goal was to guide child welfare organizations on strategies for identifying and engaging paternal relatives in order to expand kinship placement options and improve outcomes for children. Research shows that children have better outcomes when placed with kin, but there is a bias toward maternal relatives for placements, with paternal relatives often overlooked. Increased engagement of paternal relatives not only provides more placement options, but also promotes continuity and minimizes trauma for children removed from their homes.

Methods: A review of existing literature and practices in Colorado, the United States, and Canada around paternal relative engagement was conducted, drawing on family-finding tools, notification requirements, family group decision-making, and transition planning. Based on these findings, recommendations were developed for child welfare agencies looking to increase the involvement of paternal relatives.

Results: A guidance document was created covering pragmatic strategies in three areas: 1) identifying paternal relatives through contacting fathers and search tools; 2) engaging relatives in family meetings, 3) inclusion of fathers and paternal relatives in case planning, and 4) visitation recommendations; and 5) monitoring engagement attempts and participation over time. Implementing the paternal relative identification and engagement strategies outlined could help caseworkers manage the difficulty of engaging both maternal and paternal relatives in

Conclusion/Further Directions: Further tracking participation and outcomes will allow for validation of efforts and refinement of approaches. Additional research comparing outcomes for children placed with maternal versus paternal relatives can also help inform practice.



## **Claire Lindsey**

### ***The Impact of Time Pressure on Consumer Trade-Offs for Price, Sustainability, and Service Options***

The fashion industry's rapid evolution towards fast fashion and ecommerce has sparked debates on sustainability and ethical practices. This study explores the intricate relationship between generational cohorts and purchasing decisions surrounding the apparel industry. Drawing from an extensive literature review and data collection through a survey, this research explores the tradeoffs consumers make regarding sustainability, service desires (e.g. ease of returns), and price sensitivity. This research further explores the impact of time pressure on purchasing decisions across three generations: Generation X, Millennials, and Generation Z.

Findings suggest that while there are generational differences in consumer values, external time constraints significantly influence purchasing decisions, in many cases overriding initial preferences. This research serves as a valuable resource for apparel companies seeking to align their practices with consumer values and navigate the ever-changing industry. By understanding the interconnectedness of generational cohort and consumer behavior, companies can customize their strategies to meet evolving consumer demands.

## **Diego Angeles Marquez**

### ***HSI Transforming Colorado State University into a Hispanic Serving Institution: A Pathway to Diversity and Inclusion***

This qualitative study delves into the transformative journey of Colorado State University (CSU) toward achieving the designation of an emerging Hispanic Serving Institution (HSI), focusing on the strategies implemented to foster an inclusive academic and social environment for Hispanic and Latino students. By employing a mixed-methods approach, including surveys, interviews, and focus groups with students, faculty, and administration, the research aims to capture a comprehensive view of the university's endeavors to increase the enrollment, retention, and graduation rates of Hispanic and Latino students from the current 15% towards the 25% threshold required for HSI status. This investigation also examines the impact of such initiatives on campus culture, the effectiveness of support services tailored to these students, and the integration of cultural competencies into the curriculum. Preliminary results suggest a positive correlation between the university's targeted efforts, improved academic outcomes, and student satisfaction among the Hispanic and Latino student body. The study further explores the potential ripple effects of attaining HSI status, including increased funding opportunities, enhanced community engagement, and promoting a diverse educational setting that benefits all students. Through this research, CSU aims to identify best practices and challenges in becoming an HSI, contributing valuable insights to the broader discourse on diversity and inclusion in higher education. The findings are anticipated to inform policy recommendations and strategic planning for CSU and other institutions aspiring to serve the Hispanic community more effectively.

## **Elijah Sandoval**

### ***Cluttered Minds, Hindered Success: Unpacking Hoarding Disorders Impact on Academic Achievement***

This study will examine the impact of Hoarding Disorder (HD) on student success. HD is characterized by difficulty discarding possessions and significant distress or impairment in functioning, and up to 6% of the population meets the DSM 5-TR's diagnostic criteria for HD. Despite its prevalence, little research has explored HD's effects on young adults' academic performance - a crucial aspect of their development and future opportunities. Academic success encompasses peer interaction, engagement in extracurricular activities, classroom focus, material comprehension, and high academic performance.

Participants will be recruited via Mechanical Turk (MTurk), with selection criteria including a 95% approval rating among North American young adults. Participants will complete the 23-item Saving Inventory-Revised (SI-R) to assess hoarding tendencies. Participants will also complete the 21-item Depression Anxiety Stress Scales (DASS-21) and report overall academic success. Correlations will be computed between the SI-R and the included academic success measures to determine whether HD is associated with lower academic

success. Given the success of Cognitive Behavioral Therapy (CBT) in relieving not only hoarding symptoms but also depression symptoms and overall levels of functioning, this study will also incorporate psychologist-led CBT groups to improve academic success.

The objective is to shed light on the relationship between hoarding behaviors and academic achievement, contributing to the scant literature on HD's impact on young adults. This research highlights the need for early intervention and specialized support for students with HD, promoting academic success and addressing HD with the same rigor as other psychological conditions. The findings could pave the way for future research and the development of tailored interventions, emphasizing the importance of understanding and supporting students with unique mental health challenges.

**Ella Smith & Dana Rumer**

***Creating Queer Community in “Fort Closet”***

Fort Collins, Colorado is often referred to as “Fort Closet,” as a result of the lack of a visible queer community. This research project intends to look at the formation of the LGBTQIAP+ community in Fort Collins, Colorado through several avenues including Drag, Community Gathering Spaces, Religious Spaces, NOCO Pride, and more. Rather than taking a traditional modality of research, this process further intends to “queer” the research process by involving other queer individuals as “co-researchers” rather than individuals who are being researched on. Different individuals in Fort Collins who participate in the queer community were interviewed including Krissa Gonna, a noted Drag performer in NOCO. Given the number of students who move to Fort Collins every year to attend Colorado State University, the creation of a queer community is vital to ensure students feel supported. Although there is a considerable amount of hate and animosity towards the LGBTQIAP+ community in Fort Collins, this project intends to take the focus off of the hatred and instead put energy into those who combat the hatred with love.

**Emika Buschow & Lilianna Nono**

***Celebrating 40 Years with the Asian Pacific American Cultural Center (APACC)***

APACC reaches its 40th anniversary in November of this year. APACC, the Asian Pacific American Cultural Center, serves students identifying as SWANA, South West Asian and North African, and APIDA, Asian Pacific Islander Desi American. We are celebrating a center that has been a home for numerous students, allowing them to build connections and create a safe space. Throughout this project, we visited the university archives, interviewed fellow APACC members, and reviewed photos from over the years. At the archives, we scanned through scrapbooks, newspapers, posters, and documents. We interviewed the APACC staff, alumni, and students in order to create an insight on what APACC meant to each individual. We assessed photos that captured moments of time, allowing us to better understand how APACC supported students, such as community events. We have reviewed content from the beginning of APACC to its current self, watching its name change a total of three times but maintain its overall identity. All these components have shown us how APACC grew as a center and continues to fulfill its purpose of providing a community. In April, during Asian American Pacific Islander heritage month, we celebrate the center that has been home for several students identifying as APIDA or SWANA over the past 40 years.

**Emmalee Diederichs**

***Redefining Presenteeism: Exploring Interdisciplinary Perspectives and Implications for Occupational Health Psychology in the Post-Pandemic Era***

Presenteeism is most often thought of as showing up to work while physically ill and experiencing a decrease in productivity. The realm of occupational health psychology has been concerned with the topic of presenteeism since the late twentieth century. Recent discussion outside of occupational health psychology research broadens the construct of presenteeism beyond the impact of physical illness to also include mental, cognitive, and emotional demands on work. In a post-pandemic environment, I recommend the current occupational health psychology definition of presenteeism be changed, as well as antecedents and outcomes reevaluated. Through my investigation, I examine interdisciplinary research to argue that the current occupational health psychology definition of presenteeism is deficient. Further, I discuss how research in occupational health psychology may change when presenteeism is defined as mental, cognitive, emotional, and/or physical illness at work.

### **Gabriella Guerrero**

#### ***Unpacking Bias: Student Reflections on Racism in Conservation Pedagogy***

This project studies student response to learning about historic and current racism within the field of conservation. The course exposed students to diverse histories of the United States and demonstrates methods to identify personal bias and privilege, examined how legacies of structural social inequalities impact conservation practice and policy today, explains just frameworks to approach ecological research, and challenges students to consider meaningful ways to engage in ethical conservation practice. My mentor, Erin Weingarten, co-developed the graduate-level course with a colleague on social justice in conservation science and practice. This course was offered in Fall 2022 with an enrollment of 20 graduate students, 15 of which opted into the study. I became involved in this research study in the Fall of 2023 after joining the SUPER Program at CSU and getting the opportunity to be taken on by Erin as a mentee. The conservation graduate students wrote three written reflections throughout the semester. The aim for these reflections was to track student response to learning about the course content. All three reflections asked questions that were hoping to understand why students took the course, what topics felt challenging or surprising, and how they felt they have personally grown. Codes and themes were pulled out by a qualitative coding process and have been interpreted by our coding team. We will qualify experiences of student change by reflecting on how the course impacted students emotionally, how it may have altered their career goals, and how it allowed students to operate with increased self-awareness. Conservation biology and ecology programs often privilege Western points of knowing in education systems. We expect the findings of this study to demonstrate the importance of teaching historical context, community led conservation practices, and unpacking researcher positionality in order to practice ethical conservation.

### **Georgina Magana**

#### ***The Importance of Inclusive Spaces for the Hispanic Community***

Many Factors affecting the gap between Hispanic individuals and their communities include language barriers, educational disparities, and a lack of social support and accessible resources. These issues create a barrier between Hispanic people who have migrated and have not been able to settle in and don't understand how to navigate a new country. Inclusive spaces like cultural and resource centers intend to empower and educate people in the Hispanic community who feel the desire to advance their education, learn new traits, or utilize resources that will benefit them. Through the use of multifunctional seating and rooms, users will have the flexibility to use the space as they desire to fit their needs. Multiple community spaces will be provided so users can grow stronger connections with one another and strengthen their community. The sense of familiarity will encourage them to participate more and create the desire to come back. Inclusive spaces are designed with multifunctional seating and rooms, offering users the flexibility to tailor the space to their needs. Multiple community areas foster stronger connections among users, promoting familiarity, participation, and repeat engagement. While not a substitute for formal educational institutions, these centers help individuals overcome the fear of learning new things later in life. Through past case studies that show the effects that an inclusive

environment has on the Hispanic community; As well as seeing the design approaches and psychological theories being used in order to create these spaces, it will further emphasize the importance of inclusive spaces.

### **Hannah Gilliard**

#### ***Measuring and Improving Undergraduate STEM Students' Inclusive Science Communication Skills***

Inclusive Science communication bridges the gap between science and society by bringing in different perspectives using inclusion, equity, and intersectionality. Science communication has historically been inequitable, with certain voices and perspectives holding the power and promoting some ways of knowing over others. Currently, there are no ways to measure inclusive science communication or the effectiveness of science communication trainings that focus on inclusive approaches. The purpose of this research was for us to develop a scale to measure inclusive science communication and validate it using factor analysis. We also evaluated its use, by incorporating the scale into specific training, focus groups, and cognitive interviews. We used the Theory of Planned Behavior to design the survey to measure beliefs, norms, self-efficacy, and intent. To statistically validate the survey, we used Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) following previously published methods. EFA showed what patterns exist within the survey items and CFA confirms the survey items fit as hypothesized within the Theory of Planned Behavior. We also used quantitative and qualitative data to make sure the survey performs the way we intended. We were able to confirm that our 26-question survey fits our four factors of beliefs, norms, self-efficacy, and intent. Our quantitative data confirmed that our survey will work in a real world setting and our qualitative data showed us how we can improve and execute the survey in a more efficient way. From what we learn, we can measure how students think, plan, and do with incorporating inclusive science communication. We now plan to develop an intensive inclusive science communication mentorship program to support students from underrepresented backgrounds and track how that impacts their inclusive science communication beliefs, norms, self-efficacy, and intents as well as their sense of belonging, self-efficacy, and science identity.

### **Henry Warfield**

#### ***Walking With Tree***

Importance: Identifying if a non physical reward can affect daily behavior in individuals so that more cost effective and widely available therapy procedures dealing with PTSD and Trauma.

Methods: A laboratory experiment based on gathering self-reported data of step count from various individuals and then assigning them a group based on their average step count. From there pairing groups and giving the sample group an app that may increase their step count without physical reward.

Key Findings: The findings pointed towards that non-physical rewards do have an effect on daily habits but there was no concrete conclusion due to outside factors that affected the experiment.

Conclusion: The study has potential with concrete evidence to then help with therapeutic procedures for trauma and PTSD related treatments.

## **Inez Jackson**

### ***Military Integration from an Intersectional Perspective***

In the past couple of years, there has been an increase of veterans who hold marginalized identities reintegrating back into civilian society. One group of veterans that face negative health outcomes when integrating back into society is Black women veterans due to holding multiple marginalized identities. By conducting a literature review of how intersectionality impacts Black women veterans and their health outcomes while reintegrating, this will reveal how Black women veterans face worse health outcomes compared to veterans who hold more privileged identities.

An analysis of the current literature, which is separated based on race/ethnicity and gender, concludes that the disparities Black women veterans face is rooted in social factors in the United States. Some of these social factors include stigma around seeking help as well as racism and sexism that create unique structural barriers. By acknowledging the health disparities that Black women face when reintegrating, this literature review reveals that programs like Veterans Affairs should incorporate intersectional frameworks to better address these disparities and reduce structural barriers within the system. Such frameworks offer important insights for how to decrease health disparities, hopefully leading to a more equitable outcomes for all veterans especially those with marginalized identities.

## **Jazmyne Ewing**

### ***Generational Trauma Impact on Black Students***

The effects of generational trauma on black university students impact many aspects of their lives. The goal of my project is to spread awareness surrounding the mental health crisis in the black community, as it is the least talked about topic within this specific racial group. This project discusses information that shows a correlation between impacted academic performance and health wellness data. Research shows 24% of African Americans achieve a bachelor's degree or higher due to disparities. At CSU, black students make up about 2.38% of the student population. Both of these statistics are amongst the lowest racial groups and have a direct connection with one another. From the small demographic of black students that attend college, many don't attend due to hard life factors. Stigma in the black community has made receiving any type of clinical health for mental health disparities challenging. Many students suffer in silence due to guilt of receiving help or not having the best resources for them to be successful. CSU Health Network only has two black-identified counselors currently active in service. In a field that is meant for inclusivity, there aren't many options for certain black students to turn to for help. By bringing awareness to the issue, not only can this demographic of CSU students feel protected, it also creates inclusivity in the campus community. Including a black support group that focuses on generational trauma and mental illness can help students share their experiences and build healthy relationships. Being a black student at a predominantly white institution can have challenges with learning to fit in and adapting to a new environment. These challenges can make having a mental illness harder to work with.

## **Jennifer Litzau**

### ***The Appropriation of Salvia Apiana (White Sage)***

What are the impacts of smudging or cleansing a space if you are of non-Indigenous descent? The trend of burning Salvia Apiana or white sage by appropriating Indigenous traditions has caused a white sage black market and a shortage within Native communities. One can find spiritual kits from amazon and Walmart, which include fat white sage bundles. Salvia Apiana is native to Southern California and Northwestern Mexico. Native peoples from this region have been harvesting this herb and using it in rituals for generations. There have been reports of illegal harvesting of the plant including poachers coming with pickup trucks and ripping out entire plants. Poachers have even stolen sage from secret communal grounds and private properties in southern

California. A conservation group has drafted legislation for California to expand protections to all sage and mandate retailers to trace their sage to sustainable farms. With education, policy, and awareness spread about *Salvia Apiana* we can make positive change. Indigenous peoples were forbidden and killed for practicing their traditions for hundreds of years. Now they face their practices extinction because capitalism has turned sacred smudging into a trend. We can implement laws to protect white sage and deter cultural appropriation. Other cultures burn different herbs for sacred rituals. I would like more people to explore their family heritage and learn about sacred plants. One alternative is investigating one's own familial lineage to discover what their ancestors burned for protection. One can also grow these herbs at home to ensure sustainable harvest.

**Kelli Lane**

***Inequities in Paradise: A Historical Examination of Government Rhetoric, Economic Realities, and the Maya Train Development***

This comprehensive analysis delves into the pronounced dissonance characterizing the Mexican government's discourse on the tourism sector and its ramifications for local employees, with a specific emphasis on the ongoing development of the transformative Maya Train (El Tren Maya). Despite consistent governmental assurances of augmenting wages and improving living standards for those involved in tourism, a substantial incongruity persists between these promises and the harsh realities faced by workers. The historical trajectory unravels a persistent pattern wherein the economic benefits originating from the sector predominantly favor foreign investors, prompting critical inquiries into the prioritization of attracting foreign investment over safeguarding the rights and welfare of domestic workers. As we navigate this exploration, heightened emphasis is placed on scrutinizing whether these historical disparities endure or if new dynamics unfold within the context of the monumental Maya Train (El Tren Maya) project, which stands as a pivotal infrastructure initiative shaping the future of Mexico's tourism landscape.

**Kevin Salazar-Martinez**

***Cognitive Behavioral Therapy : Teen Perspective***

Cognitive Behavior Therapy (CBT) is an intervention aiming to affect a patient's thoughts, emotions, and behaviors to improve mental health. In practice, CBT helps those who have dysfunctional ways of thinking, as it teaches how negative emotions alter feelings and actions. This project focuses on teens participating in a CBT program to evaluate how their lived experiences align with how CBT is administered, specifically emotions and behaviors. Using recorded sessions of the "Blues Program" CBT intervention alongside a review of the corresponding manual, I selected themes important to emotions and behaviors. I then reviewed the literature to determine the taught association between adolescent behaviors and feelings. After a thematic and literature review, I determined CBT is fundamentally taught to teens using the visual of a triangle, showing how "feelings", "thoughts", and "actions" are connected and affecting each other. During thematic review, it was determined that feelings are difficult to change directly, the key point being "change how you think and act to change how you feel". The connections between feelings and actions is taught as "how your feelings make you act" and "how your actions make you feel". Review of teen's responses during a CBT intervention revealed that adolescents discuss changing behavior to affect emotions, more often than shifting thoughts to affect emotions. Based on the literature, CBT is a solid intervention, but from the recorded sessions, teens' understanding of CBT indicates teens may benefit from a branch of CBT focused just on affecting behaviors to change feelings.

**Miguel Lopez**

***Mental Health Resources at CSU***

Mental Health is an important topic that needs to be taken more seriously, especially when it comes to college students. As college students, multiple things are going on in their daily lives that make things extremely overwhelming. The goal for my project is to work with CSU Health and Medical Center to create a better system for students to get the resources that they require. With my project, I have met with Janelle Patrias who works at CSU Mental Health Center to discuss and ask questions about the program and what is offered by the school. After having the meeting and looking over CSU's Health and Medical Center, I have noticed that there are a lot of resources that are provided by the school, but there is difficult access to those resources. This is something very important to me because students should be able to easily access the resources that they are offered. Since making appointments with academic counselors is simple enough, mental health counselors should have the same procedure

### **Keyaria Ivey**

#### ***Female Genital Mutilation: A Battle Between Cultures***

Female genital cutting is a cultural practice that takes place in northeast Africa, the Middle East, and parts of Asia. This is a procedure performed often in secret and without consent on young female children. While the practice has shifted towards a more medically standard procedure, there is still a large amount of pushback due to its physical and psychological consequences. The difference in opinion largely lies between communities, with some stating that the practice is a cultural tradition and others sporting it as oppressive and a violation of human rights. Though there have been a multitude of attempts at banning the practice. Such attempts have been unsuccessful due to deeply rooted cultural beliefs and failure to enforce legislation. When questioning the morality of such women's rights and well being should be centered while carefully considering a culturally sensitive approach.

### **Lauren Banas**

#### ***Navigating the Tension Between Safe and Brave Spaces***

Safe spaces are characterized by ensuring, which is often hard to do, both physical and psychological safety. Brave spaces embrace criticism and debating or dialoguing different ideas and perspectives. The conversation between "Safe" and "Brave" spaces has been ongoing for years, with scholars in constant debate over whether one holds precedence and efficacy over the other. Several settings have been examined under the lenses of safe and brave, and the cacophony of research surrounding the subjects suggests adherence to promoting these ideals is applicable in virtually any setting. An examination of pre-existing research on these spaces finds that despite the constant tension between the polarities of safe and brave, to maximize the potential of deliberative discussions, protect freedom of speech, and maintain the physical and psychological well-being of participants, a balanced combination of these terms is needed. Research also shows that certain situations may require an emphasis on one over the other. This project examines the tension between the terms and explores the application and navigation of these terms in a deliberative setting and within Colorado State University's Center for Public Deliberation. This project aims to differentiate between safe and brave spaces and provide individuals with the knowledge and skills necessary to know how and when to utilize one "space" over the other. Furthermore, this project intends to result in a theoretical proposal for the CPD to utilize in the creation of its training and course materials, with the potential for this research to expand externally to other educational institutions.

### **Lauren Fox**

#### ***A Social Ecological Approach to Youth Mental Healthcare in Architecture***

Youth in the mountains of Colorado lack equitable access to mental health resources due to existing barriers to access, such as negative preconceptions, lack of information about mental healthcare, and the limited health intervention referral process. This gap is addressed through this project's proposed design of a mental

healthcare facility adopting a social ecological approach. This approach honors the importance of community and social interactions in growth and development as a main contributor to youth mental health. The objectives are to provide more equitable access to these resources, create an inclusive environment for neurodivergent users, and to approach mental healthcare from a lifestyle and community standpoint. The methods and procedures used to achieve this include a literature review to identify the current gaps and user needs, building analysis, code compliance analysis, and design development. The design for this community oriented, multi-use facility – the Mountain Youth Center and Aspen Mental Health Clinic – focuses on environmental comforts such as acoustics and safety as well as the importance of creating a safe place away from work or home. The design concept is inspired by aspen trees symbolizing support, growth, and energy – a catalyst for the project's objectives. This facility allows users a more lifestyle-oriented form of access to mental health care, as well as providing emergency care, and mental health education. The project's proposition of facilities like this addresses the rising concerns for youth mental healthcare and can avoid the barriers which keep patients from getting the help they need.

### **Madeleine Kamberg**

#### ***Artificial Intelligence usage and GPA: How Are They Related?***

School of Social Work's AI Usage and GPA

Jean Broussard, Madeleine Kamberg, Jean Loomis, Quinn Schneider & Angelita Wilson

School of Social Work, Colorado State University

SOWK 300: Research in Applied Professions

Students of SOWK 300 - Research in Applied Professions asked the question, "Is there a curvilinear relationship between the use of AI, and the GPA of students majoring in social work at Colorado State University?"

Researchers wanted to know if GPA (the dependent variable) is at all affected by AI use. (the independent variable) Researchers predicted a curvilinear relationship. That could be considered a positive trend but with diminishing returns.

Researchers conducted a survey for an observational study with a cross-sectional design open from 10/26/23 to 11/14/23.

The study was designed to be confidential rather than anonymous because some of the demographic information collected could be identifiable. Researchers included aspects of anonymity so that participants could feel comfortable self-disclosing.

This presentation aims to share the results of the study, and some other revealing information about the nature of AI use in Academia here at CSU.

### **Maggie Boyd & Serena Gouverneur Torres**

#### ***Bias in ChatGPT***

The goal of our academy's research is to investigate possible bias within ChatGPT, inspired by AI's growing popularity. Due to its widespread availability, the concern that it can introduce or fortify prejudice to its user base has risen.



We began by conducting a comprehensive literature review in order to educate ourselves on the way bias had appeared in previous studies and what forms of bias we should look out for. Deciding to focus on ChatGPT, we then developed character profile prompts to give the program that would give us sufficient information about the bias that may be present in areas such as LGBTQ+ communities and socioeconomic status. We repeated each of the prompts to ensure consistency in our results, as well as analyzing the responses individually and as a group.

We have found ChatGPT to be limited in its ability to generate realistic character profiles. It is repetitive and has restrictive explorative abilities, to the point that its lack of variety leads to responses that are offensive or stereotypical. When it comes to generating realistic examples of people, ChatGPT's characterizations often have ignorant ideals and arbitrary correlations between identities and life experiences.

### **Marwa Aryan**

#### ***Islamic Prayer Rooms in the School and Workplace***

The goal of this project is to analyze how the Muslim community is able to fulfill their prayer obligation in their school or work setting and why prayer rooms should be standard in commercial buildings. In Islam, Muslims are obligated to perform prayer five times a day, and prayer times often overlap with work and school schedules. It is a standard in Muslim countries that mosques are within walking distance to accommodate the daily prayer requirement, but current American infrastructure does not necessarily accommodate the Islamic prayer requirement. To shed light on why school and workplace prayer room availability is significant for Muslims, I will develop a survey to be administered to 25-30 Muslims in Colorado. The survey consists of demographic questions as well as questions about prayer frequency, prayer room availability, and how prayer rooms impact their ability to practice their faith, etc. This survey is at the heart of this research, in order to understand community needs, accommodations, and how Islam is practiced in public spaces. I expect, based on previous research, that the Muslim community struggles to practice their faith without prayer rooms in their school and/or workplace. As sampling continues, more information will be available pertaining to prayer space accommodations. It is imperative that Muslims, and people of all denominations, are able to carry out their daily prayers in a safe environment. Commercial buildings should include prayer rooms to embrace the identities of their Muslim students, coworkers, and community members.

### **Melissa Gonzalez**

#### ***The Tastes of CSU: A Proposed Study of Perceptions of Ethnic Foods Among Traditional Aged College Students***

Despite demographic trends in the United States showing an increase in diversity, especially among our youth, the dietetic workforce remains predominantly white. The implications of this are drastic for the health and well-being of the population at large due to the precedents of Eurocentrism in food representation regarding health. To gain a larger scope of understanding of how this precedent affects a population, my research will focus on the perception of ethnic foods within traditional aged college student populations. There will be further exploration of variabilities of factors such as socioeconomic status, regional/generational attitudes, food

neophobia, biases, and food inequities' effect on the perceptions of ethnic food's healthfulness. A literature review has also shown that social and academic perceptions are skewed when regarding the delineation of terms such as cultural, traditional, and ethnic. These terms will also be explored. This will be researched using an explanatory sequential mixed-method approach to gather data. The quantitative research will consist of a questionnaire, while the qualitative research will be gathered using semi-structured interviews and one-on-one interviews chosen at random within the consenting participants. The proposed methodology will allow for data triangulation, further exposing trends shifting towards more holistic data on said perceptions to explicate any larger themes. Traditional aged college students are ideal candidates for nutritional education and interventions. While exploring current research on this demographic, you can find themes following healthfulness, food insecurity, and neophobia. However, there is still a lack of a holistic connection regarding these factors and globally diverse foods in most academic research.

### **Monica Rodriguez**

#### ***Bridges of Healing: A Collaborative Journey for Caregivers and Children***

My research project seeks to explain the dimensions of Complex Developmental Trauma and explore the transformative potential of Trust-Based Relational Intervention (TBRI) as a groundbreaking healing model for caregivers and their children. This project delves into the core principles of TBRI, a trauma informed model that draws from attachment theory and developmental neuroscience. TBRI emphasizes the importance of building secure relationships, focusing on connecting with children at their developmental level, and empowering caregivers to navigate the complexities of trauma with empathy and skill. This project will encompass an overview of TBRI's attachment foundations, summarizing its key components, including the three core principles; Connecting, Empowering, and Correcting. Through an examination of case studies, literature, and empirical data, this project underscores the role of TBRI in trauma healing and provides an understanding of TBRI's significance in mitigating the impact of Complex Development trauma and fostering resilience within families.

### **Morgan Snyder**

#### ***War of Digital Roses, A Study In The Dissolution of Digital and Physical Alliances***

As the world has turned, new technology and newer ways of connecting others across varying circumstances and locations have become more and more common. As such, political scientists and sociologists have newer fronts of study. One of the most overlooked ones is the study of the social and political bonds formed through gaming. This research aims to study those political connections between players, and their possible geopolitical connections. The main goal was to study these alliances and their downfalls and if they showed

similar patterns to the downfall of contemporary alliances and nations. The methods of this study included looking at the Massively Multiplayer Online Game, EVE Online, and a social experiment in the sandbox game Minecraft, both of which contained elements of geopolitical and social interactions within them, and as such were such tested for similarities. These similarities were compared against the downfall of the nations of the Soviet Union, and Yugoslavia, both major contemporary nations that dissolved in the recent past. The results came to a head with the issue of alienation being their downfall. In each variable, alienation came to a head as the primary cause of their downfall. In terms of both EVE Online and Minecraft, the downfall of the tested player alliances was due to the alienation of allies and increasing authoritarianism. Consequently, the Soviet Union and Yugoslavia's break was due to the alienation of the citizens within them, such as with the revolutions following Glasnost for The Soviet Union, and succession due to Nationalistic forces for Yugoslavia. Using the data found in this study, one could predict outcomes for other nations and alliances in the physical world and thus advise choices that could lead to more stable nations and alliances.

## **Naomi Willhoit & Stephanie Cardiel**

### ***Mindful Partnering***

Romantic relationships affect physical and mental health (Cummings et al., 2007; Robles et al., 2014). Couples tend to share emotions and affect each other's emotions, influencing the physical and mental health of both partners, (Hoppmann et al. 2011). As a result, it is important to develop and test intervention methods to improve romantic function in specific respect to conflict communication. The present study focuses on interpersonal mindfulness, which involves nonjudgemental and non-reactive awareness of the ways that one's words and behaviors affect the internal experience of others, and how another's words and behaviors affect the internal experience of oneself (e.g, Pratscher et al, 2018). Within romantic relationships, interpersonal mindfulness is referred to as "mindful partnering." Data collection for the present study are ongoing. During this study, couples participate in a two-hour laboratory visit. Where they participate in a brief intervention based on mindful partnering. We measure physiological responses to stressful tasks and monitor heart rate variance, respiration, and endo-dermal activity. We expect to find that the incorporation of mindful partnering increases the presence of constructive conflict behaviors, which can be beneficial for couples (Lucas-Thompson & George, 2017).

## **Nini Hania**

### ***Bridging Health Disparities: Empowering Minority Communities for Equity***

Finding practical tactics and solutions to enhance health equity among racial and ethnic minority communities in the US is the goal of this research project. It is hypothesized that health inequalities can be reduced and equitable access to healthcare services can be promoted by addressing institutional barriers, structural racism, and socioeconomic determinants of health. This will ultimately lead to better health outcomes for communities of color. Inequalities in health between racial and ethnic minority groups in the US continue to be a serious public health concern. These disparities are caused by structural racism and socioeconomic determinants of health, which affect healthcare outcomes, quality of care, and accessibility. This research project is important because it seeks to find ways to address these disparities while improving marginalized populations' health and well-being. To evaluate disparities in healthcare among minority groups, quantitative analysis will use national health datasets. Regression analysis is one statistical approach that will be used to find factors related to disparities. To learn about the experiences and priorities of racial and ethnic minority communities on

healthcare access and health outcomes, qualitative research will interview these individuals. To reduce inequities across minority communities in the US, evidence-based interventions, legislative changes, and community-driven projects could be guided by the study project's findings. If the hypothesis is validated, the next steps would involve evaluating the effectiveness of the interventions in improving health equity. If unexpected results arise, more research will be required to determine the root causes of the disparities and adjust strategy.

## **Rachel Nieves**

### ***A Multi-Faceted Approach to Medical Misdiagnosis***

#### **Introduction**

My study of medical misdiagnosis sought to address an issue that I and many people have personally experienced. Medical misdiagnosis affects around 12M Americans a year and can have profound effects on one's life.

## Methods

For this project I used primarily journal articles and books, but I also drew from personal stories shared on an awareness website. I studied this topic from a sociological, historical, educational, and economical perspective.

## Results

In my research, I found that women and minorities are affected proportionally higher than their white male counterparts by medical misdiagnosis. The dark history of medical research, especially in the United States, likely affected the way medical research is done today.

## Conclusion

As I continue to delve into this topic, I look for a solution. Thus far, I have suggested history/sociology classes in medical school, patient empowerment, and insurance reform. I will continue to research innovative solutions throughout the MURALS process.

## **Sharol Vasquez**

### ***Institutional Violence in Healthcare Between Providers and Latino Patients***

Imagine being undocumented (i.e. not a citizen or resident) in a country far from home. Where every system is in a different language, has limited resources, and isn't adaptable to you. This is what many Hispanics/Latinos experience in medical settings. Health disparities have always existed in the system (Jimenez, 2021). Still, Latinos have a higher vulnerability of not receiving the medical treatments and services they need, often due to their immigration status (Jimenez, 2021) or other barriers limiting them from raising their voice (Magana, 2020). The purpose of doing this research is to help share the voices of other Latinos like me who have experienced a lack of resources based on race and privilege. According to Gallarde-Kim et al. (2020), there are four main types of direct and indirect violence that Latinos can experience in the healthcare system: (1) racism, (2) institutionalized racism, (3) personally mediated racism, and (4) internalized racism. This unfair treatment, obstacles, and challenges limit Latinos' access to the medical help that they need. Additionally, undocumented Latinos may feel unsafe seeking medical help because of their immigration status. These factors can lead

Latinos not to trust healthcare providers or feel as though they do not belong when they are trying to address their health-related needs.

## **Sophia Bond & Seth Nuncio-Cagle**

### ***Critically examining chemistry culture to support adoption of multiculturally inclusive practices***

Due to the lack of diversity and representation of P.E.E.R.s (People who are historically Excluded due to Ethnicity or Race) (Asai, 2020) in the chemistry field, we are researching the culture of chemistry to better understand conditions that lead to the exclusion of P.E.E.R.s in chemistry. Our research uses grounded theory, a method of coding qualitative data, such as interviews, as a guide to seek the discovery of patterns and common themes across that data. For this research, we initially used the snowball recruiting methods to recruit more P.E.E.R.s to the research. Interviews consisted of an analysis of their experiences with chemistry culture. With grounded theory, some patterns coded from the qualitative data show that P.E.E.R.s have experienced mistreatment and exclusions to specific opportunities within chemistry. Our research aims to discover the culture of chemistry as experienced by P.E.E.R.s within the field of chemistry in the desire for a more inclusive culture.

## **Tanya Sopkin**

### ***Gay TV: The Importance of Representation***

My research project is exploring the importance of queer representation in media, because historically tokenism and stereotyping has created flat characters that stigmatize groups, create antagonism towards them, and shame for the people within the communities behind represented. Initially, my investigation was analyzing people's opinions on various characters in the show Glee, by sending out a survey asking respondents to rate various characters from 1 to 10 while also collecting demographic characteristics such as sexuality, gender identity, age, race, and political affiliation; the results provided some insight on the importance of creating strong and charismatic queer characters both for the purposes of relatability and acceptance. The most explicit correlation was that lesbians rated Santana, a lesbian, significantly higher than any other character. The other gay characters, like Kurt and Blain, did not get significantly higher ratings on behalf of queer watchers. My findings provide context not only on why queer representation is important, but also how, because simply making characters queer does not make queer watchers feel empowered. Certain aspects such as charisma, strength, and vulnerability which are represented by Santana are vital in creating a well rounded character that makes viewers feel seen and empowered.

### **Tony Ramirez**

#### ***Minority Perceptions of Organizations with Homogenized Unions***

Unions have been codified in the United States since 1935. Union membership and research on unions have remained limited, despite the significant cultural changes these organizations undergo. The author aims to examine the challenges that minorities may encounter when entering established unionized organizations. By employing the Attractions-Selection-Attrition (ASA) process, and considering aspects such as culture, ingroups, and outgroups, the author posits that minority employees face greater difficulties aligning their values, beliefs, and ideologies with both the organization and the union. It becomes increasingly crucial for unions, as they mature, to avoid homogenization and distance themselves from employees who may not find a place within either the organization or the union itself.

### **Tori Teegardin**

#### ***Discrepancy in Inclusivity and Equal Opportunity in the Sciences***

In the pursuit of equal opportunities for individuals with disabilities, it is important to note that achieving absolute parity is somewhat of an unattainable goal. The notion of 'equal opportunities' is an idyllic, utopian concept, fraught with challenges and complexities. The very nature of human bias renders the prospect of completely eradicating discrimination incredibly overambitious and entirely improbable. Biases, whether overt or subtle, permeate our society, shaping perceptions and influencing decision-making processes constantly. Despite the inherent obstacles, I argue that our aim should not be to dismiss the pursuit of equal opportunities as an unfeasible dream. Rather, it is imperative that we acknowledge the multifaceted nature of discrimination and approach it with a nuanced understanding. Instead of striving for a utopian vision of absolute equality devoid of biases, our focus should shift towards fostering an environment where discrimination is able to be consistently contested and challenged. This necessitates a continuous evolution of procedures and policies that actively address biases and promote inclusivity. At Colorado State University, accessibility for disabled students is a multifaceted topic. The student disability center is a great resource, which helps provide accommodations for students and education for instructors. However, there are a lot of areas of CSU that the disability center does not reach. Opportunities, like MURALS and on-campus job prospects, which are run by CSU but not directly associated with the accommodation process present at the institution, do not have the same policies in place to ensure proper treatment of disabled individuals. In addition, when accommodations are in place but are ignored by staff or faculty, the process for correcting this leaves much to be desired. It is particularly disappointing when opportunities specifically designed for marginalized individuals, such as MURALS, discriminate against those they are trying to give opportunity to and do not have strategies



Innovation and Entrepreneurship Abstracts



1<sup>st</sup> Place Winner- Joselle Gyamfi



2<sup>nd</sup> Place Winner- Sadulla Nazrullaev



Rising Star Awardee- Elita Danilyuk

**Jhonnie Porter*****Creating Successful and Sustainable Small-scale Farms in Eastern Colorado***

In an increasingly globalized world becoming less habitable due to climate change, now more than ever do we need to localize our food production to cut down on emissions from the transportation of food. Despite the differences in biomes across Colorado, the state remains as one of the top 25 producers in the country. There has been a steady increase in the number of farms across Colorado over the years, but as land and water costs continue to rise we will see a decrease in this amount over time, particularly in small scale/beginner producers (<1-5 acres). After reviewing agricultural census data and produce sales from the Colorado Department of Agriculture, as well as calculating the investments required to start a small scale farm, I have compiled a series of considerations and methods that, if implemented, would decrease startup costs and increase revenue for new producers. These methods work on the basis of minimizing irrigation use and improving the quality of soil to thereby increase yields while also taking into account the characteristics of the eastern slope of Colorado. With this research I hope to contribute to the success and sustainability of small scale farms in eastern Colorado, and use any feedback to improve upon future research for other regions.

**Johan Yost*****Colorado Coalition for Greenhouse Gas Reduction Through Equitable Vehicle Emissions Testing***

The Earth is warming faster than ever, yet Colorado's greenhouse gas emissions are rising when 38 states' emissions are decreasing. Colorado needs to change course, and a significant positive impact is attainable if Colorado's vehicle emissions regulations are applied equitably to all fossil-fueled vehicles.

Targeting vehicle emissions became a clear solution as I reviewed Colorado's regulations when my car would not pass emissions testing. Only 10% of Colorado's geographical area is required to test, and obtaining an exemption is vastly simple. Instead of applying for an exception, I found an economical and readily available way to make my car pass: convert from carburation to electronic fuel injection. I realized this solution could be part of a statewide solution for every vehicle to achieve compliance.

Due to the policy gap identified by methodological analysis for my own vehicle, I am forming the Colorado Coalition for Greenhouse Gas Reduction Through Equitable Vehicle Emissions Testing. The primary aim is to present a regulation change to Colorado's Air Quality Control Commission. This includes soliciting air pollution experts to join the coalition to, in addition to drafting the regulation change, formulate a business plan to expand emission testing statewide and develop an app to assist Coloradans in locating testing, vehicle repair/retrofitting solutions, and financial assistance.

The resultant outcome will reduce Colorado's greenhouse gas emissions from its transportation sector by an astronomical 99%, launching it to the forefront of the global effort to stop climate change. In closing, Colorado needs to act now; our mountains, trees, prairies, farmland, and people are too beautiful, majestic, and glorious to risk.

**Joy Akintola*****"The Production of Fermented Foods"***

The art of fermentation can best be described as the controlled rotting of food in order to bring out the rich flavors behind it. This process has also been linked to an increase in the available amount of nutrients found within foods. Some studies have connected fermented foods to increase gut health, immunity, and metabolic health.

Across the board, it is important for all the utensils within the fermentation process to be sterilized, this prevents outside germs from interacting with the ferments and making the food unsafe for consumption. All fermented food items are required to be below the PH of 4.6 if intended for human consumption. If this quota is not met Botulism can be introduced to the product as a result of the bacteria *Clostridium botulinum*. When a large amount of this toxin is introduced to ferment symptoms like paralysis or even death can follow in serious instances.

During research, the two items forced were yogurt, a ferment made from milk, and kombucha, a ferment made for tea. When making both of these ferments it was important to monitor the PH of the food to make sure both products were safe for consumption.



## **Mursal Zeerak**

### ***Forging a Community that Nurtures Student Entrepreneurs***

In the STEM-focused academic landscape, the project delves into the challenges faced by students balancing STEM education with entrepreneurial pursuits. As a pre-med major managing a small business, I identified a lack of support for students navigating both realms. Interviews and campus networking explore the existence and interest among student business owners.

The strategic use of social media serves as a central hub for finding student-run businesses, participating in events, and sharing insights. Interviews underscore the interest of students of color (POC) in supporting businesses offering culturally specific services, filling gaps in the local market.

The project's significance lies in addressing challenges faced by student entrepreneurs, facilitating networking, and catering to the needs of minority groups. Results emphasize POC students' interest in supporting niche businesses.

Moving forward, the focus is on creating a targeted community that supports student businesses and encourages collaboration between consumers and sellers. Future plans include meetings, pop-up events, and a centralized contact page to enhance communication within the Colorado State University (CSU) community. This research provides a foundation for refining the project's direction, ensuring alignment with the needs of the diverse CSU student body. The goal is to cultivate a well-integrated community where students can seamlessly pursue educational and entrepreneurial aspirations, supporting each other in the process.

## **Yoseline Rivera**

### ***Campus Safety***

The objective of this initiative is to enhance campus safety and accessibility by providing students with easy access to resources and support through a mobile application. Initially focused on facilitating reporting and fostering a sense of security, the project garnered positive feedback from students regarding the necessity and desirability of such an application. Recognizing the importance of accessibility for all students, the project expanded through collaboration with campus organizations to identify key requirements. Our ultimate aim is to empower students to feel safer on campus by streamlining access to essential resources, including a panic button feature for real-time check-ins during walks and simplified reporting mechanisms. While existing tools offer similar functionalities, their complexity often deters student engagement. Through iterative development and collaboration, we aim to create a user-friendly platform that ensures every student can easily access safety resources. Plans include opening the project for contributions from the broader CSU community and fostering ongoing improvement and innovation in campus safety initiatives.

# Student Choice Poster Winners 2023



## 3<sup>rd</sup> MURALS First Year Scholars Cohort 2023-24





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