# MURALS

MULTICULTURAL UNDERGRADUATE RESEARCH
ART AND LEADERSHIP SYMPOSIUM

**March 31, 2023**
**LSC Grand Ballroom**

COLORADO STATE
UNIVERSITY

# MURALS Schedule

| | | |
|---|---|---|
| 7:30 - 8:15a | Registration and check in with breakfast | LSC Ballroom B |
| 8:30 - 8:45 | MURALS Overview and Welcome! | LSC Ballroom C&D |
| 9:15 - 10:15 | Presentation **GREEN** | See page 5 |
| 10:30 - 11:30 | Presentation **GOLD** | See page 5 |
| 11:45 - 1:00 | Official University Welcome/Luncheon<br>Alumnus speaker | LSC Ballroom C&D |
| 1:30 - 2:45 | Poster Presentation | LSC Ballroom A |
| 3:00 - 3:45 | MURALS Alumni Panel | LSC Ballroom C&D |
| 4:00 - 4:30 | Awards Ceremony | LSC Ballroom C&D |


MURALS 2022 Participants!

# Welcome!

Welcome to the eighth annual Multicultural Undergraduate Research, Art, and Leadership Symposium, we truly appreciate your presence. MURALS exposes students across a variety of disciplines to undergraduate research opportunities.

MURALS, in its 8th year, has become a true student success campus-wide collaborative initiative that is made possible through efforts and dedication across campus. These efforts have demonstrated dedication and measurable outcomes that ensure historically racially marginalized students are affirmed in their educational efforts 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:**

Rachel Huff

India Luxton

Beth Wittmann

Kayl Ecton

A sincere thank you to all graduate students who served as Graduate Student Evaluators, and to all faculty guides, evaluators, and day of volunteers!

Bridgette Johnson

Assistant Vice President

Office for Inclusive Excellence

# Schedule of Presentations

| **Presentation GREEN 9:15-10:15** | **Presentation GOLD 10:30-11:30** |
|---|---|
| **LSC 120 (Career Center)** | |
| Welcome/Introductions | Welcome/Introductions |
| 112- V. Montez (SSH) | 107- V. Mora (STEM) |
| 68- A. Olson-Gwin (STEM) | 59- A. Tekeste (SSH) |
| 29- F. Miller (SSH) | 65- V. Peterson (STEM) |
| 123- B. Anderson (STEM) | 114- H. Troyan (STEM) |
| **LSC 134 (Campus Activities)** | |
| Welcome/Introductions | Welcome/ Introductions |
| 67- Y. Kc (SSH) | 19. A. Bui (SLL) |
| 122- M. Voigtsberger (STEM) | 34. G. Harrison (SSH) |
| 12- M. Lopez (SLL) | 89. K. Yee (STEM) |
| **LSC 144 (Fraternity and Sorority Life)** | |
| Welcome/Introductions | Welcome/ Introductions |
| 108- J. Reyes (STEM) | 41. E. Danilyuk (IE) |
| 35- C. Valdez (SSH) | 73. T. Smith (STEM) |
| 24- A. Quesada-Stoner (SLL) | 61. C. Worgen (STEM) |
| 121- M. Haynes (STEM) | |
| **LSC 212** | **LSC 300** |
| Welcome/Introductions | Welcome/ Introductions |
| 38- V. McMillan (STEM) | 50. M. Gonzales (STEM) |
| 98- G. Jonasson (STEM) | 48. A. Singh (STEM) |
| 76- R. Workineh (SSH) | 42. J. White (SSH) |
| | 62. K. Kaibetoney (STEM) |
| **LSC 226** | |
| Welcome/Introductions | Welcome/Introductions |
| 120- A. Cho (STEM) | 77. D. Lopez (SSH) |
| 72- S. Mohamed (SSH) | 119. M. Buscietta (STEM) |
| 8- J. Ibarra (SLL) | 82. E. Ocampo-Lara (SSH) |
| 55- C. Kling (STEM) | 127. B. Tefera (SLL) |
| **LSC 228** | |
| Welcome/Introductions | Welcome/Introductions |
| 21- J. Nicoly (STEM) | 94. T. Nguyen (STEM) |
| 86- J. Nava Ruiz (SSH) | 64. J. Retland (SSH) |
| 26- P. Jordano (STEM) | 105. I. Prosceno (STEM) |
| 30- B. Hollis (STEM) | 40. J. Collins (STEM) |

**LSC 304**

Welcome/Introductions
10- A. Wilson (SSH)
71- A. Boyle (STEM)
9- J. Duenas (SSH)
125- A. Bushara (STEM)

Welcome/Introductions
106. E. Barrett (STEM)
101. H. Bean (SSH)
23. H. Wireduwaa (STEM)
74. S. Allen (STEM)

**LSC 306**

Welcome/Introductions
117- D. Oh (STEM)
4- M. Carrizales (CA)
75- P. Shirley (STEM)
15- E. Carlsen (STEM)

Welcome/Introductions
25. M. Wang (STEM)
113. M. Bruce (SSH)
102. L. Ho (STEM)
11. L. Walker

**LSC 308**

Welcome/Introductions
70- K. Mayorga (SSH)
14- M. Paul (SLL)
16- S. Kairamkonda (STEM)
17- C. Donnelly (SSH)

Welcome/ Introductions
126. E. Nike (STEM)
87. G. Poitra (SSH)
22. S. Nazrullaev
103. M. Gruszczynski (STEM)

**LSC 310**

Welcome/Introductions
115- G. Symanski (STEM)
100- R. Luo (CA)
18- A. Yu (STEM)
81- A. Soares Pereira (SSH)

Welcome/ Introductions
104. E. Wheeler (STEM)
90. D. Vargas-Jurado (CA)
116. R. Adams (STEM)
45. A. Hey (CA)

**LSC 312**

Welcome/Introductions
53- G. Racine (STEM)
124- J. Litzau (SSH)
2- C. Narby (STEM)
77- D. Lopez (SSH)

Welcome/ Introductions
118. J. Olivas (STEM)
92. V. Silva (SLL)
33. R. Janapati (STEM)
44. H. Von Behren (SSH)

**LSC 322**

Welcome/Introductions
46- D. Hopper (SSH)
49- A. Holzer (STEM)
97- H. Obuna (SSH)
43- M. Ryan (STEM)

Welcome/ Introductions
54. L. Williams (SSH)
52. K. Donahue (STEM)
63. J. Lapham (SSH)
69. A. Rust (STEM)

**LSC 324**

Welcome/Introductions
110- M. Thompson (SSH)
60- K. Ballard (CA)
99- J. Erickson (STEM)
31- N. Hatch (STEM)

Welcome/ Introductions
27. K. Mutmansky (STEM)
39. T. Weiland (SSH)
91. E. Jensen (STEM)
28. E. Oredson (SSH)

**LSC 328**

Welcome/Introductions
3- G. Flores Rojas (CA)
1- J. Love (STEM)
85- A. Patel (STEM)

Welcome/Introductions
5. J. Negron (STEM)
7. M. Armendariz (SSH)
128. J. Gyamfi (IE)
88. K. Tran (STEM)

**LSC 330**

Welcome/Introductions
93- S. Maskey (STEM)
20- L. Li (SSH)
36- M. Dia (SSH)
58- T. Teegardin (STEM)

Welcome/ Introductions
56. A. Goodrich (STEM)
111. M. Nokes (STEM)
57. A. Ornelas (SLL)
47. S.S.Y. Tun (STEM)

**LSC ASCSU Chambers**

Welcome/Introductions
78- A. Nash (STEM)
80- B. Dowden (STEM)
13- A. Tekeste (SLL)
95- A. Kruis (STEM)

Welcome/ Introductions
37. J. Small (STEM)
83. A. Kalla (STEM)
79. T. Johnson (SSH)
107. P. Espinoza (STEM)

***A special thanks to Colorado State University Board of Governors for providing funding for the pilot program MURALS FIRST YEAR SCHOLARS ACADEMY - huge success with promising results***

***A heartfelt thanks to all MURALS donors who give without condition***

***A sincere thanks to the Community for Excellence - COSI CPP Grant***

# MURALS

VISUAL, CREATIVE AND PERFORMANCE ART ABSTRACTS



**MURALS 2022 Winner- Malia Berry**

**Gerson Flores Rojas, #3**

***First Gen Story***

This project is a creative short video/film/episode inspired by the stories I've been surrounded by my whole life. While this story is fictional it is based on real life events and reflects the story of many first gen students across the nation.

This story revolves around a young college student living as the son of undocumented immigrants highlighting his struggles, his work and his life in general. Using the interviews from first gen students at CSU while also adding elements from other peoples stories I reflect on my own story as a first gen student.

In the beginning stages of the project I held over 10 student interviews ranging between 5 minutes to 30 minutes and a couple faculty interviews. But through the whole process I felt I was lacking a theme, a mission, a message. I set off with the purpose to bring more awareness to first gen student experiences at CSU but I didn't know what that meant. The interviews gave me the shift I needed. We were all children of immigrants, some were undocumented, all were low income. The experiences we hold are not the same but they are eerily similar.

Though I am not undocumented, my parents are and I know far too well the struggles that come with that. Bringing humanity and awareness to undocumented families and communities will highlight the experiences of first gen students coming into higher education.

The end goal of this project is to draw attention to DACA rulings, representatives that stand for and against it, and to broadcast the story of first gen students to a wider range of people.

**Mikayla Carrizales, #4**

***Humans in Nature***

The goal of these pieces is to convey the importance of interaction that humans have with nature. I used white stoneware to create coil bowls as the bases for my pieces. I then hand crafted the coral, rocks, and houses, carefully attaching them to the bowls. After firing, I brushed satin and Potter's Choice glazes to create dimension and natural diversity.

The Scandinavian coastline piece demonstrates how humans built upon the rugged terrain, unifying their way of life with the natural landscape. They created homes and families while embracing the organic beauty of the coastline, using the rocks and the water to their advantage.

On the other hand, the coral reef represents the natural beauty that has been destroyed. Through the development of the human race, we have destroyed the most biodiverse ecosystem that benefits Earth's nature as a whole. Coral reefs are a significant place of refuge, a means of survival, and a symbol of diversity. We should be protecting such a spectacularly natural complex.

I crafted these pieces with this message in mind. I am passionate about caring for the world around us and embracing its gorgeous diversity. This includes the people that have both destroyed and accepted the natural landscapes. How can we as humans work with nature to build up both society and the natural beauty that has been given to us?

**Alex Hey, #45**

***Noise Pollution in a Developing World***

This student-made documentary sheds light on the issue of anthropogenic noise pollution and its impact on the natural world. By creatively displaying an often-unheard auditory issue, the short film showcases the unique partnership between Colorado State University and the National Park Service to collect and analyze acoustic data to better manage noise levels in our natural spaces.

To gather information, I conducted interviews with faculty members at Colorado State University and collaborators at the National Park Service. The experts discussed the effects of noise pollution on the environment and human health. In addition, they provided valuable insight into the effects of noise pollution on wildlife, such as behavioral changes, hearing loss, and how noise pollution can affect the reproduction and survival of some species, leading to long-term ecological imbalances.

The documentary reveals how noise pollution is not just limited to urban areas but also affects remote and natural environments, including national parks and wilderness areas. The film highlights how human activities are causing increasing levels of noise pollution, making it one of the most pervasive environmental problems of our time.

Additionally, the project features Colorado State University undergraduate students who participate in analyzing acoustic data from national parks, which is then used to implement real-world changes in noise management. The documentary emphasizes the importance of preserving natural soundscapes for the health and well-being of visitors to national parks and how exposure to natural sounds has numerous benefits, such as reducing stress, improving cognitive function, and increasing overall happiness.

**Kyla Ballard, #60**

***The Language of Ligaments***

The Language of Ligaments is an exploration of life with a disability through the lens of poetics and language. As a person with both physical and mental health limitations, as well as an active caregiver for friends and family members with disability, I seek to draw out the meaning between my collected stories. During the span of this project, I collected fragments of language in the form of prose, poetry, and interview notes to catalog the direct experience of those affected by disability. With my fragments, I began to piece together connections that placed a diversity of moments into relationships with each other. As I traced these relationships, I used the intense pressure of poetic forms and literary storytelling to reflect upon the peaks and valleys I had experienced with my disability. Drawing upon my found connections, I transmuted the raw experiences into a spoken word poem that aims to share my journey through the world as a young woman with disability. With this poem, I seek to give a voice to the disabled community and to provide a source of connection through which they can see their own stories reflected within my words. As the practice of poetry has provided me with a path through which to regain a sense of purpose and comfort within my identity, my poem will provide an example that others can follow to reflect on their own difficult experiences.

**Chenyi (Roy) Luo, #100**

***Conservation and Promotion of Historical Architecture and Local Culture through Designing a Cultural Complex in Shanghai, China***

This research-based design project intends to create a cultural center as a commercial model that demonstrates sensitivity to culture and consideration for locals in the preservation and revitalization of old districts. Shanghai's early modern history of colonization has resulted in the mixed-style architectural fabric of the city. The design of each historical dwelling incorporates the traditional style with wooden frames and brick walls in the original structure with Western neoclassical features, including pediments on the building facades. Concorde Culture Center used a modular prototype based on the history and an industrial concept of contemporary culture. The culturally oriented design was informed through user research, material analysis, and precedent study. The cultural center comprises two sectors: the West building, with a museum and a theater, and the East building, housing a commercial complex with retail and dining spaces. The museum contains a historical exhibition structure, and the theater accommodates a variety of performances and serves as a location for cultural festivals and community gatherings. The commercial complex provides a diverse range of local to premium products and cuisine to meet the needs of a variety of visitors, as well as a unique perspective of the real historical site. The space emphasizes local materials and colors to symbolize the culture and provide an appropriate amount of instructional content. The Concorde Culture Center can also serve as a tourist hub that contributes to enriching the local culture and to the economic growth of the local community.

**Dalia Vargas-Jurado, #90**

***Coping and learning through literature: A creative tool to help children cope with difficult subjects.***

Adverse childhood experiences are traumatic experiences that occur in childhood that encompasses emotional and physical abuse, neglect, and household dysfunctions. Classrooms have begun to make spaces for children with adverse childhood experiences to grow and thrive. However, if possible these spaces should bleed into home life. This project takes on the research done about how to cope with adverse childhood experiences and turns it into a creative outlet for children and a guide for parents. With the research collected, a story was formed to help children deal with adverse childhood experiences specifically having a family member with a chronic illness. This is done by adding elements of self-regulation of emotions, social enrichment competence, and other social and emotional wellness standards. In situations such as these, in which it is strenuous on all parties involved, it becomes increasingly difficult to navigate and care for the children involved. It is important to build a guide for parents and children to help them work through these issues. This project focuses on creating a narrative that will validate the child's feelings while also advising parents on how to have difficult conversations and navigate these issues at home. The book intends to help children understand their emotions and be able to vocalize them and help parents navigate difficult situations. Further research will need to be done to understand the impact this book will have on children and parents.

SERVICE LEARNING & LEADERSHIP ABSTRACTS

**MURALS 2022 1st place Winner- Joel Ibarra**


**MURALS 2022 Social Justice and Inclusion Award Winner- Bemnet Tefera**

**Joel Ibarra, #8**

***Construction Management First-Generation & Multicultural Mentorship Program***

Undoubtedly, first-generation and multicultural (FG&MC) students experience systematic barriers that make pursuing higher education more difficult. In the construction industry, this barrier is an even more significant burden for FG&MC students pursuing a career in the field.

The construction industry and construction management program at CSU is demographically white male dominant, compared to FG&MC individuals, creating an atmosphere that is not inclusive and challenging to navigate for FG&MC students. In response to this issue, the Construction Management First-Generation and Multicultural Mentorship Program was designed and is supporting the first cohort of undergraduate students during the Spring semester of 2023. The FG&MC Mentorship program focuses on fostering supportive relationships in a mutual aid approach that supports undergraduate FG&MC students to build confidence, develop career skills, and increase construction-self efficacy.

**Lexi Walker, #11**

***The Intersection of Oral Health and Overall Health within the Homeless Population***

When my  family was diagnosed with a rare auto-immune disease, it sparked my interest in the dental field due to the disease having a large effect on his oral health due to treatment of his disease including steroids and chemotherapy. Over the course of my education, I have come to realize that so much of our overall health is affected by what is going on inside of our mouths. According to the CDC, “Oral conditions are frequently considered separate from other chronic conditions, but these are actually inter-related. Poor oral health is associated with other chronic diseases such as diabetes and heart disease.” As a local volunteer myself, I can say that there is not specific work being done on the issue of dental hygiene in Fort Collins regarding homeless or low-income people and families.

For my project, I have necessary oral hygiene practices, chronic diseases, homelessness and all correlations between these topics.

I have been able to network with local dentists and get donations of toothbrushes, toothpastes, and floss that people usually get after every hygiene visit. I have packaged and distributed these to the local homeless people that I serve at the Fort Collins Rescue Mission. I distributed one bag to every person when they were receiving their meal with an informational pamphlet regarding the importance of dental health & overall health. I also supplied over 1000 dental hygiene items to the women and children’s shelter in Fort Collins. My goal was to help fill a void by supplying resources and educating others to help improve dental hygiene in hopes that their overall health will improve as a result.

**Alondra Enriquez, #96**

***The Expansion of Learning***

As an individual myself I have become curious about things that are produced in agriculture and what I can gain. For example, how food gets to the table, how it is produced, where it comes from and who is working to make these things happen. There are many people who may be asking these same questions to themselves and would like answers. I personally have had the opportunity to take agriculture classes in high school where I learned about crops, animals, fibers, and much more. My goal is to create a solution to this problem of many people not having the resources to understand how agriculture impacts their daily lives or not being given the opportunity to gain skills that can prepare them in their futures. I

am researching the resources that are given and taught in high school classes. As well as find ways that resources can be expanded. That may include creating more programs where students from the public can be part of, or expand agriculture programs in schools. I will include a few options that would benefit high schoolers. These benefits may include programs they can attend and resources such as websites for students that are accessible. This is important to me because I would like as many people as possible to be informed and educated about how agriculture impacts what they consume, where they live, and their environment. Finally, for students to use the skills learned and gained information in class for after their high school time.

**Haylee Von Behren, Stefania Miranda, Divisha Khadka, #44**

***University Orientation and Registration: The International Student Experience***

International students are enrolled and admitted at Colorado State University to receive the same level and value of education as domestic students. International students, however, receive a lower qualitative orientation and registration process during admissions compared to domestic students. From the personal experiences of international students at this university, there is an unacknowledged disparity between international and domestic students despite their homogenous enrollment and tuition status. University Orientation and Registration: The International Student Experience is a qualitative narrative of international and domestic students to assess the necessity of a case study examining this disparity, its effect, and pending solutions. The goal of this introductory assessment is to generate cross-cultural awareness about inconsistencies in support and resources while continuing to bridge the gap between domestic and international student experiences. It is the intention therefore of this project to identify the primary factors impacting these disparities, the vitality and reasonability of their potential solutions, and the enhancement of the voices of those impacted.

**Abi Tekeste, #59**

***Bridging The Gap***

Through my experience as an English Second Language (ESL) student and working with ESL students in Fort Morgan high school, I have noticed the disparities that exist within the education system for ESL students. During my first year at CSU, I worked with students at Fort Morgan high school through the Key Communities with a focus on Education and Diversity, which further developed my interest to continue working with them. This experience served as an eye-opener to the realities, and the correlation between educational equity in non-metro areas and goals to attain higher education. Having served as a mentor through the Ethnic studies department for two years during the pandemic, I was able to maintain a relationship with students that inspired me to use my current position as an Admissions Ambassador to provide tours to CSU for Fort Morgan students. Through adversities such as language barriers and legal status, access to higher education is hindered, and my goal is to target this by creating exposure centered around higher education through campus visits to CSU that entail information for the seniors at Fort Morgan high school.

**Mariela Paul, #14**

***Addressing the Issue of Homelessness***

As someone who has worked with populations experiencing homelessness, I understand that there are barriers that prevent people from escaping the complications and difficulties of homelessness. Many individuals experiencing homelessness struggle to find support and resources they need to thrive in their environment. In terms of children and young teens who struggle from home insecurities, they often have physical and mental effects like increase in depression and anxiety, low self-esteem, less likely to finish school, etc. Therefore through my project, I strive to create a better environment that allows homeless people to ask for help. My project will focus on providing a helping hand to adults, students, and children in Fort Collins. To lessen the burdens of homelessness, I plan on creating gift bags filled with personal hygiene products, food gift cards, snacks, and a list of resources. In hopes of spreading awareness, I plan on gathering CSU students to assist with passing out gift bags. For my project to succeed, I hope to ease some of the hardships people experiencing homelessness face. I also hope to make people feel cared for, supported, and believed in. In the future, I hope to expand my project and continue exploring the ways homelessness can be addressed. I also hope to alleviate some of the burdens CSU students face on campus. I believe my project has the potential to grow and flourish within the city of Fort Collins by informing others about homelessness.

**Anh Bui, #19**

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

The underfunding gap across public schools affects millions of students all across America, especially students coming from marginalized backgrounds. This is partly because education is solely supported by local property taxes, which leads to funding disparities across school districts and a corresponding difference in the standard of instruction. Students from low socioeconomic backgrounds now find it more difficult to acquire the same resources for higher education. My own experience as a first-generation student makes it possible for me to attack this problem in my community. When I was navigating the college application process, I discovered that there weren't many resources available to me, and I almost considered giving up. My objective with this project is to develop a website that will provide high school students at Denver Public Schools (DPS) with more resources. The website provides additional information and provides links to pre-college programs, internships, and scholarship opportunities. In addition to connecting them with high school kids, DPS alumni who went on to attend college will form a network of mentoring relationships. This is significant because many students leaving DPS schools are first-generation college students who receive little to no advice. By expanding this initiative, I aim to be able to offer resources to children throughout the Denver metro region. Ultimately, by giving all kids 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.

**Alejandra Quesada-Stoner, #24**

***Creating a Research-to-Practice Tool for Making Cultural Adaptations to Family-Based Intervention Programs for Latine Immigrant Families***

Several evidence-based family-strengthening programs that exist are geared toward preventing substance use and misuse; however, most of these programs are geared toward white, affluent communities and these programs are rarely designed in a culturally responsive way for marginalized groups, specifically for Latine and Hispanic immigrant communities. Considering the vast health disparities and socioeconomic barriers among immigrant communities of color, it is crucial to culturally adapt programs to better serve Latine communities. By conducting an extensive literature review, I found ways programs can implement various surface structural modifications to their programs by changing their language, marketing strategies, and the channels they use to recruit their target demographic. Additionally, the literature pointed to several deep structural modifications that can be made with the consideration of extended families, addressing cultural differences between immigrant parents and youth, socioeconomic status, religion, and acknowledging discrimination, bias, and immigration status. Using Microsoft Word, I have created an electronically accessible tool for prevention scientists to use when culturally adapting family-based intervention programs serving Latine communities. The tool is intended to be used as an overview for Prevention Scientists and practitioners to rely on when taking the initial steps of culturally adapting their program to better serve the needs of Latine immigrant populations. This new tool has the potential to increase the effectiveness of family-based intervention programs for Latine immigrant families by ensuring that they are culturally appropriate and sensitive to the unique needs and values of this population. Implications for future research and practice are discussed. With this tool, my hope is that Prevention Scientists will take the initial steps to bridge the gap in research to practice for immigrant Latine families.

**Miguel Eduardo Lopez, #12**

***Mental Health for First Generation Students***

College can be a nerve-racking thing to think about for first generation students. College is where students not only attend classes, but they have to learn to manage how to balance things such as payments, work, and social life. Balancing things like this is not easy to any ordinary student but the thing that makes college harder for first generation students is not being able to ask family for help. Since first generation students are the first people in their families to go to college, families see students only going to school when there is so much more going on. Although I am in the early stages of my project, I am currently offering resources that are meant to be used by students such as professional help. After talking to some people who were first generation students, many of them would talk about how they wish they had more resources that were made to help first generation students. The mental health of first generation students is very important to me because when I first started college I was very nervous about starting somewhere new and wanted resources. By offering resources and creating something that is made for first generation students, I believe that it will motivate more students to go to college and to stay in school to get their degrees.

**Alexia Ornelas, #57**

***My Experience***

In Fall 2022, I had the honor to be a part of Dr. Kanatous' Extreme Physiology Lab through the MURALS First Year Scholars (FYS) program. I joined that lab because the project title "Skeletal Muscle Adaptations of Animals" sounded interesting, and I thought it would benefit my future goal of going to vet school. I also hoped to gain experience by expanding my learning/understanding of the scientific community such as learning what research is being done and how the results could be beneficial to the community. The FYS program and experience in the lab was a positive experience. I developed a sense of confidence in taking newfound skills that I learned from this opportunity and apply them to help me be more successful in the classroom. One of the most important skills I have learned is to never be afraid to ask questions. I also learned to properly read and analyze scientific literature, as well as how to be observant, professional, and responsible for my own actions. Dr. Kanatous and his lab members taught me skills to use in the lab and professional settings, and also how to transfer some of these skills to my everyday life. I feel that experiences like FYS should be strongly advertised to not only incoming freshmen, but to anyone that is interested in doing research.

**Victoria Silva, #92**

***Representation for Mobile Home Residents***

Mobile Home Park residents in Fort Collins have been facing a water crisis for decades. Residents have reported countless instances of roots in their underground clay pipes, situations calling for an emergency plumber, and pets dying from lead poisoning. Most residents own their mobile homes, however, they do not own the land the mobile homes are parked on. Even if someone were able to purchase land, it can cost over $10,000 to move their homes. Thus, many stay where they are and are subject to whatever the corporation owning the land decides in regard to their plumbing issues. Mobile home residents are often low-income, members of marginalized communities, undocumented, not fluent in English, and afraid of retaliation for speaking up. There are residents who have been exclusively drinking store-bought water for over 30 years. I am gathering data from residents, testing water, and soil, and in contact with 3 local House of Representatives members to see what can be done about the unethical practices occurring in a particular Mobile Home Park and surrounding communities. The laws around mobile home park residents are blurry and unclear and I am unraveling the laws and regulations with representatives and residents to determine what is illegal, what should be illegal, and what laws and protections need to change for residents.

**Bemnet Tefera, #127**

***Pushing First-Gen Forward: A Mentorship Program for Navigating the Professional World***

There is a clear struggle, first-generation students experience in their transition to a "professional" life. It is often confusing, intimidating and it can be a lot to handle. Moreover, anxiety is a natural emotion to feel about the future. But, first-generation college students step into their future without any form of support or foundational knowledge. It is difficult having to experience the work field with no real guidance. While classes and other opportunities teach vocational and communication skills. There is little to no information on how to navigate the "real" working world.

Ergo, my project aims to partner with the Alumni Center to create a program that will guide and mentor fourth and third-year students on their journey after graduation. My hope is to have alumni who are interested in volunteering help guide and answer questions on a bi-weekly basis discussing various topics and themes. For example, the first meeting will focus on resume and cover letter building, the second will focus on networking and elevator speech prep, and so on. My focus is to have first-generation students come to this program to hear directly from alumni who have graduated and have begun their careers. Furthermore, I think it is important to hear from someone who has been in a similar position and succeeded. Overall, I hope that the students who participate in this program will have more confidence and knowledge in themselves and the skills they have built over the past four years. Ultimately, it is my hope that the students in this program understand the innerworkings of what professionalism means to them and are able to confidently advocate for themselves. In the future, I want to see my program expand by having celebratory events where students can network and practice the skills they have gained.

# MURALS

SCIENCE, TECHNOLOGY, ENGINEERING, & MATHEMATICS ABSTRACTS



**MURALS 2022 1st place Winner- Andrea Velez**

**Joy Love, #1**

***Exploring the Fecal Microbiome of Mice Vaccinated Against the Rotavirus Using Python***

Rotavirus is the most common cause for dysentery in young children and the leading cause of mortality due to diarrhea and dehydration. Unfortunately, the vaccine for Rotavirus is less effective in developing countries, although these countries are more heavily affected. Over 85% of deaths from Rotavirus dysentery occur in developing countries but the vaccines reduce severe disease by 30-60%. This is compared to a 90% decrease in other settings. To create a more effective vaccine, it is important to understand the biological response for potential vaccines. Specifically, the vaccines impact on the host microbiome. This study used a vaccine developed by the Dean lab at Colorado State University, which used a recombinant Lactobacillus acidophilus as a rotavirus oral vaccine vector to assess immune and microbiome responses in mice. The fecal contents of two male mice were taken before and after they received the vaccine. DNA was extracted from the fecal samples, quantified, and then sequenced. From there, Metagenomic analysis was performed using a computation pipeline to determine if the difference was significant. We hypothesize that there will be no significant difference between each male at the two timepoints, but there will be a significant difference in the microbiome before and after the mice receive the vaccine. A secondary goal to this study was to increase the robustness of the computational pipeline used in this experiment.

**Christian Narby, #2**

***Quantifying Effects of Wildfires on Avian Migratory Stopover Density in the Western United States***

Previous studies indicate that wildfires are increasing in frequency, scale, and intensity in the Western United States and that these fires have significant detrimental effects on migratory birds; however, many of these studies are site-specific and require intensive field-based methods which leaves a lack of understanding on the impacts of fires on a large scale. To fill this need, we use remote sensing to quantify avian land use before and after forest fires throughout the Western US. This study utilizes weather surveillance radar data collected one hour after sunset, averaged for two years per spring and fall migration season, processed, and compared separately. Forest fires were selected within areas free of blockages and within 80km of radar stations, their boundaries being delineated by shapefiles from 2009 to 2018. To test for differences in migrant land use, we compare stopover intensity within each forest fire polygon from two years before and after the corresponding event. A paired t-test is used to quantify statistical differences in means in pre- and post-burn areas. Using remote sensing to quantify differences in an avian migratory stopover in response to burn events represents a new way of studying conservation, avian ecology, and forest fires while providing a unique avenue for managing these entities.

**Bianca Anderson, #123**

***Is What You Eat Driving What Is Eating You? Exploring How Host Diet Influences Host-Parasite Interactions in Daphnia***

This project explores the role that the diet of a host plays in the virulence of parasites of that host. A major challenge in host-parasite research is determining how the diet of a parasite's host could influence the nutritional status of the parasite. Whereas there is some evidence that suggests a link explaining how host diets influence host-parasite interactions, the mechanisms remain undefined. With the

increase in nutrient runoff as a result of human activities, understanding these interactions is crucial in helping us to predict how changes in host diets and parasitic activity could influence host populations in increasingly nutrient-rich ecosystems.

We hypothesized that the stoichiometric trait distribution of the parasite drives the parasite's interactions with the host and is linked to the diet of the host. We grew two different populations of Daphnia magna, one uninfected and one to be infected with Hamiltosporidium tvaerminnensis and Pasteuria ramosa, from the neonate stage fed with an alga species Scenedesmus obliquus that had high and low biomass phosphorus (P). We harvested infected individuals at different time intervals and analyzed the biomass stoichiometry of the host infrapopulation. By using an SEM with an EDS detector, we analyzed the stoichiometry of individual spores in the physiological state they were in in vivo. Approximately 80-100 spores were run per sample host, and we compared the biomass carbon:nitrogen:phosphorus (C:N:P) of infrapopulations from hosts fed different diets. Here we compare the influence of the host diet on parasite infrapopulation biomass stoichiometry.

**Afra Bushara, #125**

***Examining Canine Tumor Microbiomes***

Cancer is defined as a disease in which abnormal cells divide uncontrollably and destroy body tissue. This complex disease is known to arise from mutations, alterations in the nucleic acid sequence of the genome, that can affect one or more genes. Recent research has determined the frequent colonization of human tumor tissue by tumor-associated microbial communities. This means that bacteria are able to find a means to survive within cancerous tumors, but where they come from and how they get inside of the tumor is unknown. The consequences of bacterial presence inside of these tumors is not widely understood. These microbes could possibly encourage disease development and progression, drastically change the outcome of cancer treatment, or might lack any consequence to the tumor and the disease whatsoever. To further examine these unique tumor microbiomes, canine companions are being studied as a translational model. The challenge in studying these tumor microbiomes is that sequencing the genetic material of bacteria inside of these tumors is difficult due to the high concentration of host DNA contamination. That being said, the goal of this study is to determine whether bacteria are present inside of these cancerous tumors and to measure the impact of canine DNA on bacterial DNA detection using methods such as qPCR via DNA mixing experiments. If bacteria are detectable, future goals include sequencing genetic material of tumor microbiome communities and isolating the bacteria themselves using culturing methods.

**Jaellyn Erickson, #99**

***Crystallizing Synthetic DNA ~ Tensegrity Triangles***

Our team has bioengineered a class of DNA-only biomaterials, DNA tensegrity triangles, capable of holding guest molecules that were previously very difficult to hold or work with. The tiles' ability to be scaffolds for guest proteins is due to the precise choreography of DNA crystallization, which allows for the design of complex structures with specific properties and functions. These guest molecules could be anything from a new drug to a protein with a currently unknown structure. We have designed the three-dimensional structure of the tiles to include cavities or pockets that can accommodate said guests.

The two winning designs had binding sites in the center of the triangle, the proximal site, and on the stretch of DNA between triangles, the distal site. By optimizing these conditions, we were able to have repeatable success in growing the DNA tile containing a distal binding site for the guest protein, while the proximal tiles grew less consistently. Using these DNA crystals for guest loading will be the first step in showing the utility of our DNA-only biomaterials.

**Malachi Haynes, #121**

***How Exercise May be the Secret to Symptom Management with Multiple Sclerosis***

Multiple Sclerosis (MS) is a chronic, neurodegenerative immune disease in which the immune system attacks the myelin sheaths that surround the nerves. The repetitive attacks on the myelin sheaths cause lesions around the nerves. This results in the demyelination of axons in the central nervous system which can cause disruptions of neuronal signals. MS affects nearly 1 million people in the U.S. (National MS Society, 2023), making it the most common neurological disease of young adults with symptom onset generally occurring between 20-40 years of age (National Institute of Neurological Disorders and Stroke, 2023). A wide array of symptoms can arise from MS including increased spasticity, muscular atrophy and a decreased state of mental wellness. PA and exercise are excellent forms of complementary medicine to help reduce the severity and prevalence of these symptoms. With that in mind, the following study examined the effects of different types of exercise on these symptoms. A randomized control trial was conducted for six months to target MS symptoms through behavior change of PA. The intervention found significant correlations between self-reported fatigue severity ($p=.001$, $\eta\rho 2=.15$), physical impact ($p=.008$, $\eta\rho 2=.09$), depression ($p=.006$, $\eta\rho 2=.10$), and anxiety ($p=.006$, $\eta\rho 2=.10$). An increase in self-reported PA was also found ($p=.001$, $\eta\rho 2=.13$) (Pilutti et. al, 2013). This intervention provides relevant evidence indicating that only approximately 20% of persons with MS engage in appropriate levels of PA (Motl, 2021). Therefore, this research suggests that PA may prove to be beneficial for symptom management for those living with MS.

**Mia Wang, #25**

***Assessing snow and climate trends at SNOTEL Stations in Northern Colorado***

The snowpack is an important natural reservoir in the western United States. The ever present threat of climate change led us to wonder about how the snowpack is changing in our local region. Our project investigated various changes within the western snowpack, mainly within the Poudre River watershed in northern Colorado. Using local SNOTEL stations, we investigated the change in snowmelt rate, changes in peak snow water equivalent (SWE), changes in storm frequency and magnitude, as well as the change in snow off dates between 1980 and present. Across our study, we found a decrease in the length of time and magnitude at which snowpack stays on the ground, suggesting that warming temperatures are leading to declines in this key resource for our region.

**Justine Negron, #5**

***Impact of a megafire on the overwinter survival of alpine small mammal communities***

Extreme climate events (ECE) such as megafires - defined as those outside the range of typical weather fluctuations - are expected to become more frequent with ongoing climatic change. The ability of animal species to withstand increasingly common ECEs will be key to the long-term persistence of biodiversity in the Anthropocene. Hibernators in mountain and alpine ecosystems are especially susceptible to environmental change, yet we know little about how fires impact their fitness. My objectives were to organize demographic data into encounter histories from two populations of ground squirrels – the golden-mantled ground squirrel 'GMGS' (Callospermophilus lateralis) and the Wyoming ground squirrel 'WGS' (Urocitellus elegans) – to test the idea that the Cameron Peak Fire 'CPF' decreased their overwinter survival. Encounter histories are a demographic format used to estimate survival in wild animal populations. Data was collected from 2018 to 2022 each summer at the Colorado State University Mountain Campus (40.5705°N, 105.5913°W) where CPF took place in 2020 and partially overlapped with the study site (WGS n=113; GMGS n=94). While data analysis is ongoing, we predict that WGS will be buffered against the CPF given the distance between their colony and the burn scar, while GMGS should be negatively impacted because of the overlap of their burrows with the fire. We further expect that younger individuals will experience lower survival than adults because of lower fat reserves. Understanding shifts in fitness in light of extreme climatic events such as megafires will help predict hibernator robustness to environmental change.

**Elizabeth Carlsen, #15**

***Identifying a new avian DNA sexing PCR Protocol***

Most bird species in North America are migratory. However, males and females often migrate at different times, which likely has important evolutionary implications. To better understand these implications, we need to be able to study migration in the sexes separately. This can be difficult with some species where males and females look alike. To combat this issue, scientists have developed protocols that can identify the sex of an unknown bird from a DNA sample. Here, we test the efficacy of a new protocol for finding the sex from songbird DNA samples. DNA was extracted from the tail feathers plucked from 22 Common Yellowthroats (Geothlypis trichas). The sex of each bird was previously determined and served as a positive control to compare with the results. Once extracted, DNA was placed in a polymerase chain reaction (PCR) master mix, run through a thermocycler, and then imaged on an agarose E-gel. Results indicate that the new protocol correctly identified the sex of 20 of 22 samples (91%). One of the two remaining samples produced inconclusive results, indicating only one sample was sexed incorrectly. This is a marked improvement from previous protocols. Moving forward, this new protocol holds promise, but the application of this protocol across species needs to be tested. It may also be impacted by the quantity and quality of DNA collected. If this result is indeed generalizable across species, then this protocol can be used to distinguish males and females as well as to study their migration patterns and conservation needs.

**Sreeya Kairamkonda, #48**

***HPV Vaccination Rates in New Mexico and Future Directions for Promoting the HPV Vaccine Among Young Adults***

The Human Papillomavirus (HPV) is the most common sexually transmitted infection in the U.S. and is attributed as a cause for cervical, penile, vaginal, vulvar, anal, and oropharyngeal cancers. Vaccination is an effective cancer prevention strategy and the Advisory Committee on Immunization Practices recommends HPV vaccinations for everyone between 11-26 years of age. Despite these recommendations, national rates have been consistently low (compared to other recommended vaccines) and very little research exists around HPV vaccination in New Mexico (NM). We used a mixed methods study design (i.e. sequential explanatory) to first describe NM's HPV vaccination rates and second, identify strategies to improve vaccination rates. Using data from NM Statewide Immunization Information System, we found that in 2021, 21.12% of individuals between 0-17 years (n= 680,449) and 41.87% of individuals between 18-26 years (n= 431,710) received at least one dose (of the recommended two or three doses) of the HPV vaccine. Furthermore, in the age group of 18-26 years, more females received the vaccine compared to males. A comprehensive literature review revealed several interventions directed at parents and providers to improve vaccination rates for the 11-17-year age group, with limited research focused on the young adult (18-26 years) population. Therefore, we conducted interviews with clinical and community partners to identify strategies to improve catch-up vaccination rates with a focus on young adults between the age of 18-26 years. Informed by these research efforts, we provide three key recommendations. First, we recommend examining attitudes and beliefs among young adults to inform the design of socio-behavioral interventions targeting vaccination uptake. Second, there is a need to explore communication strategies to help young adults make informed decisions around HPV vaccinations. Finally, we recommend incorporating interventions targeting HPV vaccination for young adults in state cancer control plans to impact population health.

**Jalynn Nicoly, #21**

***Is Nature or Abstract Art More Effective in a Virtual Environment for Stress Reduction?***

Stress tends to strain the mind and body, and while minor stress can be beneficial for daily tasks, management of it is essential to prevent chronic stress. Being in nature and having art in [hospital] rooms have demonstrated to have restorative effects that reduce stress. Therefore, our goal is to identify how to provide effective stress-reducing virtual environments (VE) to those that do not have access to the outdoors. We created multiple VEs (a 3D forest, a 2D image of a forest, and a 2D image of abstract art) to determine how each VE reduces stress and promotes virtual restorativeness. We hypothesize that our 3D nature VE will be the most restorative, and by contrast, our art VE will be the least restorative. However, we also hypothesize that both forest VEs will be more restorative than the control condition. 82 participants first completed an arithmetic test for the baseline using physiological and psychological data. Next, in an attempt to reduce their stress, we introduced them to one of our three VEs or had them sit with their eyes shut (control condition). Although results are currently pending, we expect our hypothesis to provide statistical significance in improved physiological and psychological parameters in the 3D forest compared to other groups. Future directions for our experiment include focusing on biodiversity to discover what makes the most effective VE for stress reduction

**Hanna Wireduwaa, #23**

***CRISPR-Cas9 gene therapy of sickle cell Disease.***

This thesis research describes the advances in using CRISPR-Cas9 gene editing to correct the beta-globin mutation in sickle cell disease (SCD). SCD is a genetic disorder that affects people of African-American heritage and is caused by a point mutation (20A >T) in the β-globin gene (HbS) responsible for producing hemoglobin. The mutated gene forms sickle-shaped red blood cells resulting in severe health complications. Available treatments include painkillers to relieve pain attacks. Traditionally, bone marrow transplant presents the only cure for SCD; however, this therapy carries significant health risks. Advances in CRISPR-Cas9 gene editing therapy provide promises to cure SCD through two approaches, 1) gene knock-in method by repairing the β-globin mutation locus in a patient's hematopoietic cells ex vivo via CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) and homologous recombination and reintroducing the edited cells into patients to provide long term relief of the disease. 2) reactivation of the fetal hemoglobin (HbF) that inhibits sickle hemoglobin (HbS) polymerization alleviating symptoms of the disease. The approach involves manipulating regulators of the HbF, of which silencing (Knock-out) the transcriptional factor BCL11A that suppresses fetal hemoglobin production is a primary therapeutic target. Both methods are currently in clinical trials at varying stages; the knock-in method has completed pre-clinical trials going into the clinical setting, while the knockout approach has reached the clinical II stages. Results with a limited number of patients in both methods have successfully corrected the disease, although many challenges remain.

**Persephone Jordano, #26**

***Exploring Cost-Savings of DNA Extraction and Concentration***

More than three billion birds have been lost in North America since the 1970s. The factors leading to these losses are many, and not all species are equally impacted. Conservation groups have started to look at the effects on different populations within species. The Bird Genoscape Project has developed an approach to do this, creating maps of genetically distinct populations of breeding birds called genoscapes. Genoscapes are constructed using DNA contained in feathers plucked from living birds. Despite the effectiveness of this method, the trace amounts of DNA found on feathers makes the extraction and concentration of DNA difficult, yet remains critical. Currently, this is done using expensive commercialized tools. Here, we look to save valuable conservation money by testing the effectiveness of alternative, less expensive tools. DNA from the feathers of ten American Robins (Turdus migratorius) was extracted and concentrated using standardized, expensive tools vs alternative, less expensive tools. After extraction and concentration was completed, resulting DNA sets were quantified. We found that the less expensive DNA extraction kit performed equally well as the expensive, standard kit. However, the more expensive concentrating beads performed better in conjunction with DNA extracted with the less expensive extraction kit. Bead performance did not differ when using DNA extracted with the expensive, standard kit. The path to cost savings is available, but there is a clear tradeoff. Additionally, the efficacy of these alternative tools needs to be tested across species of different sizes with varying amounts of DNA on their feathers.

**Kelli Mutmansky, Myorie Duke, Sinder Buckmire, #27**

***Design and Validation of a Water Quality Sampling Plan in Spring Creek, Fort Collins, Colorado***

The goal of this project was to develop and validate a sampling plan for a water quality monitoring protocol in Spring Creek. This process is important to understand the dynamics of pollutants present in the water column and create a concentration profile of the creek. We began by surveying the trail and deciding on the data collection points. Twenty-five points were chosen between Rolland Moore Park and Edora Park, based on accessibility. The coordinates of each spot were recorded and plotted using Google Maps. All of the tests were determined to be simple and necessary to conduct. After walking along the trail once, we determined that it would be necessary to collect less samples and thus, modify the plan. Carrying the required water samples for approximately three miles, proved to be more challenging than expected. From this research experience we learned that the local bodies of water in our community are at normal water quality levels. There is no concerning data that we collected which means that the water is safe to its inhabitants and there is no concern of problematic contamination to the people in neighboring communities. For future projects, a long-term frequent monitoring sampling protocol will be implemented so that pH, T, DO, conductivity, nitrates, sulfates, chlorine, free chlorine, chromium, and phosphates are tested in the same sites. Also, a concentration profile will be plotted to find correlations between the concentration of parameters, location, and season.

**Braden Hollis, #30**

***Twitter and Machine Learning***

The objective of this study was to detect and classify emotions contained in a tweet. Twitter has had a major influence on the way everyday Americans view the COVID-19 pandemic. The service gave equal access to everyone to share their thoughts surrounding COVID-19. Users shared information, false information, opinions, or a combination of the three. Our goal was to analyze these tweets from the heart of the 2020 pandemic to build an AI database that measured emotion. Numerous tweets were annotated by our team and ranked on a scale from zero to two; zero represented a lack of emotion, whereas two represented a large amount of emotion. The types of emotions were: joy, sadness, surprise, fear, and anger. Each member annotated 150 tweets that fed into the model. The importance of human annotation was to give the program a sense of what to look for. The model was then applied to a dataset of 12 million tweets related to the COVID-19 pandemic. Overall, our cybersecurity team successfully contributed to the Twitter project.

**Eryn Wheeler, #104**

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

Africa is facing a rapid loss of biodiversity and cascading effects on its ecosystems. This creates a need to gather data to cover the gaps of understanding Africa's biodiversity patterns. Our goal to combat this problem is to train an open-source machine learning algorithm that detects and classifies amphibians, bats, and bird species based on their acoustic data. We collaborated with Colorado State University's Fish and Wildlife department and Snapshot Safari to collect non-invasive acoustic data. This data collection will be wrangled and put into our machine learning algorithm to identify the different species. While we are working and waiting for results, we hope that our algorithm will provide a significant and wide-use tool to advance collaborative research and discoveries of Africa's biodiversity.

**Nizhoni Hatch, #31**

***The cultivation and characterization of soil bacterium in Navajo Nation to identify the natural soil biome***

From the 1940s to the 1980s, the demand for nuclear weapons during World War II caused the extraction of nearly 30 million tons of uranium ore from Navajo Nation lands. Today, the mines are closed, but over 500 abandoned uranium mines are in different stages of remediation or reclamation. These processes involve closing mine portals and replacing contaminated soil with non-radioactive soil. There is little research on how the introduction of foreign soil impacts the bacterial makeup of the natural soil, which is crucial for plant, wildlife, environmental, and human health. To understand how the remediation process affects the native Navajo Nation soil biome, we collected soil samples from a control area and abandoned uranium mines in Sweetwater, AZ. We analyzed the control bacteria to identify the baseline properties of the natural soil microbiome. We characterized four different biochemical properties of twenty-three bacterial isolates from the control soil sample: anti-bacterial, anti-fungal, quorum quenching, and quorum-sensing capabilities. The control group exhibited ten bacterial isolates with anti-bacterial activity, fourteen with anti-fungal activity, four with quorum sensing, and fifteen with quorum quenching activity. The next steps involve identifying the control bacteria and characterizing the bacteria from the disturbed soil around abandoned mines. Comparing the biochemical properties across the soil groups will determine if the remediation process alters the balance of the native soil biome and impacts plants and wildlife.

**Ritika Janapati, Lauren Bennett, #33**

***Are Wild Armadillos a Reservoir for Leprosy Bacilli in Ecuador?***

Leprosy is a neglected tropical infectious disease that causes skin lesions and nerve damage. The disease is caused by Mycobacterium leprae and Mycobacterium lepromatosis. The mechanism of leprosy transmission is unknown, but it is assumed that human-to-human transmission is the main route of infection. However, M. leprae has been found in wild armadillos, in different countries of the Americas where the animal is endemic. In the US, zoonosis transmission has been reported. This raises public safety concerns for regions with endemic armadillos that come into close contact with humans. Ecuador is a country where leprosy is endemic in human and where armadillos are found in the wild. However, leprosy bacilli have never been found in wild Ecuadorian armadillos. The objective of our research was to investigate the presence of M. leprae and M. lepromatosis in wild Ecuadorian armadillos and to an extent, study the connection between humans and armadillos bacterial strains. Using DNA extractions and quantitative PCR, we tested 82 tissue samples from 36 armadillos from 10 provinces, and seven tissue samples from human patients from Ecuador for both M. leprae and M. lepromatosis. Our results show that 31/82 of the armadillo samples and 6/7 human samples tested positive for M. leprae, and none tested positive for M. lepromatosis. Further genetic studies on both human and animal M. leprae strains should help establishing if leprosy is a zoonostic disease in Ecuador. From these results, we concluded that wild armadillos are a reservoir for M. leprae in Ecuador.

**Josie Small, #37**

***Dendroctous rufipennis Morphology***

Dendroctous rufipennis, the spruce beetle, has a devastating effect on Engelmann spruce trees (Picea engelmannii) across the United States. This species has caused the most deaths of spruce trees compared to any other natural cause throughout North America. The objective of this project was to determine if the morphology of the D. rufipennis varied between sites with different outbreak and climate regimes. The spruce beetle samples were collected from Rabbit Ear's Pass (high outbreak), Lost Creek (low outbreak), Alma (low outbreak), and Empire (moderate outbreak). The masses of the live samples were recorded. Ten of the samples from each site were photographed using a stereo microscope. From these images, the body length (mm), body width (mm), head size (mm), elytra length, elytra color, antennae length (mm), pronotum length (mm), pronotum width (mm), and pronotum color were recorded. Results of morphological measurements showed that beetles had an average weight of 19.2 mg with a length of 5.87 mm and a width of 2.5 mm. Beetles from Rabbit ears pass (18.5) had a slightly lower body mass compared to Lost Creek (20.1) and Alma (19.3), however, this difference was not statistically significant. We concluded that there is no difference in beetle morphology among the studied sites. All of the samples were morphologically similar suggesting that beetles are morphologically identical among the sites with significantly different outbreak regimes.

**Jade Collins, #40**

***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 and can cause seizures. Multiple industries have a vested interest in disposing of these algal blooms including conservation, hospitality and tourism, and health professionals. The blooms pose a health and economic threat to humans. If someone swims in the infested water, they can be affected by the neurotoxin. If no one can swim, then the economy of these coastal areas that rely on tourism gets hit hard too. How can we effectively combat these blooms in the Gulf of Mexico? By culminating the research and experiments of experts in the field, I can determine what works, what doesn't work, and what might work. There is a promising compound called brevenal that can inhibit the effects of brevetoxin made from the same algae, but it has not been fully-developed yet. The findings can be used for environmental conservation and to make the water safe again. If there is a viable solution to this problem, the next step would be making it cost-effective and widely implemented. If no solution can be found, then the best course of action would be to raise awareness to limit injuries, transfer endangered aquatic species, and protect land species from the water. In either case, reducing pollution will reduce the food the algae has available.

**Victoria McMillan, #38**

***Sensory Input Motor Output***

My project is a post-pandemic office space for NEXT, a home robotics company. The NEXT home robotics company is expanding its offices to the Seaport District of Boston, Massachusetts with the proposal of a new research and development hub.

My concept for this office space is “sensory input, motor output”. The design of a robot is derivative of the human nervous system. Its basic blueprint reveals a system of input and output. Information is input into the system, the system processes it, then it responds to it. The central nervous system works in the same way. People receive information through the five senses: touch, sight, hearing, smell, and taste. This information is processed in the brain, then a physical response occurs.
One’s output is directly related to their input. The condition of one’s environment affects one’s productivity. Through evidence-based design, I designed a multisensory work environment that encourages productivity through the stimulation of the senses. Inspired by Japanese culture and design, I used biophilic elements to achieve this multisensory office space for NEXT.

**Michael Ryan, Vincent Flegeance**

***The Influence of Dietary Barley Supplementation on American Wagyu Feedlot Performance***

Eighty-nine American Wagyu steers were used to evaluate the effects of dietary barley supplementation on American Wagyu feedlot performance. We hypothesized that with the supplementation of barley the American Wagyu steers would have greater ADG than non-supplemented control animals. The experimental design was a randomized complete block design. Steers were blocked by initial body weight (BW) and randomly assigned within that block to one of two treatments. Treatments consisted of: 1) Control (CONT; no supplemental barley) and 2) Control diet + 2lbs per head of supplemental barley (BARLEY). Steers were housed in feedlot pens (n=4 steers/pen; 11 replicates/treatment) and fed a traditional American Wagyu finishing diet (DM basis: 68.42% DM, 14.33% CP; TDN: 74.76%, NEg: 1.16 Mcal/kg, 5.25% EE). The basal diet consisted of grass hay, corn silage, cracked corn grain, soybean meal, corn distillers grain, white salt, ground limestone, and olive byproduct. Diets were fed once daily in the morning and the barely treatment was top dressed, to the appropriate pens, immediately after the basal diet was delivered. Steers were individually weighed on d -1 and 0, and approximately every 28 days throughout the 270d experiment. Data were analyzed using a mixed effects model (PROC MIXED, SAS) for a completely randomized block design. Initial pen BW was used as a covariate in the statistical analysis of all performance data and significance was determined at $P \leq 0.05$. Initial and final BW, ADG, DMI, and feed:gain were similar across treatments. Therefore, under the conditions of this experiment, these data suggest that barley supplementation for 270d to American Wagyu cattle did not impact overall animal performance.

**Su San Yr Tun**

***Indoor fungal communities of animal shed.***

All the living microorganisms inside an indoor environment, and their by-products, are known collectively as an indoor microbiome. Research on indoor microbiomes has rapidly expanded increasing public interest. However, most of the studies on the indoor microbiome are related to humans. It is postulated that the indoor microbiome plays a critical role in maintaining animals' nutrition, health, and well-being. However, we have a limited understanding of microbial communities that inhabit different habitats with the indoor microbiome of animal sheds. Here our objective is to provide a detailed census of fungal communities residing in different environments within the indoor microbiome of animal sheds. We collected air, soil, feed, and fecal samples from a shed at ARDEC, CSU, where mother sheep were kept. We extracted DNA from the collected samples and characterized the fungal communities using

quantitative PCR (qPCR). Our results showed that the indoor fungal community within animal sheds is diverse and complex. We are now processing samples for next-generation sequencing to provide a detailed census of fungal communities for animal sheds. Our study will provide vital information on fungal communities' structure and potential functions in the indoor environment.

**Alyssa Singh, #48**

***Algae: A New Solution Towards A Sustainable Future***

A new focus towards a sustainable future lies in the hands of this unique photosynthetic organism, algae. Algal biomass has the potential to tackle climate change and be converted to biofuel through the use of attached algae flow-way systems. It has regenerative efforts on degraded lands and waste-water treatment and helping the overall battle with excess pollution and providing an outlook for more sustainable production efforts. Our goal is to redesign and rebuild two new algae cultivation labs that will aid in the future process of growing algal substrates through attached flow-way systems using a Photo bioreactor system and algal turf scrubbers. Testing is in the beginning stages, current processes are focused on general rebuild of two individual labs to cultivate, test, and retrieve algal media to examine its ability to convert into biofuels. Two strains of pond algae will the main test subjects that will be examined, and proper measures must be in place to control growth factors including pH control, flow conditions, light exposure, and nutrient retrieval of the algae. Within this project I am highlighting the process of rebuilding a lab, and the process of the use of complex systems to evaluate attached algal flow-way systems. The results of this work hopes to successfully cultivate two strains of algae and convert into biofuels. Ability for the project to succeed will highlight the capability of the use of algae to more sustainable efforts and processes.

**Lori Ho, #102**

***Does The Price of Colored Pencils Match What is Inside of Them?***

Being an artist is an expensive yet rewarding process whether as a career or a personal hobby. The cost of colored pencils varies greatly ranging from a pack of 24 pencils for 5 dollars to a pack of 120 professional colored pencils costing 300 dollars. Four different colored pencil brands will be tested ranging from Crayola, Cra z art, PrismaColor, and Faber Castell with price points of 5 dollars to 300 dollars. Using a paint thinning solvent, Gamsol, the primary colors are tested by first turning the pencil leads into a powdered substance and then adding the powder to a Gamsol solution which dissolves them. Then, using a spectrometer, the absorbance of color in each of the different colored pencil brands will be measured. It is expected that there is a higher absorbance in the more expensive brands of colored pencils as there is a higher pigmentation concentration in color compared to the colored pencils that are made for children. It can also be expected that depending on the brand and material of each of these colored pencils, the absorbance would also be different but the amount of absorbance should be able to tell a lot about how saturated each of these colors will look on an art piece. Overall, doing this experiment tests to see what exactly the difference is in these different prices and allows artists to understand what they are paying for.

**Macy Gruszczynski, #103**

***Snail Mucin***

The skin is the largest organ in your body, even though you see a lot of this organ the integumentary system is throughout the inside of your body as well. Snail mucin can be used for different benefits in/on your body. I will research snail mucin and the benefits and other effects it may have, skincare and beyond using studies that have already been completed and researched. Snail mucin is being researched and tested to prove that it has many other benefits other than being a functional food for your skin. Snail mucin is produced by snails sliding along on a surface that can collect their slime trail, this slime trail is the mucin. Mucin contains a complex mix of proteins, enzymes, hyaluronic acid, copper peptides, antimicrobial peptides, iron, zinc, and proteoglycans (Lawler, 2023). Although we know that the skin has a good reaction to these ingredients there are not many studies that show the application of snail mucin on the skin. In Nigeria there was a study done by Funmilayo Okeniyi and other scientists that show that three different African snails have antimicrobial effects on gram-positive and gram-negative bacteria. In a different study SKH-1 hairless male mice were orally fed with snail mucin to see the photoprotective effect of the mucin against ultraviolet B rays. As a result of oral administration of snail mucin, the mice' antiaging properties like wrinkle depth, moisture loss, and loss of elasticity on the skin improved with no toxicity (Yongeun, 2022).

**Isabella Prosceno, #105**

**I*nfluence of ABO Blood Types on Endurance Running***

Throughout endurance sports, professionals have analyzed how the body molecularly and physiologically responds to the high stress of exercise. The ingredients to have an exemplary performance include proper nutrition for fuel, water for hydration, balancing of electrolytes, and consistent training for one's mitochondria to adapt to the limitations of mechanical strain. Specifically, in endurance running, blood being the most important aspect to transfer oxygen throughout the muscles of the body, set up an athlete for a grand moment of performance. Recent studies questioned that depending on blood type is there an advantage to a greater performance? It was hypothesized that there would be a more predominant blood type, but knowing why was still a mystery. In this research, distance runners were observed before and after exercise. Their vitals of oxygen levels, heart rate, and blood pressure were recorded, as well as a blood draw before and after a set parameterized run. Molecular studies that determined blood type and compared pre and post exercise vitals were conducted in the lab. The data resulted in Type O blood leading to the fastest endurance performance (Lippi, et al., 2017). This brings into question why Type O blood showed the best results in this experiment. Something as simple as an endurance run hints that further research must be conducted on the advantages of Type O blood in sport and throughout day to day life.

**Emma Barrett, #106**

***Exploring an emergent disease of cereals as a model for bacterial infection in plants***

As climate change alters cultivation conditions for crop-growers worldwide, it is increasingly imperative to understand the characteristics of emerging and re-emerging pathogens making their way into newly

warmed areas of the world. Plants are prone to diseases that can diminish their normal growth and damage their tissue, which are caused by organisms called pathogens. One of these relevant pathogens is a bacterium known as Xanthamonas translucens, the causal agent of Bacterial Leaf Streak in many cereals. This pathogen has a different host range depending on its pathovar classification, which groups bacteria with similar characteristics and host specificity: the undulosa pathovar (Xtu) mainly affects wheat and barley, while the translucens pathovar (Xtt) only infects barley. We hypothesize that recently collected bacteria are more virulent than older bacteria due to their propagation across nearly all wheat-growing regions of the world. To explore this idea, wheat and barley were infected with recent and historical strains. These strains are subtypes of X. translucens. Through experiments on these cereals, growing the bacteria up inside and outside of the plants, disease symptoms and bacterial characteristics could be observed. Newer strains caused more severe symptoms – for example, necrotic lesions rather than a light yellowing of the leaf – and they replicated at higher rates than older strains. Based on these observations, newly isolated strains were found to be more virulent than older strains. This raises concerns for global agriculture given the emergence of these increasingly pathogenic varieties. Future research will be carried out to learn how some of the mechanisms bacteria have to survive and replicate could be causing these worsening symptoms.

**Victor Mora, #107**

***More Hemp, More Problems: The Danger of a New Vector***

Hemp production has been a growing sector in agriculture within the United States since the 2018 farm bill passed. With production not being seen like this since before World War II in the United States, issues with pests vectoring diseases to or from hemp has become prevalent. Among some of the most damaging pests has been the cannabis aphid, which usually is very selective for its hosts but can still vector diseases from non-host plants. One virus that PVY has been found to vector is Potato Virus Y or PVY. With how damaging PVY can be, this project investigates if there is an association between hemp acreage, PVY incidences, and aphid infestations. To test this association, I used data from the San Luis Valley examining acreage of both potatoes and hemp, and data showing PVY transmission for aphids on both hemp and potato along with feeding patterns of cannabis aphids. While the high transmission rates that cannabis aphids show in both hemp and potato are concerning, the varying prevalence of both cannabis aphids and PVY in potato acreage shows a need for more data. A prolonged study observing cannabis aphid and PVY incidences in hemp acreage would be needed to make any definitive conclusions.

**Jorge Reyes, #108**

***Qualitative factors that can impact financial aid worthiness***

Financial aid can be a determining factor for prospective college students. The process underlying the division of financial aid is not adequately defined. It is plausible that qualitative variables, such as ethnicity, impact an individual's financial aid worthiness more than their income. To determine the role of qualitative variables, my project used an established database to investigate if demographics are an underlying factor that determines how much financial aid is awarded to an individual. Methods: Data was extracted from the Colorado Information Marketplace. Statistics were run in R Studio to test if qualitative variables including ethnicity and gender have a significant influence on the amount of financial aid awarded. The "stats" and "car" packages within R were utilized to run a test for the

significance of the regression. And the “ggplot2” package was used to generate appropriate plots. Results: The analysis suggests that there is a relationship between the amount of financial aid and at least one of the qualitative variables when tested together. When tested individually, both ethnicity and gender proved to be statistically significant, which means that there exists a relationship between the amount of financial aid awarded and ethnicity and gender. These results do not imply definitive conclusions because there exist influential external factors such as income. Future directions can build upon the model to add more complex variables and other implications such as socioeconomic status. Thus, achieving better results. Also applying this model to other situations, like in another state, and see if the results differ.

**Phoenix Espinoza, #96**

***The Effects of Weekly Intermittent Fasting on SARS-CoV-2 Severity in Mice***

BACKGROUND: Intermittent fasting (IF) is a popular dietary strategy and purported to ameliorate cardiometabolic disease. Our preliminary data show that IF reduces vascular stiffness in obese mice while altering their immune system. Due to the continued presence of COVID-19, we aim to clarify whether changes to the immune system from IF leads to altered protection against SARS-CoV-2 (SC2) infection. METHODS: Lean (WT) and obese (Ob) mice were randomized to a control diet (Ad-Lib) or once weekly 24 hour fast (IF). Following the protocol, Ad-Lib and IF mice were infected with SC2 (MA10) or sham, yielding 6 groups: WT+Ad-Lib; WT+Ad-Lib+MA10, WT+IF+MA10, Ob+Ad-Lib; Ob+Ad-Lib+MA10, Ob+IF+MA10. Temperature, body weight, and food intake were measured prior to infection (baseline) and 3- and 7-days post infection (3 DPI and 7DPI, respectively). At 3 or 7 DPI, mice were euthanized, and tissues were collected for flow cytometry, histopathology, and/or viral titers. RESULTS: Compared to baseline, food intake decreased in all groups following infection, which validated infection in mice. Changes in food intake compared to baseline were similar for all groups (range of -12.9 ± 4.1 g. to -22.8 ± 8.2 g). 7 DPI temperature in Ob+IF+MA10 mice was increased compared to baseline ($p=0.0097$) and 3 DPI ($p<0.0001$). No significant differences were observed in changes in body weight. CONCLUSIONS: IF might alter SC2 infection in Ob mice, yet our forthcoming flow cytometry, histopathology, and viral titer data will clarify whether this rise in temperature is due to an improved immune response or exacerbated infection severity.

**Marley Nokes, #111**

***Identification and Impact of Fungal Volatile Organic Compounds in Flooded Homes***

An increase in the frequency and intensity of flood events in the United States has led to increased damage to homes and lasting health effects among vulnerable populations (e.g., those with asthma). The American Thoracic Society reported that exposures to airborne fungi are a major health concern for occupants re-entering flood damaged homes. Post-flood fungal growth could also affect health through the emission of volatile organic compounds (VOCs). Previous study designs and methods have not been able to provide an accurate understanding of fungal types and amounts in the air after flooding events. Because of this, there is little research evaluating the association between fungi exposures (including VOCs) and increased asthma exacerbations following flooding events. Tracking inhaler use in asthma patients in flood damaged homes, along with innovative methods that identify fungal types and concentrations in the air, can help determine those fungal communities and associated VOCs that

exacerbate asthma. As of right now, it has been identified that about 210% more fungal DNA is present in flooded homes as opposed to non-flooded homes. Current limitations are identifying the fungal communities and VOCs present and how much of an impact that the increased concentration may have on asthma patients.

**Grace Symanski, #115**

***Is Kombucha Safe?***

Kombucha is a popular fermented “health drink” that has grown in popularity in the past few years, and with this growth, consumers of the drink are starting to make/ ferment Kombucha in their homes. The question arises of what this drink is and whether it is safe to brew or should be left to the professionals. Kombucha is a fermented black tea that’s carbonated. It is distinguishable by bacteria and yeast with added flavoring. It’s said to give health benefits like influencing cholesterol levels, regulation of gastric, joint relief, etc. (Kapp and Summer 2019). Kombucha is fermented, it's a metabolic process that produces chemical changes in organic substrates through the action of enzymes. It is defined as the extraction of energy from carbohydrates without oxygen. Is it safe to drink at home? After reading this research article, many have concluded that the pH of this drink is the main concern. When making this drink the pH needs to be between 4.6 - 2.0 pH. This means that the drink is very acidic. If the drink isn't placed between these numbers, then it could be a health hazard to drink. Throughout this study, I will be referencing Advances in Kombucha Tea Fermentation: A Review, by Laura M. Nyhan, and Kieran M. Lynch. peer-reviewed research article. There will be findings as to why this “health drink” is safe to make at home or if it should be regulated by professionals.

**Rayia Adams, #116**

***Fungi Growth: In the Dorms and Throughout the Years***

A long-lasting cold I had earlier this semester drove me to consider if air quality was impacting my health. Fungi, such as Penicillium and Aspergillus, can cause allergy symptoms, coughs, and asthma attacks. The experiment aims to grow different types of fungi while considering the age of dorm and analyzing the amount of mold via spores/〖cm〗^2. It can determine if Colorado State University students should be concerned about mold in their dorms, and if older buildings' residents need to be more concerned. Mold tends to grow in warm, damp places, and vents in CSU housing fit these criteria. To test for fungi, three different dorms (Pinon Hall, built 2014, Summit Hall, built 2003, and Newsom Hall, built 1954) will be sampled for mold in the vents and air. I will perform surface swabbing on the air and vent, then perform air sampling by leaving agar plates exposed for a short period of time. The plates will be kept moist to grow. From this experiment, we can determine the mold growth of three dorms and asses the benefits from mold removal and education. Research in this area is imperative as all CSU first years are required to live on campus and fungi are known to cause big impact on health.

**David Oh, #117**

***Prevention of the Knocking Phenomenon of Internal Combustion Engines***

Cars are an integral part of daily life for many people, used primarily for commute and transport of goods. Despite the rise in popularity of electric battery-powered vehicles, internal combustion engine (IC-engine) cars remain commonplace. IC engines operate through a series of four cycles, namely intake, compression, ignition, and exhaust. Any failure in these cycles, especially suboptimal ignition timing can cause knocking and lead to the malfunctioning of the car and cause serious damage to the engine. To address this problem, researchers have conducted extensive investigations on knocking with regard to ignition delay and other factors. Through their research, they have found that increasing the octane number of gasoline, managing the compression ratio and even changing the materials used in engine components from aluminum to steel can prevent knocking from occurring and improve engine durability. In some cases, car manufacturers have already switched from aluminum to steel engine blocks to handle high compression ratios and increase engine longevity. Based on previous research material and data, I will conduct further investigation to identify efficient and cost-effective ways to prevent knocking and increase engine lifespan. This will involve evaluating the feasibility of using alternative materials for engine components, exploring the benefits of different fuel types and engine configurations, and analyzing and managing compression ratios. Overall, continued research in the field of IC engine technology, by addressing issues like knocking, can improve the performance and durability of cars, making them more efficient, cost-effective and sustainable.

**Joseline Olivas, #118**

***3D Printing of Molds for use in manufacturing of Polymer Composites***

Carbon fiber polymer composite products are increasingly replacing metals due to their high strength and low densities. However, the molds used in manufacturing are expensive and account for approximately 40% of the composite part production cost, with a production time of up to six months. Any necessary design changes or defects at the end of production require more money or time to fix. Using 3D printing to manufacture these molds can reduce the time and cost associated with composite manufacturing and allow for rapid design changes to be made. To produce molds for composite manufacturing using 3D printing, a flexible thermoplastic polyurethane (TPU) material was necessary to easily remove parts. However, TPU is challenging to use in 3D printing, so the print settings had to be calibrated and refined to manufacture models accurately. Computer-aided design was employed to create and test molds with varying wall thicknesses, infill percentages, and designs to determine the optimal mold design for resin polymerization and composite manufacturing. Once the optimal design was identified, the resin was infused into the molds and cured using external heaters. The results showed that TPU material can be used to successfully manufacture high-quality molds for carbon fiber composite production. A mold design was identified as ideal for resin polymerization based on the thickness required for resin heating but limiting heat deformation. 3D-printed molds were designed and manufactured for high-performance carbon fiber composites, significantly reducing the tooling cost associated with manufacturing.

**Megan Buscietta, #119**

***A Rust On Our Forests***

Cronartium ribicola, Famously known as White Pine Blister Rust (WPBR), is an invasive fungal disease decimating native white pine forests across North America and Europe. Native to Asia, White Pine Blister Rust spread to Europe, where It was further spread to America through innocently-appearing seedlings that had not entered the symptomatic stage of their infection. Today, this fungal disease sweeps through the native forests of Colorado, producing a dangerous lethality among species of white pine. Some of the most notable hosts include the Eastern White Pine, Western White Pine, Sugar Pine, Whitebark Pine, Limber Pine, and Southwestern White Pine. Due to this rampant pathogen and other stressors, the native Whitebark and Limber Pines are endangered and under threat of extinction. This presentation will be a collage of valuable insights on the hosts of WPBR (White Pine and Ribes, a secondary host), the cycle of infection between Ribes and White Pine, symptoms of infection, and preventative measures/research currently present to protect native forests from this invasive invader. Additionally, this presentation seeks to inform others about identifiable traits of WPBR and its effects so this issue may become more well-known amongst the public.

**Abby Cho, #120**

***Could mycorrhizal fungi and organic compost replace artificial fertilizers with similar plant growth rates and yield counts?***

Mycorrhizal fungi form symbiotic relationships with plant roots, allowing the plant access to a greater volume of soil, leading to greater amounts of nutrients that are essential to plant life. Mycorrhizae form structures on, or inside of roots to assist the plant with nutrient absorption, which is especially important in stressed or nutrient limited environments. Furthermore, mycorrhizal fungi are decomposers, making them essential to all ecosystems to bring nutrients back into the soil and continue the movement of Earth's natural processes. This is a direct contrast to artificial fertilizers used in conventional farming, which can harm natural ecosystems. Conventional farming is defined by the use of artificial fertilizers, which are used to derive the highest crop yields possible. Currently, they are necessary to sustain human and animal life, but the world will continue to see increasing amounts of soil degradation, water contamination, changing trophic states of fresh-water ecosystems, and even increasing climate change as a byproduct of the continual use of artificial fertilizers. Research focused on working with the planet's natural cycles is vital to sustaining the fertility of agricultural lands to feed future generations. To compare natural methods with artificial methods, 3 common agricultural crops will be grown: wheat, alfalfa, and pinto beans. One plot will be treated with artificial fertilizer, and the other will be treated with mycorrhizae inoculant and organic compost. Over a period of 8 weeks, yield counts and growth rate will be measured, since efficiency and yield amounts are prioritized in today's farming industry.

**Ava Holzer, #49**

***Halting neurodegenerative diseases by decreasing inflammation in the glial cells***

Neurodegenerative disorders like prion disease, multiple sclerosis, and Alzheimer's disease greatly decrease the quality of life in affected individuals, impacting daily activities. These diseases cause progressive deterioration in physical, social, and cognitive functioning. Toxicity in the brain causes this to

transpire. Ultimately, this comes from inflammation of the glial cells and the accumulation of misshapen proteins. Studies in mice have found that if we stop inflammation of the glial cells we can increase behavior, decrease cellular stress, decrease misfolded proteins, and subsequently save neurons creating a longer, healthier life. However, we have yet to translate this to humans. We also know that it will be important to gain a better understanding of the causes or risk factors (eg. environment, diet, genetics, mental well-being) that induce neuroinflammation. We hope to do this by using prion-diseased mice to further tease out mechanisms of these diseases.

**Mckenna Gonzales, #50**

***pH at Different Elevations and its Affects on Wildflowers***

Wildflowers, such as the Great Blanket flower (Gaillardia aristata) grow all over the state of Colorado, growing in large quantities, and in all kinds of conditions including droughts. Great Blanket flowers can grow in a pH of about 6 to 6.5 so they need more acidic soil to grow best, however, they are most commonly found in higher elevations giving them an advantage, as pH decreases with elevation. Throughout this experiment, the question being answered is, "how does the pH in soils at differing elevations affect the growth of the shoots and roots of wildflowers?". To test this soil samples are being collected from the following locations, Denver; Pagosa Springs; Castle Rock; and Fort Collins, CO each varying at different elevations to understand the difference in pH. Each of the soil samples will be placed in terracotta 0.25-quart planters for growth, in turn, all of the planters will contain 3 Great Blanket Flower seeds. Once the seeds have been planted, they will be each given the same amount of water from the tap and placed in a spot with sunlight for growth. After the 1st week of being watered, they will be measured by stems and roots. This process will be continued for 3 weeks until the final measurement and pH is taken with a probe. The prediction being expected is that the seeds will grow best in the Pagosa Spring soil since that location has the highest elevation of 7,126 ft.

**Amber Kruis, #95**

***Peekaboo, where are you? : Using camera traps and occupancy models to aid in identifying the probable habitat preferences of Muntiacus vuquangensis***

On the border of Lao People's Democratic Republic, Vietnam, and Cambodia lays the Annamite Mountain range, a rugged tropical forest that harbors many diverse endangered species. The large-antlered muntjac (Muntiacus vuquangensis) is just one of the elusive species that calls the range home. The species was only recently discovered in 1994 but is already facing a high risk of extinction due to illegal hunting. Nevertheless, information on the species' ecology is still limited, hindering its conservation. By using available data from a camera trapping survey in Khoun Xe Nongma Provincial Protected Area, we investigated how habitat variables may affect use of an area by the large-antlered muntjac. We applied a single species, single occupancy model to estimate the probability of use of 50 camera trap sites between October 1st 2018 to January 3rd 2019. Five covariates; elevation, slope, aspect, curvature, and ruggedness were used to examine the probability of site use in the model. The most parsimonious model showed that elevation, slope, and ruggedness were factors that affected the detection of large-antlered muntjac. However, we found no significant relationship between these factors and probability of site use. Our results suggest that rather than applying an occupancy model to estimate area occupancy, this model can be used to predict environmental factors that will affect the use

of a site within the species' home range. In the future, we can obtain a better explanation of site use by obtaining a finer scale of environmental factors.

**Kira Donahue, #52**

***Evaluation of alternatives to feed grade antibiotics in feedlot rations on performance of beef steers***

The objective of this experiment was to find alternatives to Tylosin, an antibiotic used in cattle feeds. Secondary plant compounds or essential oils provide natural antibacterial functions that may alter the rumen microbiome and improve the immune system in beef cattle. Our involvement with this experiment and other related experiments included animal husbandry, sample collection, and laboratory work. Specifically, we bled heifers for blood samples, drenched steers during vaccination, handled and weighed cattle for data collection, cleaned fistulas for animal maintenance, conducted in vitro rumen experiments, and processed laboratory samples for analysis. While the experiments that we have had direct participation in are still ongoing, previous experiments from our laboratory (data described in this poster; Table 1) have reported no difference between Tylosin and secondary plant compounds on growth performance, carcass characteristics, and immune function in beef cattle. The experiments we were involved in, are promising regarding the efficacy of the secondary plant compounds being tested. Ultimately, this experience has introduced us to a many research topics, such as the feedlot and meat industry, laboratory techniques, experimental design, animal welfare, biochemistry, etc. The feeling of contributing to something bigger than ourselves is very fulfilling and we are very grateful to have had this opportunity.

**Grace Racine, #53**

***Changes in Reactive Nitrogen Loading to a Tropical Lake From Its Watershed Before and After Major Precipitation Events***

Presently we have more knowledge about temperate watersheds than tropical watersheds Differences between temperate and tropical watersheds suggest that what we know about how global change affects temperate watersheds cannot be directly translated to tropical watersheds and requires a more thorough understanding of how tropical watersheds are being impacted by global change. One aspect of global change is an increase in sea surface temperature that has increased the frequency and intensity of hurricanes in the Caribbean Basin. This can influence tropical inland waters and their corresponding watersheds by causing an increase in major precipitation events. Recently Lake Yojoa (a tropical lake) in Honduras, C.A. experienced two major precipitation events, Hurricane Eta (a Category 4 Hurricane, November 3rd - 5th 2020), and Hurricane Iota (a Category 5 Hurricane, November 17th – 18th) 12 days later. To assess how these precipitation events impacted the loading of reactive nitrogen (N) to Lake Yojoa, we estimated daily discharge and weekly dissolved N concentrations from four of the six principal tributaries to Lake Yojoa for an entire year before and after the two hurricanes. Here we present differences and similarities in the behavior of each of these tributaries and discuss implications for increased frequency of large precipitation events for the behavior of tropical watersheds in the context of global change.

**Caley Kling, #55**

***TP53 Gene Mutations***

The p53 gene is a cancer fighting gene that is present in all animal species. When a p53 gene mutation is present, the affected organism is highly susceptible to various cancers. Currently, 1 in 5,000 people are born with a p53 gene mutation. Because of this, it is important to find a solution. The most promising development is elephants; because of peto's paradox, elephants have 40 copies of the p53 gene instead of the two that humans have. If we can figure out a way to give humans extra p53, mutations of the gene would become irrelevant.

In this study researchers are determining a way to use elephant DNA to help humans fight cancer and virtually eliminate cancer itself. They started by analyzing necropsy data from multiple species, and now have been working to translate their findings to a solution for humans.

If this research study is successful, cancer will become an issue of the past. Humans will be able to fight off cancer in a way that only large animals have been able to. For people with p53 mutations in specific, their mutations will become almost irrelevant.

**Alison Goodrich, #56**

***The Decline of Pinyon Pine: Regeneration Through Enhanced Germination***

Pinyon pine (Pinus edulis)-dominant landscapes across Southwestern US are actively disappearing as the result of increasing global temperatures. Understanding pinyon pine response to climate change is critical for sustaining pinyon and the cultural and ecological benefits this species and ecosystem provides, including habitat and food source for various endangered wildlife species such as pinyon jays (Gymnorhinus cyanocephalus). With impending climate change, pinyon pine susceptibility to extreme drought and deluge events is a possible driver of decreased cone production. Increased germination potential might allow seedlings to become better established and associated with soil ectomycorrhizal communities, allowing for resistance to severe climate conditions. In nursery settings, pinyon seeds are treated with 3%-30% hydrogen peroxide for 0.5-8 hours for sterilization, promotion of seed coat degeneration, and elevated seed respiration. A standardized method for hydrogen peroxide treatment post-cold stratification has not been investigated since the 1980's. This study evaluated pinyon pine seed germination rate by treating cold-stratified seeds with hydrogen peroxide at various exposure times. Treated seeds were grown in field inoculated and non-inoculated soil mixtures to observe growth rate in response to mycorrhizae present in field soil collected from mature pinyon-juniper woodlands. Effective seed treatment for optimum germination is silviculturally applicable and can contribute to seed conservation efforts. Results from this study are expected to refine germination techniques for enhanced germination rates which would allow for more efficient study of pinyon pine to better inform recommendations for future land management decisions.

**Tori Teegardin, #58**

***What's Killing Our Trees?***

White pine blister rust is a disease that has been killing pine trees in Colorado for over 2 decades The fungus Cronartium ribicola was first discovered in North America in the early 1900s In the presence of moisture, spores from this Asian fungus infect plants called 5 needle pines This disease has a big effect on the lumber industry in North America, including in Colorado The BROADN lab at CSU is trying to understand more about this infectious fungus, such as how to treat it, and how it spreads The project

that I am working on in particular is relating the amount of spores in the air, to the amount of needles infected with white pine blister rust The hypothesis for my project is that the quantity of fungal DNA found is dependant on the stem, as well as the age class of needles The null hypothesis for this project is there is no difference in fungal DNA found in limber pine needles between stems, and there is no difference in fungal DNA found in limber pine needles between age classes This is done, first, by collecting pine needles from lumber pines in Laramie, Wyoming, specifically 2 individual limber pines located roughly an hour southwest of Colorado's peak to peak highway Pine needles are separated into something called age classes, depending on how old a pine needle is This is determined by looking at bud scars, the needles in between 2 bud scars being one age class The youngest pine needles are of age class 0 In this study, pine needles from age class 0 to age class 9, in case age class has an effect on inoculation of the ribicola spores The Cronartium ribicola spores were collected in Laramie as well They are aeciospores, collected from aecia from infected

**Gabriela Jonasson, #98**

***Possible Carcinogen Found in Starch-Rich Food***

Within a normal daily human diet, it is recommended to consume between 100 to 278 grams of starchy carbohydrates a day. These starchy carbohydrates can come in the form of potatoes, bread, cereal products, and grains; carbohydrates can also come in baked or fried forms (NHS). Within years of studying human food consumption, it is predicted by Bruce Ganem, a professor in Cornell University's Department of Chemistry and Chemical Biology, that acrylamide, a possible carcinogen, may form within starch-rich food when fried or baked (Friedlander). When starch-rich food is heated above 212 Fahrenheit, asparagine, naturally found within starch-rich foods, is converted to acrylamide with the presence of sugar (Friedlander). Healthier alternatives to reduce acrylamide intake are limiting foods sources that are high in acrylamide, such as; French fries and potato chips, limiting certain cooking methods, for example; frying and roasting, and cooking scratch-rich foods to a lighter color (American). As a society that has incorporated fatty and fried diets, it is important to understand the risks to human health that these diets and products can cause to our bodies.

**Cassidy Worgan, #61**

***Influence of Youth: How does the juvenile bottlenose dolphin influence the respiration rate of the adult dolphin?***

The influence of youth is underexplored in complex social creatures, humans and dolphins alike. How adult bottlenose dolphins are influenced by young dolphins is unknown. Using observational data collection techniques, a baseline respiration rate and activity level for two adult male dolphins will be taken while residing in an open sea enclosure. After the introduction of a juvenile male dolphin, the respiration rate and activity level of the adult dolphins will be recorded using the same collection techniques. The results, as behavioral indicators of physiology, will be analyzed comparatively to evaluate the influence of the presence of the younger dolphin. The goal is to discover how the physiological and social engagement level of adult male dolphins are affected by the presence of young dolphins. Using previous knowledge, the anticipated results will show an increase in respiration rate in correspondence to an increase in activity level, caused by the introduction of the young dolphin. Through the use of this data, assumptions can be made regarding the plausible consequences of housing captive animals of

different ages together. This, in combination to further research, will lead to the betterment of captive animal care. Additionally, this research will further the understanding how of bottlenose dolphins allocate critical resources such as oxygen towards social behaviors.

**Keanu Kaibetoney, #62**

***7 Generations Through Indigenous and Climate-Resilient Landscape Architecture***

The 7 Generations project works to engage Indigenous and climate-resilient design principles to develop a 70-acre field site that will support experiential learning and research opportunities for future generations of Indigenous students, faculty, staff, and community members. Research, outreach, and activities at this generational space will broadly focus on ecological restoration and cultural reconciliation efforts. This project's significance is preparing a field site and programming to address a longstanding need for community-based Indigenous science education while serving CSU's commitments as a land grant institution and needs identified by our local Native community.

The first step was identifying and compiling a portfolio of existing Indigenous and climate-resilient program models to inform architecture and design. The next step was to develop a stakeholder assessment plan for identifying needs and functionality the site could serve (e.g., Indigenous garden, phenology walk, climate-monitoring station, greenhouse for plant propagation, etc.) Which led to applying climate-resilient landscape architecture principles to designs after assessing the site's natural elements, including the climate, soil, slope, drainage, and vegetation. The designed master plan is for the structures and outdoor areas working towards community-informed environmental, social, and cultural outcomes. What is next for this project is drafting a complete budget and proposal for site development. To be able to give back to our local native community and impact future generations of Indigenous people is the true significance behind this work. Being able to present research findings and design proposals to investors would help turn this 7 Generations dream into a reality.

**Vance Peterson, #65**

***How Can We Limit Harmful Emissions from Combustion Engines?***

Harmful emissions from combustion engines are a big problem in our technological world today. As society gets increasingly dependent on vehicles, combustion engines that are commonly used are more prevalent than ever. Although there is an effort to focus on sustainable and ecofriendly ways of generating electricity, the a large basis of our world’s infrastructure is based on combustion engines. Harmful emissions that are produced are unnatural and are stuck in our atmosphere, increasing the damage of issues like climate change and widespread pollution. The methods to my analysis will be to research what the most harmful emissions are, through what process they are released, and how that process can be changed or modified to limit the harmful emissions without decreasing the engines efficiency. With positive results, the solutions can be implemented all over the world with much lesser cost than converting to entirely different forms of energy. While clean and ecofriendly energy is preferred, companies will be much more inclined to continue using the same combustion engines at little cost while having a more positive and healthy effect on our environment.

**Alexis Olson-Gwin, #68**

***The Defensive Activation Theory***

Throughout history, dreams have been interpreted in a variety of ways, such as messages from the subconscious or higher powers, or answers to problems people have been facing in their waking lives. Recent studies have determined that small changes in brain activity and structure are noticeable in as little as ninety minutes. This led researchers to hypothesize "the defensive activation theory," published in May 2021, that states we dream to prevent takeover of the visual cortex due to the fact that our ancestors were cast into darkness for twelve hours each day. During this study, researchers gathered information from peer reviewed journals in databases. The researchers gathered measurements of a) the neuroplasticity of 25 different primates including humans, and b) the percentage of time spent in REM sleep across their lifespan. Neuroplasticity can be defined as the degree to which the brain physically changes in response to environmental stimuli. Because time until weaning, locomotion, and adolescents are behavioral proxies to plasticity, the researchers recorded this information to determine each primate's neuroplasticity. It was discovered that the more neuroplastic each primate was, the more time they spent in REM sleep on average; the more neuroplastic the brain was, the more time each species spent in REM sleep to combat takeover of their visual cortex during the night. This tells researchers that there is a feedback system that prevents the takeover of unstimulated space in the brain, offering reason to why the precise circuitry behind dreaming has developed through evolution.

**Savannah Johnson, #66**

***An Analysis of Double Haploid Programs in Modern Wheat Breeding Using Wide Hybridization***

Traditionally in wheat breeding, new cultivar development is accomplished via the repeated self-pollination of the first filial (F1) generation created by the crossing of two homozygous parents. Using this method, it takes several generations for the offspring of those parents to reach homozygosity for the desired trait. Unfortunately, with the rapid increase in climatic changes coupled with the growing demand for food due to a rising global population. It is more necessary now than ever to implement ways to increase new cultivar development for staple crops like wheat. These new cultivar developments can aid farmers in producing higher yields, along with fighting global hunger and ensuring that future generations maintain a stable food supply. Implementing double haploid technology, however, into breeding programs such as the one here at Colorado State University and other institutions, not only reduces the development time for new wheat cultivars but also increases the yields of said cultivars. Through the investigation of double haploid wheat breeding programs at Colorado State University along with other similar institutions. We can see just how this technique can benefit the production of new wheat cultivars and in turn improve efforts to address the growing global food demand as well as aid farmers as they navigate changing climates, diseases, and other factors that may diminish annual yields.

**April Rust, #69**

***Artificial Intelligence in Advancing Prosthetics***

The evolution of prosthetics throughout the generations has seen a large involvement of artificial intelligence and Internet of Things (IoT) as it has developed Human-Machine Interaction (HMI) in prosthetic advancements. Neuro-prosthetic researchers have implemented a way for amputees to be able to feel through prosthetics embedded with sensors that connect to the body. The method to create

these prosthetics includes the use of intelligent metasurface and electromagnetic wireless strategies to create non-contact gestures of the prosthesis. These gesture recognitions are used for determining how the hand, fingers, or wrist should be able to flex and move according to the body's natural abilities. The AI agent is designed to translate the amputee's movement through a peripheral nerve interface. In order to decode the subject's motor intents, the AI uses a Six Degrees of Freedom Decoder (6DOF) that focuses on the translation and rotation for the prosthetic to move along the x,y, and z axis. In the nerves that remain on the body's stump, the goal is to embed electrodes that can be stimulated with a small current, allowing the patient to feel what the prosthetic feels. These electrodes are then needed to be recognized in the brain, where the body is able to then adjust and relearn the ability of movement. This technology helps enable amputees to intuitively control the replacement limb with a 97-98% accuracy. There are many limitations to this prosthetic approach at present, but researching the advancement of artificial intelligence in prosthesis brings us closer to finding a reliable way to implement this technology throughout the medical field.

**Amber Boyle, #71**

***Response to Rainfall of a Non-perennial Stream in the West Stroph Area***

As an ever-growing state, previously rural and natural areas in Colorado are undergoing development at a rapid pace. As a historically water scarce region, there is an important emphasis on continually improving water management and allocation methods. Therefore, it is important to quantify the impacts of development on existing water resources as the landscape changes.

West Stroh Gulch, a watershed located in Parker south of Denver, CO provides a unique opportunity to record housing impacts on a non-perennial stream channel's flow patterns from pre to post development. Presence and absence of streamflow is recorded using timelapse photography. Field cameras were strategically placed along the stream channel to take photos every five minutes. These photos are processed and reviewed for specific observations including presence and absence of streamflow, soil moisture, and wildlife presence. These logged photo observations are then compared with precipitation data to review stream channel responses to recorded precipitation events.

Our results will help us determine what rainfall intensities and storm depths trigger stream flow in the West Stroh Gulch watershed. Additionally, this historical pre-development baseline can be used for comparison to post-development streamflow patterns in the West Stroh Gulch watershed and assist future predictions for stream flow impacts in similar watersheds slated for development. Streamflow observations and precipitation data collection will be ongoing through the stages of development.

**Tristan Smith, #73**

***CBD as a treatment for ADHD symptoms in college students***

It's estimated that in 2022, between 2-8% of college students worldwide (ages 18-29) reported having ADHD, although it is thought that the number is much higher. Attention Deficit/Hyperactivity Disorder (ADHD) is one of the most prevalent neurobehavioral disorders diagnosed today. It can present itself in many ways depending on age, sex, and other physical or neurobehavioral disabilities. However, most people will experience the inability to focus, heightened stress levels, low retention rates, difficulty paying attention to details, and difficulty organizing tasks, all of which are important skills needed to be a successful student. There have been many studies on the correlation between mental health disorders

and Cannabidiol (CBD) found in cannabis. Through these studies, we will be able to understand exactly how the components in CBD impacts the brain and intern, how it affects these 5 specific symptoms, proving that CBD is a positive method of dealing with difficult ADHD symptoms for students in college. CBD alleviates the intensity of other neurobehavioral disorders, such as anxiety, insomnia, post-traumatic stress disorder, and bipolar disorder, which share common symptoms with ADHD. CBD is an active compound that targets the nervous system and research shows that it specifically targets areas in the brain responsible for anxiety, memory, and inattentiveness. Although the study of the relationship between CBD and ADHD is still ongoing, there is evidence that it can be used as a treatment for ADHD symptoms.

**Shiloh Allen, #74**

***How does our absence effect our pets?***

Our pets are precious creatures that most humans put a lot of time and money into caring for. Yet, we sometimes fail to remember that, just like us, our pets have complex mental processes. Like us, our pets form essential bonds with those caring for them, and forced separation can give them anxiety and depression. Most pet owners are unaware of the adverse feelings their pets can go through when separated, which is why observing our pets and their behaviors is essential. After spending a whole week with their owners, several dogs' and cats' behavioral patterns, such as their eating and bathroom habits, energy levels, and other general behaviors. After a week of observation, it was determined that our presence significantly affects our pet's ability to behave normally.

**Payton Shirley, Sydney J Risen, Sean Boland, Sadhana Sharma, Grace Weisman, Amelia D Hines, Arielle JD Hay, Vincenzo Gilberto, Stephanie McGrath, Anushree Chatterjee, Prashant Nagpal, Julie A Moreno, #75**

***Targeting neuroinflammatory pathways using Nanoligomers™ reduces glial inflammation and protects the brain from spongiosis and neuronal loss in prion disease***

A key factor in the development of neurodegenerative diseases, including prion disease is neuroinflammation. Currently there are no effective treatments to halt pathogenesis and progression, which includes accumulation of misfolded proteins and glial inflammation, followed by irreversible neuronal death. We hypothesize that by utilizing Nanoligomer™ in prion diseased mice we can downregulate the two key neuroinflammatory targets to be neuroprotective. To test this, we examined different brain regions of the prion infected mice to identify the impact the Nanoligomer™ will have on glial inflammation, spongiosis, and neuronal loss. The four brain regions; hippocampus, cortex, thalamus, and cerebellum were examined to assess the impact on glial inflammation and spongiosis. To assess the impact of neuronal loss the hippocampus brain region was examined. Prion-diseased mice treated with Nanoligomer™ showed decreased microglia and astrocyte inflammation in all four brain regions assessed. Spongiotic change, formation of vacuoles as the prion disease advances, was significantly reduced, and therefore protected against in all brain regions assessed in mice treated with Nanoligomer™. Within the hippocampus neuronal numbers were notably protected when mice were treated with the Nanoligomer™. Therefore, Nanoligomer™ treatment is independent of the misfolding of the PrPSc and inhibits the inflammatory pathways, ultimately preventing neuronal death and slowing the progression of neurodegenerative diseases.

**Amelia Nash, #78**

***Effective and Easy Water Filteration***

Water is a fundamental part of life for almost all living things, yet for humans, despite all of the water available on earth, only a small percentage is safe enough to drink, whether it be too salty, contaminated or dirty. Through experimentation and research of different purification methods we were able to decide which water samples (tap water, melted fresh snow, bottled water and lake water obtained from the lagoon on CSU's campus) as well as which purification methods (Bleach, boiling, distillation, or standard filtration) produced the cleanest water samples. We measured this by seeing which sample had the most neutral pH and the least bacteria present after filtering to determine which type of sample and filtration method worked the best to purify water for safe consumption. By repeating the different filtration methods on multiple samples we are able to more effectively decide which method is the best for purifying water, removing bacteria and neutralizing the pH.

**Brenna Dowden, #80**

***Testing Genetic Similarity Between Natural and Transplanted Ponderosa Pines***

Across different geographic locations, ponderosa pines (Pinus ponderosa) experience a myriad of conditions, leading populations to adapt differently to their specific stressors or limiting factors, such as varying altitudes, higher temperatures, drier climates, or increased fire damage. As conditions change and become more inhibiting to tree growth, some populations have begun to have lessened seed banks and limited new growth, leading to efforts of reforestation or restoration. However, if the affected area is attempting to be reforested with seedlings from an area of different climatic conditions, the seedlings will not be able to perform as well since they are adapted to different conditions. If transplanted seedlings are unable to grow, the area would struggle to return to its natural habitat, negatively affecting many other organisms in the area. Testing the genetic variation among ponderosa pines from different geographic locations can show the differences in adaptation. It can possibly show which successful populations can be used to reforest areas of similar conditions with the best outcome and forest regrowth. In order to test the genetic similarities of transplanted trees to naturally grown trees, samples from one old growth tree, one new growth tree, and one transplanted tree from Black Forest, CO will be gathered and genetically compared at the CaPF1 and WRKY genes. Ideally, the trees should have little genetic variation, but varying seed sources could show differences. These types of tests are important to make sure that reforestation efforts are not in vain and the forest can recover successfully.

**Anisha Kalla, #83**

***Shape Shifting Robotics-Design of an Automaton***

Technology is increasing at a rapid rate; these advancements must be coupled with synergetic innovation. Throughout the years, robots have mainly been composed of rigid, sensitive material that prevent them from handling intricate, delicate tasks. The Adaptive Robotics Laboratory, directed by Dr. Zhao, aims to create shape shifting robots made by morphing polymers. The key goal of this project is to fabricate numerous prototypes of multifunctional robots. As a new addition to the lab, my role is to prototype a robot that is able to move on different terrains. The initial design is similar to that of a Rhex robot; I currently utilize Arduino IDE and SOLIDWORKS to program and design this robot. This project is designed to showcase the mechanical and electrical fundamentals of engineering which can be applied

to a larger scale shape shifting automaton. Overall, our lab is focused on engineering reconfigurable robots made of shape memory polymer that serve a variety of purposes. For instance, a robot has been developed that can both swim and walk on land with the expansion and contraction of the synthetic polymer material. This is one of many designs that have been modeled and tested in the lab. Our goal is to refine and advance automatons that have quintessential mechanical, biomedical, and environmental applications that enhance current apparatuses.

**Francisco Martinez, #84**

***Microbes Around Us***

All the living microorganisms inside an indoor environment, and their by-products, are known collectively as an indoor microbiome. Research on indoor microbiomes has rapidly expanded, increasing public interest. However, most of the studies on the indoor microbiome are related to humans. It is postulated that the indoor microbiome is critical in maintaining animals' nutrition, health, and well-being. However, we have a limited understanding of microbial communities that inhabit different habitats with the indoor microbiome of animal sheds. Here our objective is to provide a detailed census of bacterial communities residing in different environments within the indoor microbiome of animal sheds. We collected air, soil, feed, and fecal samples from a shed at ARDEC, CSU, where mother sheep were kept. We extracted DNA from the collected samples and characterized the bacterial communities using quantitative PCR (qPCR). Our results showed that the indoor bacterial community within animal sheds is diverse and complex. We are now processing samples for next-generation sequencing to provide a detailed census of bacterial communities for animal sheds. Our study will provide vital information on bacterial communities' structure and potential functions in the indoor environment.

**Aryan Patel, #85**

***The Race to Doom***

Mass extinction occurs when a majority of different species living at a given time go extinct in a short amount of geological time. There have been five mass extinctions until now, and the sixth one is said to be underway. The sixth mass extinction is the only one which is centered around humans (the only one which has humans) and referred to as the ‘anthropocene’ mass extinction. The entire human species is responsible for what is about to come, and we don’t even know about it. Humans and their activities mess with the natural balance of ecosystems, and through a series of events one or more species of animals lose to make the cut. What is more concerning is that we are so bound to take extinction to its fruition, we are solely committed to it, and doing everything to make it possible. My question is should we be worried about it right now, because it takes a lot of time? And if we should be worried, what can we possibly do to halt it from coming so sooner (we cannot stop mass extinction, it’s a natural way of control)? To investigate the question, I would be using the works of other scholar, and a few other sources and then interpret and synthesize the results of all.

**Krist Tran, #88**

***Analyzing the Wavelengths of Traditional and Alternative Medicine Through Spectrophotometry***

In traditional healthcare settings, patients are examined by multiple nurses and doctors and later prescribed medication that is further assessed by local pharmacists. Whereas, in a holistic medicinal approach, healthcare providers assess the patients comprehensively, rather than looking solely at the symptoms. There is skepticism surrounding the holistic approach, as many people are wary of herbal supplements being used as medication. An experiment will be conducted in which the active ingredients of four different medications will be analyzed using spectrophotometry. The spectrophotometer will measure the specific light absorption of compounds which can be used to identify unknown chemicals. Eagle Brand Medicated Green Oil and Vicks VapoRub will be compared as they both have menthol as an active ingredient. Willow bark, which has an active ingredient of salicin, will be compared to aspirin, which has an active ingredient of acetylsalicylic acid. From the data gathered using the spectrophotometer, wavelength peaks that correlate to the active ingredient will be identified through comparison with known UV curves. After confirming the wavelength of the active ingredient, the wavelength spectrums of the medicines will be compared to one another. The hypothesis of this experiment is that these two comparisons will demonstrate that different cultures use very similar medicines as treatments, which are both effective because they have the same or similar active ingredients. It is hopeful that criticisms of alternative medicines will be lessened if the data found supports this hypothesis.

**Katelyn Yee, #89**

***The Impact of Music on Stress Levels***

Despite awareness about mental health issues increasing, there is also an increase in stress levels. This was especially true following the COVID-19 pandemic. Generation Z, including people born between 1997 and 2013 were particularly impacted by the pandemic. In 2019, the average reported stress level for Generation Z adults was 4.9 out of 10 on a 1-10 scale. In 2020, the same reports had an average of 6.1 out of 10 (American Psychological Association, 2020). Stress levels are increasing, but there are possible solutions. It has been demonstrated that music increases the amount of dopamine in the brain, which can be beneficial in minimizing negative emotions (Salimpoor, 2011). To expand on this, I will be testing the effect of different genres of music on stress levels. Using a pulse ox machine to monitor a participant's heart rate (because heart rate is correlated to stress) and the Perceived Stress Scale, participants will be closely monitored before, during, and after listening to music of different genres. The independent variables will include the participant's favorite genre, classical music at slower tempos, and Hip Hop/Pop music. By combining physiological and psychological measurements, the results will show a person's stress level not only based on what they feel, but also how their body is reacting. The participants will be college students, which is a population that is particularly stressed and can benefit greatly from listening to music whether it be when walking to class, doing homework, or just going through daily life post-pandemic.

**Erika Jensen, #91**

**Synthesis of Zinc Oxide Nanoparticles for Energy Technologies**

With the vast increase in electricity use across the globe, it is paramount that more efficient lighting sources are used. While the traditionally used incandescent bulbs have very low efficiency, their much more efficient replacement, LEDs, are difficult to manufacture and often contain rare earth metals, which leads to an overall higher cost. Zinc Oxide nanocrystal-based white light emitters are an efficient, low-cost solution to this problem due to their low complexity and use of common, non-toxic elements. In this experiment, we set out to determine the relationship between the synthesis temperature, size, and size distribution of ZnO nanocrystals. We hypothesized that the average particle size will increase and the particle size distribution would broaden as the reaction temperature increased. We expect to see broader distribution due to the temperature increasing the rate of reaction. UV-Vis and fluorescence spectroscopy were utilized to characterize the absorbance and emission of ZnO nanocrystals synthesized at varying temperatures of 60℃, 65℃, 70℃, 75℃. Based on our results, we discovered that there is no correlation between the synthesis temperature, size, and size distribution of particles within the range studied. This may be due to a small range of temperatures tested. As we continue to study the synthesis of ZnO nanoparticles, we will consider testing different variables such as larger temperature range, synthesis time, and the amount of starting precursor, to determine how different variables affect particle size distribution. This fundamental knowledge will ultimately enable us to leverage ZnO nanocrystals as the active material in environmentally friendly lighting applications.

**Smriti Maskey, #61**

***Health Promotion in Psychology: How Psychological Sciences is Utilized to Improve Healthy Lifestyles***

Healthy lifestyles encompass various essential components, such as physical activity and eating behaviors. In recent decades, sedentary behaviors have been on the rise due to several factors, including lack of time, limited space for exercise, and increased demand for desk jobs, alongside the surge of technological entertainment. Additionally, unhealthy eating behaviors caused by fast food chains, diet culture, fad diets, and lack of knowledge or misinformation, are also contributing factors to an unhealthy lifestyle. These unhealthy behavioral patterns have been linked to increased mortality rates, cardiovascular disease, diabetes, obesity, depression, anxiety, and other health issues. I have been involved in the development of multiple health promotion projects aimed at promoting active lifestyles and healthy eating. These projects focused on testing walkability in virtual reality and real life, combating sedentary lifestyles through workstations, food-ordering behaviors, and buffering stress through physical activities. My presentation summarizes how each project uses psychology to address these health concerns, my contributions to each, future directions, and limitations. The current findings indicate interventions to promote healthy lifestyles are promising.

**Kelly Mutmanski**

***Design and Validation of a Water Quality Sampling Plan in Spring Creek, Fort Collins, Colorado***

The goal of this project was to develop and validate a sampling plan for a water quality monitoring protocol in Spring Creek. This process is important to understand the dynamics of pollutants present in the water column and create a concentration profile of the creek. We began by surveying the trail and deciding on the data collection points. Twenty-five points were chosen between Rolland Moore Park and

Edora Park, based on accessibility. The coordinates of each spot were recorded and plotted using Google Maps. All of the tests were determined to be simple and necessary to conduct. After walking along the trail once, we determined that it would be necessary to collect less samples and thus, modify the plan. Carrying the required water samples for approximately three miles, proved to be more challenging than expected. From this research experience we learned that the local bodies of water in our community are at normal water quality levels. There is no concerning data that we collected which means that the water is safe to its inhabitants and there is no concern of problematic contamination to the people in neighboring communities. For future projects, a long-term frequent monitoring sampling protocol will be implemented so that pH, T, DO, conductivity, nitrates, sulfates, chlorine, free chlorine, chromium, and phosphates are tested in the same sites. Also, a concentration profile will be plotted to find correlations between the concentration of parameters, location, and season.

**Tam Nguyen, #94**

***Delayed Sleep Disorder: CRY1 and CRY2 Gene Mutations Could Modify Your Circadian Rhythm***

The circadian clock is what controls our body's natural cycle of mental, physical, and behavioral changes, making us more or less active at night. CRY1 and CRY2, mammalian cryptochrome genes, are essential for regulating the circadian rhythm through the molecular mechanism. Mutation of cryptochrome genes have been related to delayed sleep phase, affecting one's internal circadian clock, causing a two-hour or more delay from a conventional sleep pattern. I conducted a literature review on two research papers: Patke et al. 2017 and Hirano et al. 2016, where the relationship between a missense mutation in CRY1 and CRY2 has been hypothesized to yield an advanced sleep phase in humans, making someone more active at night. This variant of CRY1 is prevalent in 1 in 75 people in certain populations. Therefore, the results of these papers suggest "night owl," behavior might be caused by a genetically predetermined mutation in your CRY1 and CRY2 genes.

**Elizabeth Ninke, #126**

***Glial-mediated neuroinflammatory response to simvastatin in a murine, in vitro model***

Heart disease is the leading cause of mortality in the United States, accounting for around a third of all deaths. While statins are a family of drugs widely prescribed to lower the risk of cardiovascular-related diseases by decreasing cholesterol synthesis, the side effects of statins on the body's most cholesterol rich organ, the brain, remain largely unknown. Cholesterol facilitates fundamental neuronal functions such as regulation of signal transduction, ion channel permeability, and overall homeostasis of the central nervous system as it is a major constituent of the myelin sheath and membrane lipid rafts found in neurons and glial cells, including astrocytes and microglia. Astrocytes provide neurotrophic support and microglia are the immune cells of the brain, both necessary for optimal neuronal health and function. Thus, we postulate that if cholesterol synthesis is essential for healthy neuronal function, then chronic inhibition of cholesterol synthesis from statin use results in a glial-mediated neuroinflammatory response associated with neurodegenerative diseases such as Parkinson's disease or Alzheimer's disease. To test our hypothesis, we utilized a commonly prescribed statin, simvastatin; due to its lipophilic properties and widespread use. Glial and neuronal health analysis occurred in a primary, murine in vitro model to exhibit that glial viability is not affected from direct simvastatin exposure. Measurement of inflammatory cytokines and neuronal exposure to glial-conditioned media, however, will inform whether

glial-neuronal signaling is altered by the popular cholesterol therapeutic, shedding light on the role that statins may play in the development of neurodegenerative disease later in life.

**Hayley Troyan, #114**

***Toxic Air- Every Little Step Counts***

Air pollution increasingly contributes to life-threatening health issues as well as deaths each year, especially in marginalized communities. Also, air pollution is one of the leading risk factors for disease, which can damage an individual's organs. Such emissions need to be cut down and stopped to ensure the safety of the people and the planet by educating the public and voting. Locally, in Commerce City, Colorado, the establishment of the Suncor Energy Oil Refinery consistently spews harmful chemicals and pollutants making it the largest source of air pollution in the state. In turn, surrounding neighborhoods and people are becoming sick and unwell due to these air contaminants. According to the Air Pollution Control Division from the Colorado Department of Public Health and Environment, air monitoring stations, sensors, and models collect data on the 98,000 barrels of toxic emissions per day. Suncor and other research departments like Cultivando, a nonprofit endorsing health equity and environmental justice for Latino populations, also provide information to the Air Pollution Control Division. The data from air quality reports of hydrogen sulfide, sulfur dioxide, and other particulate matter, will establish an argument concerning developmental health risks that arise in nearby communities in Commerce City. To put a stop to these emissions from Suncor Refinery, studies like this one can be used to advocate for the communities that are harmed and aid in informing the public about such issues. Further efforts will try to discontinue the refinery and its dangerous emissions.

**Su San Yar Tun, #47**

***Indoor fungal communities of animal shed.***

All the living microorganisms inside an indoor environment, and their by-products, are known collectively as an indoor microbiome. Research on indoor microbiomes has rapidly expanded increasing public interest. However, most of the studies on the indoor microbiome are related to humans. It is postulated that the indoor microbiome plays a critical role in maintaining animals' nutrition, health, and well-being. However, we have a limited understanding of microbial communities that inhabit different habitats with the indoor microbiome of animal sheds. Here our objective is to provide a detailed census of fungal communities residing in different environments within the indoor microbiome of animal sheds. We collected air, soil, feed, and fecal samples from a shed at ARDEC, CSU, where mother sheep were kept. We extracted DNA from the collected samples and characterized the fungal communities using quantitative PCR (qPCR). Our results showed that the indoor fungal community within animal sheds is diverse and complex. We are now processing samples for next-generation sequencing to provide a detailed census of fungal communities for animal sheds. Our study will provide vital information on fungal communities' structure and potential functions in the indoor environment.

**Mya Voitsberger, #122**

***Hypoxia, pregnancy, and the spleen: physiology underlying fetal growth trajectories in high elevation environments***

Environmental hypoxia at high elevations is consistently associated with fetal growth restriction. Maternal physiology is thought to mediate at least some of these effects: hypoxia interacts with maternal physiology, which ultimately dictates the in utero environment. To understand how environmental hypoxia shapes fetal growth, we need to understand how hypoxia impacts maternal physiology. Using experimental acclimations to hypoxia, the Wilsterman lab previously showed that hypoxia restricts fetal growth in low elevation-derived deer mice (Peromyscus maniculatus). I hypothesized that maternal splenic remodeling in response to hypoxia contributes to these population-specific fetal growth trajectories. I specifically predicted that hypoxia reduces white pulp (lymphatic tissue) in the spleen of pregnant dams, and that fetal growth would be positively correlated with the splenic white pulp size such that more white pulp would be associated with heavier fetuses. To test this hypothesis, we cryosectioned spleens from pregnant and non-pregnant deer mice that had been acclimated to either normoxia or hypoxia, and then I quantified splenic size and structure (specifically, proportion of white and red pulp). I will test for differences among groups using two-way ANOVAs. If splenic white pulp is indeed affected by hypoxia and related to fetal growth, future work should investigate the mechanisms leading to these associations. Alternatively, other maternal organs may be better targets for understanding how environmental hypoxia shapes maternal physiology in ways that impact fetal growth. Either way, these data will provide insight both into how hypoxia affects pregnant moms and can lead to prenatal complications.

**Cassidy Worgen, #61**

***Influence of Youth: How does the juvenile bottlenose dolphin influence the respiration rate of the adult dolphin?***

The influence of youth is underexplored in complex social creatures, humans and dolphins alike. How adult bottlenose dolphins are influenced by young dolphins is unknown. Using observational data collection techniques, a baseline respiration rate and activity level for two adult male dolphins will be taken while residing in an open sea enclosure. After the introduction of a juvenile male dolphin, the respiration rate and activity level of the adult dolphins will be recorded using the same collection techniques. The results, as behavioral indicators of physiology, will be analyzed comparatively to evaluate the influence of the presence of the younger dolphin. The goal is to discover how the physiological and social engagement level of adult male dolphins are affected by the presence of young dolphins. Using previous knowledge, the anticipated results will show an increase in respiration rate in correspondence to an increase in activity level, caused by the introduction of the young dolphin. Through the use of this data, assumptions can be made regarding the plausible consequences of housing captive animals of different ages together. This, in combination to further research, will lead to the betterment of captive animal care. Additionally, this research will further the understanding how of bottlenose dolphins allocate critical resources such as oxygen towards social behaviors.

**An-Ping Yu, #18**

***Gene Expression of Insulin-Like Peptides (ILP) Across the Molt Cycle of the Blackback Land Crab***

Crustaceans regularly undergo growth and regeneration through the molt cycle. Four stages of the crustacean molt cycle are controlled by levels of circulating ecdysteroids, which are synthesized by Y-organs (YO). Insulin-like peptides (ILPs) are members of the insulin superfamily and are known to regulate growth and development in arthropods. ILPs have been characterized in insects, but their role in the molt cycle of crustaceans is unknown. An insulin receptor (InsR) was previously detected in the YO transcriptomes of the blackback land crab, Gecarcinus lateralis. Thus, ILPs may activate signal cascades that ultimately regulate ecdysteroid synthesis. A potential role of ILPs is the delay of regeneration and molting. In Drosophila, an ILP secreted by damaged imaginal discs inhibits ecdysteroid synthesis and delays metamorphosis. Correspondingly in crustaceans, limb regeneration and molting can be inhibited if regenerating limb buds are damaged. Growth of intact limb buds does not continue again until damaged regenerating limb buds are replaced. The goal of this study is to identify ILPs and characterize their role in regeneration and molt regulation of crustaceans. Three putative ILPs (ILP-1, ILP-2, ILP-3) were identified in the eyestalk ganglia and YO transcriptomes of G. lateralis through phylogenetic analyses. Additionally, limb buds were autotomized at different regenerative states of G. lateralis and will be used to generate new transcriptomes. By analyzing changes in gene expression of ILPs across different limb bud states, this study will provide a better understanding of ILPs and their role in molt regulation.

**Nikole Z. Madrid, #32**

***Neuroinflammation Across Canines: Young, Aged, and Aged With Canine Cognitive Dysfunction***

Canine Cognitive Dysfunction (CCD) is a naturally occurring neurodegenerative disease in aging canines and is pathologically similar to human Alzheimer's Disease (AD). Canine CCD is characterized by clinical signs such as barking for no reason, no longer greeting their humans, having accidents in the house, not wagging their tail as much as usual. CCD may lead to persistent neuronal inflammation and protein misfolding, and while the cause is unknown, it may be linked to environmental factors such as diet, air pollution, and heavy metals. In canines with clinical signs of CCD, the persistent neuroinflammation leads to neurotoxicity causing cell death and worsening signs and symptoms of CCD. Currently neuronal inflammation, known as gliosis, associated with CCD is diagnosed with Immunohistochemistry (IHC) staining of postmortem canine brain tissue. Important pathological markers for gliosis used are GFAP and S100β to visualize activated astrocytes and Iba1 for activated microglia. In ongoing longitudinal clinical studies, plasma and CSF are analyzed across three groups; young, aged, and aged with CCD. This study allows for ongoing analysis of canine samples to examine connections between pathological findings in the brain tissues and markers in the CSF and plasma. Canines make excellent sentinel translational models for aiding development of diagnosis and treatment of AD.

SOCIAL SCIENCES & HUMANITIES ABSTRACTS

**MURALS 2022 1st Place Winner- Tianna Weiland**

**MURALS 2022 Overall Winner- Akilah Martin**

**Abi Tekeste and Monica Schafer, #13**

***Needs analysis for Spanish language and cultural knowledge in medical and legal contexts***

There is a Spanish/English language gap between professionals in medical and legal fields and their Spanish-speaking clients and patients. The goal of this research team is to better understand this gap by surveying and interviewing professionals in these fields and the Spanish-speaking communities they work with. The goal of this research is that it will be used to create a Spanish language curriculum designed specifically for professionals and pre- professionals in medical and legal fields. Interviews with a variety of practicing professionals and Spanish and English patients/clients about their experiences interacting with one another, as well as observations of these interactions, continues to help us understand what information to include in the Spanish for Healthcare and Spanish for Law classes that are aimed to create.

**Yubraj Kc, #67**

***The Societal Impact of Artificial Intelligence: Challenges and Opportunities***

The world as we know it is about to change due to artificial intelligence (AI), which has the ability to have an impact on every sphere of society, including healthcare, finance, education, and employment. Although AI has many advantages, such as greater effectiveness, production, and innovation, it also poses serious problems for society. As AI systems improve and are able to carry out jobs that humans once performed, one of the main worries is the possible displacement of human workers. This might worsen already existing disparities and cause substantial social and economic disruptions. However, there are ethical issues with AI use, including prejudice, privacy, and accountability, that need careful thought and regulation. AI also offers ways to address societal issues including social inequality, access to healthcare, and climate change. It is crucial to create a thorough framework for AI governance that includes moral guidelines, openness, and accountability in order to maximize the potential benefits of AI while minimizing its risks. This study examines how AI is affecting society and offers suggestions for how to deal with the benefits and problems that this game-changing technology presents.

***Paige Perricone, #87***

***Promoting Resilience and Protective Factors for LGBTQ+ and Foster Youth***

I am a second-year student at Colorado State University and a first-year scholar at the Puksta Foundation. My family runs a trauma-informed home designed to help facilitate the social rehabilitation of teens, pregnant teens, and teen moms.

My project is still in the early stages of development, but the goal is to teach others how to promote Resilience and Protective Factors for LGBTQ+ and Foster Youth. By exploring factors that affect the way different people cope with stress, hardship, and trauma. I intend to create a support network catered to adolescents facing these types of adversity.

Protective factors are the assets and resources within an individual, family, and community that facilitates the capacity for resilience. By fostering the development of protective factors, and teaching them how to effectively manage, adapt to, and bounce back from hardship, we can create opportunities that will allow these young leaders to prosper.

**Autumn Wilson, #10**

***Missing and Murdered Indigenous Women Prevention and Resources***

Indigenous women in North American face the fact that they are at elevated risk for trafficking, sexually abuse, and face life-threatening events. In my project, I want to assess why Indigenous women are a target for acts of violence, what kind of laws are there to protect Indigenous women, and what are the next steps for victims and families to take if someone they know or themselves have been a victim. Missing and Murdered Indigenous Women has been an important topic in Indigenous communities due to the little number of resources given, little to no legal support due to tribal sovereignty, and insignificant amounts of attention whether it be from the media or word of mouth. I want to give Northern Colorados communities a space where Indigenous peoples and other community members can gather and discuss. In my project I want to provide many resources to the victims and families, one way that healing happens is through building a community. Having a safe space for the community to discuss their situation gives them the power to be heard. It is also important that our community members know how to prevent themselves from being put in harmful situations, and how others can help when someone is placed in a dangerous situation. Overall, I want to help improve my community and make it a safer place to live in.

**Teja Johnson, #79**

***How does financial security affect children from low-income households?***

Poverty is a revolving cycle that is hard to break. Currently, there are nearly 385 million children around the world that are living below the universal poverty line. Kids feel all the stress, anxiety, and sometimes the embarrassment of not being able to be fully provided for. In this study, 12 students from low-income families were interviewed on their struggles growing up whether it was an emotional, physical, or environmental issue that arose from their financial hardships. It was found that there are five major components that arise from financial insecurity which are trouble connecting with peers, the struggle to receive adequate health care, mental health issues, food insecurity, and insufficient academic performance. This is important information to gather so as a society we can take steps forward to better this huge issue. For example, making healthcare more accessible or having to take home meal sacks for students that need it. Some students said that one thing that could have made life easier for them is if their struggles were talked about more. This is not an issue that can be solved in one day but if we know the problems that come with financial insecurity then we can take steps into improving the lives of these children.

**Jocelyn Lapham, #63**

***Blue Lives Matter: In Combating Police Brutality Against All Communities***

Police brutality affects Black Americans at disproportionately high rates, however, no one is exempt from experiencing police violence. Therefore, I am developing a community centered program to proactively address police brutality. Implicit biases are unconscious beliefs about someone or something, while systemic racism is racism embedded in the laws and practices of an organization. Based on preliminary literature review of these terms, I hypothesize that educating police and the community on systemic racism and their implicit biases while humanizing one another, will make officers significantly less likely to use excessive force on someone- regardless of their race- and give community members effectively

safe tips on engaging and interacting with law enforcement. During the program, police and community members will work closely in research-informed workshops and critical collaborations (currently in development). To measure success, alongside brutality statistics, a precinct's (a geographically defined area for police purposes) community members will periodically fill out surveys on their views and understanding of law enforcement. The officers will also fill out surveys on their views of themselves and the community. Optimal results would show a correlation or causality between continual execution of the program and a decrease in police brutality incidents and/ or an increase of positive perceptions between police and community members. Once fully developed, I will use Fort Collins for a pilot program and work out any foreseeable drawbacks; as my long-term goal is to implement this nationwide, providing a customizable program that cities can utilize to reduce their rates of police brutality.

**Jennifer Litzau, #124**

***Regulation 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.

**Delilah Lopez, #77**

***Boarding Schools Connection To Generational Trauma***

My research highlights boarding schools' connection to generational trauma for Native Americans. I chose to research the connection between boarding schools and generational trauma for Native Americans because I want others to better understand the ways this affected many generations of Native American families mine included. I will document the number of boarding schools across the United States and the reasons why these boarding schools were created by the government.

I will integrate my Native American culture into this research so that others can better understand how traumatic boarding schools were for Native American children. Not only were Native American children taken away from their families, but they were also stripped of their identity, and culture.

Survivors of boarding schools have spoken about the abuse they endured in boarding schools, and their firsthand accounts are of much value to my research. Therefore, I am interviewing a boarding school survivor to understand how the trauma he endured affected his life.

Overall, I want to show how the injustice of boarding schools caused many issues in Native American communities by way of generational trauma. It's a common misconception that Native Americans are alcoholics, while the true reason for their alcohol abuse often stems from the generational trauma that has perpetuated Native American people throughout history and even into today.

**Melanin Armendariz, #7**

***The Beauty In Healing***

Trauma can stem from adverse childhood experiences, which are things like neglect, familial dysfunction, and different types of abuse. However, trauma is not only individualistic; it can also be systemic. Intergenerational trauma is rooted in colonialism and patriarchy and enforced by oppression and racism. In my project, I will focus on addressing the unresolved trauma that people who've experienced domestic violence have had to endure. I want to create pathways that will support their healing through makeup application and conversations. Makeup has an incredible impact on someone's self esteem and it can be very uplifting. However, it is not something that is considered to be as important as basic needs. Through this work I will create a safe space for people to identify the trauma they have experienced and provide the tools necessary to start their healing journey.

Many of the people that have experienced trauma whether it's through adverse childhood experiences and/or systemic forms of intergenerational trauma are mostly people of color. Through my project, I will be specifically focusing on addressing the cause and the experiences of domestic violence. I am at the beginning stage of my project but once I solidify a partnership with a shelter in my area I plan on building a foundation with the people there. I will spend the initial months volunteering to get to know the people better and see what their lives and environments are like. This will allow me to get their opinions on how they would like their perspectives included in a safe and confidential way. My ideas include creating a video that showcases their experiences that impacted their journeys. However, I know some of them will likely want to remain anonymous so my other option would be writing an article that would showcase something similar

**Maimouna Dia, #36**

***Health Disparities among People of Color***

Healthcare disparities are gaps in the quality of care and accessibility for particular social identities. Such identities range from socioeconomic status, ethnicity, gender, emotional or physical abilities, or race. My research focuses on healthcare accessibility for people of color within Fort Collins and Colorado. The main objective of this research is to inform others of the racial discrepancies that exist in the healthcare system and serve as a toolkit in terms of how people of color can be better served in the healthcare system. Several factors impact the quality of healthcare that people of color receive. In my research, I analyzed research studies that surveyed 10,000 Colorodian, which helped fill knowledge gaps in the

healthcare system. I additionally examined the demographics of how many people of color seek healthcare and identified their quality of experience while simultaneously analyzing other prodigious factors, such as what contributed to their quality of experience. Lastly, I looked at how the COVID-19 pandemic exacerbated these disparities and how telemedicine can serve as a potential solution. My results indicate that people of color still experience unfair treatment in all sectors of the healthcare system ( general, oral, and behavioral health). Despite the fact that more people are insured than ever, in the last decade, fewer people are visiting hospitals due to concerns about unfair treatment. The primary source of these healthcare disparities is a manifestation of the structural bias in the healthcare system. My research concluded that increasing access to racially and culturally competent care can impact people of color's experience in healthcare settings.

**Hannah Bean, #101**

***Diverse Biology & How it Can Impact Gender Essentialism***

Studying how biology is taught and what is included in the course in order to open people up to a more inclusive mindset. Gender essentialism can be referred to as the belief that gender is a discrete and dichotomous social category. Included in this can be the belief that men and women are biologically as well as fundamentally different from one another. Together with the belief that gender is biologically determined, immutable, with predetermined categorical properties of men and women. The effects of including this in regular courses can lead to people being more accepting and less ignorant about gender essentialism. Through this research, there can be a higher understanding of one another that can further lead to greater equity and inclusion in our society. Other topics were also covered regarding the relationship between science and society in regard to gender essentialism. By teaching and gathering responses from a biology course we were able to see what people took away from the course. As well as categorizing said responses for further analysis. Discussing and deliberating on responses leads to a further understanding of what people learned or thought during the course. Evaluating the human responses also allows for further areas of study and human understanding of the inclusive topics at hand.

**Cullen Donnelly, #17**

***Psychological Outcomes in Advanced Lung Cancer Patients – A literature Review.***

OBJECTIVE: The purpose of this review was to explore psychological outcomes among Advanced Lung Cancer (ALC) patients.

INTRODUCTION & SIGNIFICANCE: Lung cancer is the most common malignancy and the most common cause of cancer death worldwide. Lung cancer is associated with high symptom burden, poorer prognosis, and stigmatization. Such factors can lead to psychological distress which can often affect patients' quality of life. This study will review the current literature regarding psychological outcomes among ALC patients.

METHODS: Studies used in this review were retrieved from PubMed database and included electronic content of professional journals. The following search terms were used: "Psychological outcomes" AND "Advanced cancer stages" OR "Late- stage cancer ". Studies were selected based on their relation to the research question and the recency of publication.

RESULTS: Overall, four studies reviewed all addressed psychological outcomes among ALC patients. One study served as background review on the subject. Two studies assessed depression, while one study

assessed both anxiety and depression symptoms. ALC patients appear to have an increased risk for depression, especially among patients in lower socioeconomic statuses. Finally, depressed patients were more likely to die than non-depressed patients.
CONCLUSION: The findings of this review revealed a connection between depression, socioeconomic status and ALC mortality rates. Health care providers who work with ALC patients should be aware and provide opportunities for interventions aimed at improving depressive severity and symptom control among those with ALC to promote longer survival. These interventions may be particularly beneficial for low socioeconomic status individuals.

**Jose Dueñas, #9**

***El Sueño Inalcanzable: Redefining The Journey to College for Latine and Undocumented Students***

Predominantly white-serving systems create a wide onset of harmful effects for BIPOC individuals. In examining the journey to college for Latine and undocumented high school students, we can gain a deeper understanding of just how wide the scope of this issue is. Research has shown that Latine students tend to face depravity of information regarding essential steps to take to attain a college education. This systemic push-out is further exacerbated when accounting for the discrimination Latine students face in the education system. With the heap of legal obstacles already faced by the undocumented population, the hope of college can often be subjected to remain a mere dream. Through a collaboration of my identity as a Latine student and my opportunity to deeply study the issue as part of a research team, I will examine the struggles Latine and undocumented students face in the pursuit of higher education. This will be done in an effort to redefine the college journey for Latine students by targeting the core issues that underlie the struggles. Through an evaluation of the results yielded, I will take the next steps in working with local organizations to help the Latine community within Northern Colorado. Local organizations have the power to empower Latine youth who want to pursue a college education. The systems have worked against marginalized communities since their inception and it is time to make a change.

**Emma Oredson, Elise Justine Golyer, Madison Guzman, #28**

***Invisible Identities in Colorado State University Undergraduate Students***

There are many identities that are not inherently visible but create additional obstacles to self-disclosing. An inventory and understanding of these identities allow for insight into aspects of how individuals interact with learning environments, relationships, and self-efficacy. The present study investigated undergraduate students' personal experiences on CSU campus relating to invisible identities and learning environments. We conducted a cross-sectional study using an online survey between 10/18/2022-11/10/2022. Participants were recruited using QR code flyers hung around CSU's Student Diversity Program and Services offices and from social work classes. The survey included four demographic questions and seven questions to measure invisible identities. In total 57 surveys were completed. Of those, 46% reported race/ethnicity as their invisible identities, 46% LGBT+ community, 33% disability, and 30% first- generation. Most respondents stated feeling comfortable disclosing their invisible identities to instructors (53%) and to peers (43%). However, 40% of participants also stated that they have at some point felt pressure to conceal part of their identity while on campus. Through the

open question, five themes were identified related to how invisible identities influence learning environment and decisions to disclose: feelings of loneliness, being a parent, conversations relating to LGBTQ+ issues, fear of judgment, and not fitting the expectations of others. Results suggest that the participants are generally comfortable disclosing hidden identities with their peers and instructors. This research can be used for further investigation into how invisible identities affect the daily lives of CSU students.

**Fiona Miller, #29**

***Redesign Proposal for the College of Veterinary Medicine and Biomedical Sciences' Website***

Colorado State University has lacked a significant amount of diversity in their student body. By examining the city of Fort Collins' racial demographic data compared to that of Colorado State University and just the College of Veterinary Medicine and Biomedical Sciences, the demographics attracted to the school were visible. Analyzing the College of Veterinary Medicine and Biomedical Sciences' website displayed the racial demographics that were mainly present in the college. The results illustrated the lack of diversity in both Colorado State University and the College of Veterinary Medicine and Biomedical Sciences, along with the city of Fort Collins. The College of Veterinary Medicine and Biomedical Sciences is mainly made up of white women, with other racial demographics largely in the minority. The website for the College of Veterinary Medicine and Biomedical Sciences displayed mainly white women in both photos and the news section of the website. Both opportunities for students of color and accomplishments by students of color were difficult to find through the website. It was concluded from the lack of diversity not only displayed through the website, but in the population of students in the College of Veterinary Medicine and Biomedical Sciences, that the website for the College of Veterinary Medicine and Biomedical Sciences should be modified to amplify opportunities for students of color and accomplishments by students of color. These modifications should be made to attract more students of color, thereby increasing the diversity of Colorado State University overall.

**Luna Li #20**

***The Impacts of Covid-19 on Local Small-Scale Tourism-Based Enterprises near Lake Manyara and Tarangire National Parks, Northern Tanzania ,***

The global Covid-19 pandemic continues to impact people and communities all around the world, including developing countries such as Tanzania, East Africa. Current research on the impacts of the Covid-19 pandemic in Tanzania is more focused on the national macroeconomic level and it is unclear how the pandemic has impacted the tourism sector on the microeconomic level. This study aimed to fill this knowledge gap by seeking to understand the impact of the Covid-19 pandemic on local small-scale tourism-based enterprises near Tarangire and Lake Manyara National Parks in northern Tanzania. Primary data was collected from 112 key informants through interviews using semi-structured questionnaires. The results suggest that the pandemic has negatively impacted the tourist trend in the study areas; the local people saw extremely low tourist traffic in 2020 and 2021, and that the tourist traffic during 2022 did not recover back to pre-Covid levels. The pandemic has also extremely negatively impacted the local enterprises and has led to lower tourism revenues or in some cases the temporary cessation of enterprise during the pandemic. The study found that local people engaged in these enterprises adapted by depending on land and natural resources to generate income during the

pandemic. The results were reflective of the national tourism sector trends in Tanzania. The outcomes of this study suggest that local people should diversify their livelihoods and expand to include non-tourism-based businesses, and that the local government should stimulate the local economy and provide aid to those hit the hardest by the pandemic.

**Gwendolyn Harrison, #34**

***Cancer Resources in Sexual/Gender Minorities***

Research has documented various links between cancer and the outcomes of mental health, such as heightened rates of depression, anxiety, and more. However, this research is mainly targeted around cisgender, heterosexual individuals. I examined the effect of cancer on the mental health of anyone who identifies as a sexual or gender minority across the United States. I chose this population because individuals who fall into one/both of these categories often receive a lower quality of care due to the stigmas, insensitivity, and lack of awareness by healthcare providers (Hafeez, et al. n.d.). I used Academic Search Premier through Colorado State University's library database to find studies related to depression and anxiety levels in cancer patients who identified with this minority, versus those who do not. There is not an immense amount of research in this field (initially, there were less than 150 hits), making the studies I did find and decide to use (5) that much more important. The research (Boehmer, et al. 2022, Desai, et al. 2021, Glickman, et al. 2012, Jesdale, et al. 2022, Kamen, et al. 2022) documents less access to resources and support for individuals who identify as a sexual or gender minority, as well as heightened rates of depression/poor mental health (Jesdale, et al. 2017) when compared to their cisgender, heterosexual peers. Future steps must include more in depth studies into the support systems established for cancer patients who identify as a sexual/gender minority (such as access to healthcare and decreasing the stigmas).

**Caley Valdez, #35**

***Undergraduate STEM Students' Perspectives on Inclusive Pedagogy in STEM Classrooms***

Inclusive pedagogy is important to incorporate to classrooms of all subjects and at all levels. In university STEM classrooms, incorporation of inclusive practices improves student performance, decreases disparities in academic success of underrepresented students, and increases student retention and persistence in STEM programs. Inclusive pedagogical practices include effective instructional choices like active learning, providing rubrics, and other strategies that have been shown to support students from disadvantaged backgrounds. Additionally, explicitly inclusive practices such as addressing microaggressions and sharing pronouns can promote a sense of belonging for students. While a plethora of literature has shown these impacts and faculty have access to resources and trainings about inclusive pedagogy, we were interested in whether students are actually noticing these practices. We examined whether student identities impact what inclusive pedagogical practices students observe in STEM classrooms at a large land-grant university. We surveyed n=74 undergraduates from diverse STEM disciplines regarding their observation of 11 different inclusive pedagogical practices. This includes 5 effective instructional practices and 6 explicitly DEI-related practices. Overall, students observed the inclusive instructional practices more often than they observe the explicit DEI-related practices. For both types of inclusive pedagogical practices, white students observed more practices than students of color. This suggests that more work needs to be done to train faculty in explicit DEI-related practices, especially with the goal of supporting students of color who have been historically excluded from STEM.

**Tianna Weiland, #39**

***Abuse of Power in American Death Investigations***

Death investigations are a crucial part of the American medicolegal system, yet the investigations often lack regulation, training, and oversight. There is much variation both within and between states regarding the death investigation process, with some jurisdictions being headed by a coroner and others by a medical examiner. The American coroner is often an elected position, or in some cases appointed based primarily on political affiliation with minimal regard to training and education. A coroner is not required to consult a physician, yet is still in charge of leading the death investigation, determining the cause/manner of death, and signing the death certificate. In contrast to the coroner, a medical examiner must be a certified physician. Both coroners and medical examiners have the power to overrule forensic pathologists, and have final authority on cases.

The politicization of the coroner position, the lack of federal regulations, and the lack of checks and balances within the position contribute to potential abuse of power and incompetent death investigations. This can be observed when examining investigations regarding in custody deaths and instances of police violence. Additionally, coroners are often affiliated with sheriff departments, which presents conflicts of interest and allows for incompetent death investigations and harm against at-risk populations, especially against people of color.

**Jade White, #42**

***Diversity and Equity in STEM***

For my MURALS first year scholar research, I worked under Dr. Michelle Foster in diversity and equity in STEM. This research was inspired to learn more about the issues with inequity, related to sexism and racism, that minority students face when working in the STEM major. My research was primarily focused on learning about diversity and equity in clubs under the biology department. My research question was “in what ways are you making your club feel like a safe place for students?”. To gather the information needed to answer my research question, I first emailed 15 biology club leaders and provided questions. These questions included how they felt about the diversity in their clubs, actions that they planned to take to increase diversity within their clubs, and what specific actions were currently being taken to increase the diversity within their clubs. After reaching out to all 15 chosen clubs, only 5 responded. Overall, they all responded with productive plans for the future. Diversity is a challenging subject: my thoughts about the lack of responses were the clubs that did not respond have never been asked about an uncomfortable topic. Yet for these topics to change, uncomfortable topics need to be discussed.

**Dhajia Hopper, Marcelo Espinoza-Diaz, Kendall Hollins, Elsa Barcenas Ramirez, Jewelyssa Rodriguez, Ricky Winston, Faraaz Bukhari, Nevaeh Newton, Calista Douglas, Ayo Bello, #46**

***Food for Thought: The relationship between food insecurity and student success***

Food insecurity is a prevalent issue for college students. With the rising cost of living, tuition, and inflation, students are at a high risk for experiencing food insecurity. Programs like Rams Against Hunger (RAH) are designed to support students and provide resources to mitigate the subsequent effects of food insecurity. The goal of our project is to explore if RAH is effective at supporting student success. Student success in this context is defined as GPA, retention, graduation rates, and post-graduation ability to

secure a job. To begin, we analyzed data from various surveys conducted by Institutional Research, RAH, and First Destination. Then we compared deidentified CSU ID numbers and the parameters of success. From this, we were able to create a model student who is the ideal target of people utilizing RAH. If the research suggests that students are not experiencing success when using this service, we intend to investigate why. The resource itself may be lacking. Although in its current state it is meant to be supportive, it cannot meet the needs of those using them. We propose remodeling RAH's outreach will better support student success. Additionally, we will provide RAH with empirical data to use in restructuring their own programs. If our research finds that these programs are successful at supporting student success, then we intend to use our model to target students who could benefit from this resource. Furthermore, RAH can restructure their outreach and current programs to be more accessible to this model.

**Naeemah Weathers, #51**

***The Promise of Black Utility: The Field of Clinical and Counseling Psychology***

This project is imperative to the field of clinical and counselling psychology because it highlights the cornerstone of why women of color, particularly in psychology are paramount to the success of Black individuals who seek psychological help, or therapeutic modalities. Black children statistically, preform at much higher levels academically when paired with Black educators, Black role models, and are given the opportunity cultivate relationships to enable success. Black individuals report at a rate of 60% preference when asked about their clinician preferences in relation to the intersectionality of their own identities. These cornerstones of humanities preferable to the Black community incorporate complex cultural attitudes, linguistic combability, and a sense of race related solidarity, all of which, directly relate to an increase in return rate, positive client perception of therapy, and effective therapeutic outcome. This collection of intellectual literature and contribution will highlight the what the development and cultivation of Black therapists within the field of clinical psychology can do for the marginalized, often censored, identity of the Black individual.

**Marisa Thompson, Josif Nedeljkovic, Abby Powell, Anna Rember, Ella Smith, Karissa Bohme, #110**

***The Need for Feminist Anti-Oppression Research at CSU: Introducing the Undergraduate Academy of Feminist Scholars***

This presentation highlights the work of the Undergraduate Academy of Feminist Scholars (hereafter The Academy), a research lab for undergraduate students that centers the voices and experiences of marginalized youth. Using a Youth Participatory Action Research model, its members examine the conditions that produce intersectional inequities and marginalization around gender and sexuality and suggest solutions to them. The Academy aims to educate students and other stakeholders by capturing the voices and experiences of marginalized communities towards the kind of action effecting social change at CSU, Greater Fort Collins, and Colorado. Through accountable, ethical and reflexive research practices that embraces the co-researcher as a partner in the work, we conduct research dialogues and develop research projects that foreground participants' ideas and knowledge as resources in the formulation of research designs and questions, and value the knowledge held by marginalized communities and individuals.

The Academy offers a space to reframe DEI discourses toward a feminist justice framework that explores multiple viewpoints, and also challenges the perspective of the researcher who is always situated within systems of power and privilege. We see this work as a chance to use what oppresses us to guide the research we do. As undergraduate research associates, we think critically about our campus and are dedicated to the use of anti-oppression research as a way to create systemic change for the benefit of students, especially those who are most marginalized. The Academy believes that Feminist Anti-Oppression Research has important implications for improving campus life, including 1) identifying and recognizing existing problems, harms and injustices; 2) accountability for harm and injustice at the level of institutions; 3) deconstructing colonial models of producing knowledge; 4) practicing critical reflexivity; and 5) providing participant-based solutions to the harms and injustices uncovered through the research.

**Vincent Montez, #112**

***Humorous Conflict***

Each person will experience some type of conflict in their lives, whether big or small. Since each case is unique, no single tool to resolve conflict will work for all scenarios. This project aims to analyze the use of humor in navigating conflict. Individuals with leadership roles at Colorado State University share their experiences to better understand their perspectives on what they qualify as conflict and how they have used humor to deescalate situations with high tensions & times in which humor makes situations worse. Many of the nuances of when to utilize humor are taken into account such as the social context, emotional & cognitive reaction, and most importantly the ability for the humor to be understood across the cultures of the people involved. These experiences are compared to existing research to validate the use of humor as a tool to relieve conflict.

**Mikayla Bruce, #113**

***Student Receptiveness to Queer Identity-Affirming Content in an Introductory Undergraduate Biology Course***

Biology is diverse because it encompasses all living organisms, however, its teaching is often inaccurate since society usually only focuses on what we have labeled “normal.” One way normalcy is achieved is by disregarding the differences between sex and gender, and the diversity of sex and reproduction in biology. It also is achieved by validating science only if it is presented from a western modern science (WMS) point of view as opposed to coming from traditional ecological knowledge (TEK). WMS is a way to understand biology with data and evidence collected through experiments, while TEK is passed down in indigenous communities, and it describes the connection that all life has together. The Culture of Disengagement was used as the theoretical framework to analyze the data. It explains that science is usually approached in a way that separates it from the social context when it is indeed influenced by the social context and choices made by those doing science. To understand how students responded to being taught about the non-essentialist aspects of biology in an introductory biology class, a qualitative content analysis was used to analyze student responses to open-book exam questions. This research

focused specifically on responses to gender essentialism and TEK, and themes that categorized student responses arose. These findings indicate that students were receptive to a more inclusive class and require more exposure. This research will help increase the fairness of biology for queer students and give all students a more biologically accurate education.

**Kimberly Mayorga, #70**

***Media and Policy Making***

As a First-Generation Hispanic student hoping to pursue a degree in Journalism and Media, I sought to understand how the portrayal of people of color in media influences policymaking. There is a connection between the way that people of color are portrayed in media and policymaking that not many are aware of and is frequently neglected. Media is not only involved in the reporting politics but goes even further into shaping it and how people feel about certain politics. My goal is just that, to exemplify how media portrayal of people of color affects policymaking. Media plays a big role in our everyday lives and that involves policymaking.

**Shaza Mohamed, #72**

***Bridging the Divide: Assessing Racism Related Stress and Counseling Services***

The impact of racism-related stress is qualitatively understood; however, the field needs a quantitative perspective, and our project aims to rectify this. To this end, we designed a two-part project focusing on the racism-related stress that students experience at CSU. The first part will concentrate on collecting quantitative and qualitative data. We will track students' physiological responses to stress via a wearable device, and they will journal about any moments of racism-related stress that occur throughout one week. The participants will be placed into four groups with ten students in each group: non-STEMM students of color, STEMM students of color, non-STEMM white students, and STEMM white students. The quantitative and qualitative data will be analyzed for statistical significance individually and collectively. The second part will analyze the effectiveness of existing counseling-related services at CSU. This will be accomplished with a student-focused survey exploring the success of counseling-related services in helping students cope with stress, which will be indicated by high student satisfaction. If our research finds that students of color are disproportionally affected by racism on campus, we propose refining counseling-related services as a solution to combat this problem. If not, we plan to examine the counseling-related services to see what contributions are doing well in assisting students of color.

**Joseline Nava Ruiz, #86**

***We Are Here To Stay: An Insight to the Struggles BIPOC Women Face Within the Agriculture Industry***

The agriculture industry has always been ruled prominently by white males. However, there has been a surge of females within the industry. Despite the presence of women within the industry, women are made to seem incompetent. It is already hard being a woman in an industry that believes you are not ever enough, imagine being a BIPOC woman. Not only facing the oppression of being a minority but as well of being a woman.

Being the Latinx Representative of the Student Equity Team within the College of Agriculture here at Colorado State University, I have been able to not only see the different struggles we face but as well see

the great potential that is silenced. Continuously having to justify our place in the industry, and always having to work harder.
My project will focus on the struggles BIPOC women face within agriculture. It will highlight on the different barriers we face as women and minorities, inclusion, representation, and engagement. Despite the Agricultural of Science's attempts to have more inclusion and equity, it is not enough.

**Helen Obuna, Aida Wales, Jacob Perreault, Umaru Elijah, Agnes Mhalanga, Asma Bushara, Samoi Wright, Mercy Abate, Jocelyn Won Goss, #97**

***Real Talk Academy***

The Black experience at predominantly white institutions (PWIs) can vary significantly depending on a variety of factors such as the geographic location, student population size, the existence of multicultural centers and facilities, and a university's contribution towards diversity and inclusion. Common experiences among Black students enrolled at PWIs include feelings of isolation, exposure to microaggressions, discrimination, and academic challenges due to a lack of culturally responsive resources and university expertise. This MURALS presentation is based on an ongoing Research Academy that provides an opportunity for Black/African American undergraduate students to conduct community-engaged research with members of the Black/African American Cultural Center (BAACC) to collect and analyze their experiences at Colorado State University. It explores themes revealed at a weekly student-led conversation titled "Real Talk" and demonstrates a need for critical dialogue on campus to increase awareness about the issues that Black/ African American students face. This presentation emphasizes the importance of documenting these experiences to assist in improving students' experiences and encouraging increased solidarity at Colorado State University.

**Emily Ocampo-Lara, #82**

***Mental Well-Well Being: Helping Latinx Individuals***

According to Mental Health Colorado, Colorado has been ranked 43rd in the United States in terms of mental health illnesses and mental health treatment. Latinx individuals make up 22.3% of the population in Colorado; of the individuals struggling with their mental health, 14.2 % of Latinx individuals are less likely to seek out and receive treatment for mental health struggles compared to non-Hispanic whites due to a variety of barriers they face. The barriers faced by this population include mental health stigmas, language barriers, and cultural incompetence. Like physical health, mental health can impact other aspects of one's life, such as negative social relationships, substance misuse, and poor performance at school/work. To reach this community, it is essential to create a program that allows the Latinx community to overcome these barriers making mental health services easier to access. In researching existing plans and platforms that aim to make mental health services more available, a program with a mixture of qualities could be created. This plan could then be used in various health settings like schools and clinics to slowly break the barriers faced by this minority group. Helping the Latinx community will not only help breach the barriers faced, but it will also aid society through the improvement of interpersonal relationships, addressing substance abuse issues, and improving school/ work functioning. Should the program be successful and show improvement in people's well-being, it will then be able to help other minority communities that are also facing similar barriers.

**Garrett Poitra, #87**

***Neurodivergent Accommodations in Graduate Stem Programs***

There is a dearth of research on the experiences of neurodiverse students in higher education beyond the undergraduate level. What literature exists tells of graduate programs with hostile cultural climates that both directly impede and indirectly exclude neurodiverse individuals from entering and succeeding in such programs. The present study aims to elevate the experiential differences of neurodivergent individuals in graduate level STEM programs through a phenomenological exploration of their time in higher education. Using critical disability theory and neurodiversity theory as a framework, nuerodivergence was conceptualized as a natural cognitive and neurological difference that presents itsown individual strengths and difficulties. We conducted eight semi-structured interviews wherein participants were asked to reflect on the socio-cultural and institutional dynamics that influenced their experience as a neurodiverse graduate STEM student. The data collected were analyzed using inductive thematic analysis. Initial findings indicate that institutional policies and the attitudes within higher education create an ableist environment that impact neurodivergent individuals' well-being and academic capabilities. We believe this to be the direct and indirect result of discrimination, stigma, and the current professional paradigm within higher education. Furthermore, previous research and the prescriptive suggestions they offer often serve the aimof making the individual act as neurotypical as possible., disabled individuals may benefit more if these institutions and the systems therein are critically analyzed using neurodiverse and critical disability theory. Additionally, using these frameworks may allow for policy changes that force the institution, rather than the individual, to change thereby addressing the root cause.

**Jasmine Retland, #64**

***Disability In The Performing Arts***

In the arts, creativity and uniqueness are championed. The more you think and create outside the box, the more outstanding and artistic your work is. So what happens when someone's disability goes too far outside the box? In the performing arts, there is a low representation of actors, roles, and storylines, that accurately and equitably represent and depict people with disabilities. This lack of representation and understanding of disabilities also impacts students in higher education, their access to education, and the support they receive while pursuing degrees in performing arts. In my project, I will be conducting literary research around statistics and expert opinions on disability in film and the performing arts. I will also collect qualitative research from testimonials of CSU students who identify as disabled, pursuing a degree in the performing arts. The questions these CSU students will be testifying to will pertain to details of their disability, and the positive and negative ways their disability impacts their learning and performance. The survey will also focus on the support these CSU performing arts students feel they receive from their respective programs and professors. I predict this research will reflect the need for disabled respresentation in the performing arts and more equitable support for these students in higher education. In my final presentation, I will present the information I will have gathered, and incorporate a song that includes the research, testimonials, and personal experience that depict the realities of being in the performing arts while disabled.

**Abrao Soares Periera, #81**

***Enhancing Women's Involvement in Marine Conservation in the Timor-Leste Region***

Timor-Leste is a hotspot of marine biodiversity and provides valuable resources for communities living in coastal areas throughout the country. Marine Protected Areas are one of several strategies used to maintain ocean health and support the livelihoods of coastal communities. However, not all members of the community have an equitable role in designing and implementing these strategies. Women's participation in decision-making is extremely low compared to men due to patriarchal practices that limit women's involvement in conservation management. This issue must be addressed to achieve equitable participation in decision-making and to increase the effectiveness of marine and community conservation practices. The objectives of this study are to evaluate the current status of women in Timor-Leste's coastal communities in marine conservation, as well as opportunities and barriers to future participation. To address these objectives, I partnered with Blue Ventures Conservation in Timor-Leste to interview ten women in the communities of Fatumeta and Lian-lidu in Timor-Leste in February 2023. The interviews focused on Marine Protected Areas and included questions about whether women's perspectives are currently represented in decision-making, barriers that limit participation, and ideas about how to overcome those barriers. The outcomes of this study will include recommendations for addressing gender inequities in this region and to increase women's participation in conservation practices. I will also suggest ways to measure how potential interventions could be evaluated to ensure positive impacts on women and marine conservation in Timor-Leste and other coastal areas globally facing similar socio-ecological challenges.

***Tianna Weiland***

***Abuse of Power in American Death Investigations***

Death investigations are a crucial part of the American medicolegal system, yet the investigations often lack regulation, training, and oversight. There is much variation both within and between states regarding the death investigation process, with some jurisdictions being headed by a coroner and others by a medical examiner. The American coroner is often an elected position, or in some cases appointed based primarily on political affiliation with minimal regard to training and education. A coroner is not required to consult a physician, yet is still in charge of leading the death investigation, determining the cause/manner of death, and signing the death certificate. In contrast to the coroner, a medical examiner must be a certified physician. Both coroners and medical examiners have the power to overrule forensic pathologists, and have final authority on cases.

The politicization of the coroner position, the lack of federal regulations, and the lack of checks and balances within the position contribute to potential abuse of power and incompetent death investigations. This can be observed when examining investigations regarding in custody deaths and instances of police violence. Additionally, coroners are often affiliated with sheriff departments, which presents conflicts of interest and allows for incompetent death investigations and harm against at-risk populations, especially against people of color.

**Lyric Williams, #54**

***Restructuring Curriculum and Profession Development of Educators to be Culturally Aware and Informed***

Since the first one room schoolhouse, we have done our best to progress towards an inclusive and meaningful educational system as a whole, even if this altered between demographics. Through literature review, interviews, and integrating disciplinary insights, it is apparent how education differs between social classes and cultures. This also causes many groups of students, specifically indigenous students, to receive an education that is distant from their culture. We also see a point of intersectionality: the intersection of poverty, generational and historical trauma, and ongoing oppression. As an audience, we can open our minds to non-European-traditional types of schooling that get less media and educational attention. From the voices of real people, I was able to gather data on how Native American culture was portrayed in modern education. In my research, it is clear that part of minority culture includes being singled out and having the history lessons be surface level. Students educated in Indigenous schools had a deeper connection with their history and cultural values, whereas students in traditional schools didn't know if there were Native students in their class. Being Indigenous in a Eurocentric school also meant that you were a target for bullying, your culture was studied by fact, and you had to battle systematic racism. With the correct professional development, raising awareness of the Native American experience, and inclusion in educational pedagogy, we can start battling systematic racism earlier and extend this to understand the land we are taught on.

**Rebeca Workineh, #76**

***Combatting Medical Racism Begins With Medical Education***

The legacy of racism in medical institutions is recounted through the stories of inhumane experiences on black enslaved human bodies; and this legacy is connected to present-day substandard care for Black, African, and African American peoples. While openly racist behaviors are aberrant in society, institutional racism has not been eradicated as it persists through policies and unconscious biases. This project will discuss the historical and current literature on the consequences of institutional and individual racist attitudes through a public health lens. 4 types of health disparities will be discussed: Life expectancy, the burden of disease, mental health, and lack of access to care. Furthermore, literature will be reviewed on the current relationship between physicians' implicit biases and how cultural competency training impacts the quality of care for Black, African, and African American peoples. In this literature review, I conducted a search utilizing the Colorado State University Libraries database and the National Library of Medicine search engines. In the advanced search of the Colorado State University Libraries database, I used "racism" and "medicine" as search terms. Fixing disparities in health care requires medical institutions to implement effective strategies for the recruitment of prospective medical providers and career-long cultural competency training. Increasing interviewer's and professors' awareness of these issues decreases the likelihood of medical institutions perpetuating these culturally racist, or negative biases toward their students. In preventing physicians from further fortifying medical racism, medical training should use a multi-faceted perspective including naming racism, cultural competency training, community-led interviews, and cultural humility.

MULTICULTURAL UNDERGRADUATE RESEARCH
ART AND LEADERSHIP SYMPOSIUM

# Innovation and Entrepreneurship

**MURALS 2022 1st Place Winner- Umetesi Karinganire**

**Sadulla Nazrullaev, #72**

***RamPlanner***

The RamPlanner is a smart scheduling app designed to help college students at Colorado State University plan their course schedules and study routines based on their individual preferences and priorities. Using machine learning algorithms, the app learns from the student's behavior and makes personalized recommendations for course schedules and study habits based on their learning style and personal preferences.

The RamPlanner app features user profiles, group creation, and group chat for students to connect with others who share similar interests or majors. Users can schedule study sessions with other group members, and the app can help them find a time that works for everyone. The app also provides notifications to remind students of upcoming study sessions or when new study groups have been created.

Data will be collected from the student's interactions with the app to train the machine learning algorithms used in the RamPlanner. I will build the app using mobile app development frameworks like React Native or Flutter, machine learning libraries like TensorFlow or sci-kit-learn, and cloud-based databases like Firebase or AWS.

The challenges in developing the RamPlanner include designing a user-friendly interface, creating effective machine learning algorithms, and ensuring the privacy and security of the student's data and personal information. I plan to work on addressing these challenges as I develop the app. The RamPlanner app is a great opportunity to apply machine learning and artificial intelligence techniques to a practical problem that can make a real difference in the lives of CSU students.

**Elita Danilyuk, #41**

***PortfoliU Project: How an Open Source Repository of Personal Portfolio Websites can Benefit Students***

PortfoliU Project's mission statement is to build and develop a free open-source repository with the resources, documentation, and information that is designed to help students create a simple personal website portfolio. A personal portfolio webpage is important because it gives students the ability to showcase their skills to potential employers in a meaningful way. However, many students lack the skills, resources, and information establish their own webpages. PortfoliU Project was created to help bridge this gap and help break the barrier for students to begin building their personal brand sooner. The websites they construct will showcase their individualized and school projects, resume/CV, professional/educational experiences, research work, publications, and anything else they see fit. PortfoliU Project is catered toward computer science students and entry-level individuals who are interested in programming but who may not have the skills to fully build a website from scatch. Additionally, PortfoliU encourages creators to get involved in open-source and to learn from their experience. Since PortfoliU has gone live, 17 users have participated, contributing 30 modifications. Qualitative and quantitative feedback from users says they love it.

**Joselle Gyamfi, #128**

***Obaasima- Personalization as a Route to Sustainability in the Fashion Industry***

We often hear about how the fashion industry is one of the biggest polluters on earth. There are a host of problems that arise from creating clothing, including but not limited to carbon emissions, water pollution, and water usage. There is also the issue of ethics. Underpaid workers in collapsing factories are an issue in any industry, however, fast fashion giants have become synonymous with maltreated workers. A lack of size inclusivity and consistency perpetuates unattainable beauty standards.

As a fashion enthusiast, I fully support the self-expression that clothing allows. As humans grow, their style evolves. This means discarded clothing is ending up in landfills and overstocked thrift stores.

In this project, I will propose a business plan for a fashion brand called Obaasima. The goal of Obaasima is to clothe women with strength, dignity, and self-love. The brand aims to produce zero fabric waste while providing quality garments.

I looked at two brands to formulate my business plan. Zara and Reformation. The brands create smaller collections and have fewer drops in a year with each collection being available for a limited time. This builds demand for the product. Both brands also use nearshoring to shorten lead times. Using some of these methods, Obaasima will generate demand for their products. Obaasima will operate on a 10-season calendar, dropping a new collection almost every month. Additionally, the brand will produce garments on a made-to-order basis. Obaasima will maintain high standards of sustainability and ethical conduct while satisfying its customer’s demands.