11th Annual

URC

Undergraduate Research Conference

A Symposium of Scholarly Works & Creative Projects

April 22, 2022
8:00 am- 5:00 pm
Jordan Student Success Building (JSSB)

Metropolitan State University of Denver

Table of Contents

Welcome

Welcome to the 11th Annual Undergraduate Research Conference: A Symposium of Scholarly Works and Creative Projects. After two years of meeting virtually, we are excited to be back on-campus and in-person! The last two years have been incredibly challenging, but our students and faculty have shown remarkable resilience and innovation in continuing their research and creative scholarship. Conducting research is both challenging and rewarding in normal times. During a pandemic, the challenges require faculty mentors and students to alter protocols, learn new technologies, and move beyond their comfort zones. This conference is a culmination and celebration of all that hard work.

In addition to celebrating faculty and student research, the Undergraduate Research & Creative Scholarship Program promotes and supports research through various programing throughout the year. This year the Undergraduate Research & Creative Scholarship Program offered a new series of workshop offered both virtually and in-person. We also piloted two new programs. The Undergraduate Research Opportunity Work-study Program (U-ROWdy) aimed to pay students for working on research with their mentor while providing co-curricular community support. The Research Apprenticeship Program was supported by HEERF funding and aimed to introduce students to research and learn fundamental research skills. We are excited to further develop these programs in the coming fall.

Thank you to all the faculty and staff who mentored students in undergraduate research and creative scholarship, and to all the students who did the work and were ready to share their work back in-person. It is because of you that undergraduate research at MSU Denver continues to grow. I am grateful for your work and that we are able to celebrate together in-person once again!

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

KEYNOTE SPEAKER

"Embodied Ethical Social Justice Research"

Sheila Carter-Tod, PhD. Executive Director of the University Writing Program and Associate Professor of English, University of Denver

Dr. Carter-Tod is the new Executive Director of Writing and Associate Professor of English at University of Denver. Having just moved here from Virginia this fall, she previously (at Virginia Tech) directed the Composition Program for five years and the Curricular and Pedagogical Development Program in the College Access Collaborative for two years.

Professionally, she has chaired the National Council of Teachers of English's Racism and Bias committee, and held leadership roles on College Composition and Communications, and Council of Writing Program Administrators' executive boards and committees. She has published works in College Composition and Communication, Enculturation, Composition Studies, Council of Writing Program Administration Journal (CWPA) and others.

Recently, her research and publications have focused on the intersection of writing program administration and race. She recently edited and published in a special edition of CWPA-- "Black Lives Matter and Anti-Racist Projects in Writing Program Administration" in which she co-wrote the introduction and wrote a chapter intitled "Why So Few of US: Addressing Larger Issues of Systemic Exclusions that Limit the Numbers of Black Writing Program Administrators." Additionally she has chapter in a forthcoming book on invisible labor entitled "Nothing New: Understanding Invisible Labor for Faculty and Administrators of Color."

In addition to exploring issues of race and writing program administration, Dr. Carter-Tod's research/teaching/service/outreach focus on race and rhetoric(s), composition theory, and writing pedagogy. Personally, she has lived in multiple countries, comes from a large family, has two adult daughters, and has recently adopted a new puppy (Inigo) who is a Australian Shepherd/Poodle mix.

Dr. Andrew Bonham provides his students with a plethora of research experiences that are unparalleled to many opportunities undergraduates receive at other universities. He continues to exemplify the definition of an excellent research professor and teacher. On top of being the Chair of the Chemistry & Biochemistry Department here at MSU Denver, he is an enthusiastic educator and has a passion for undergraduate research. With over six separate research projects underway in the Bonham Lab, nearly every student receives the rare opportunity to spearhead biochemistry and bioengineering projects tailored to their individualistic interests and strengths. From viral and bacterial diagnostics to cutting-edge bioinformatic cancer research, there is something for everyone. Prolifically, he continues to publish and contribute to the biochemical sciences; many undergraduates even get the challenging opportunity to contribute, edit, and publish in leading peer-reviewed scientific journals. Apart from the laboratory skills and guidance, Dr. Bonham continues to develop a personal mentorship with each of his students by pushing them academically and scientifically while being available for problems both inside and outside the laboratory. He constantly helps in the professional development of his students by allowing them to present their research, write grants, publish papers, and learn to problem-solve like scientists. Within the past few years alone, there have been several students whose lives have been dramatically altered by the opportunities provided by this lab; many alumni are in the process of earning their graduate degrees to continue their passion for science. Before starting research in his lab, I was sure that I wanted to apply for medical school to pursue becoming a medical doctor. This was before I had the opportunity to experience research in biochemistry. While many professors would scoff at having a sophomore student join their research lab, especially one who hasn't even taken a basic biochemistry course, Dr. Bonham graciously allowed me into his lab. Moreover, he patiently taught me what I needed to know to assist in the development of a novel electrochemical DNA-biosensor for the diagnosis of Nontuberculous Mycobacteria (NTM). Just weeks after starting research in the Bonham lab, my career trajectory was entirely turned around. Dr. Bonham fostered a passion for research that has brought me to where I am today – applying for a Ph.D. in Biochemistry. I am positive that I speak for many other students, past and present, by saying I would never have developed this fervor for scientific research if it were not for Dr. Bonham's mentorship, patience, and the opportunities he has given to each of us. For this, I am forever grateful. I consider Dr. Bonham to not only be my research professor, but a friend and mentor who has been there to offer support through some very trying times in my own life. Dr. Andrew Bonham is truly a paragon of what every professional and undergraduate research mentor should strive to be.

By Dylan Poch, Chemisty Major

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

MINI GRANT RECIPIENTS 2021-2022

Otavaia Davis
Major: Psychological Sciences
Mentor: Lisa Bandanes
The Impact of Early and Current Life Stress on Higher Education Faculty
(Photo not available)

Ana Elfring

Major: Biochemistry Mentor: Shailesh Ambre
Year of anticipated graduation: 2023
What you have enjoyed about your research experience:
It's extremely fulfilling being surrounded by other people who love learning about and discussing chemistry as much as I do. The research process is challenging, but for me the lab has truly been a safe, supportive space to build confidence and skills to engage with relevant biochemical questions beyond the scope of the classroom.

Isabel Kool

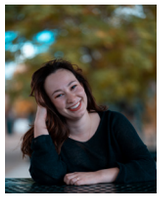
Major: BS Psychology and BA Human Development and Family Studies
Mentor: Bethany Fleck Dillen
Year of graduation: May 2022
Quote research experience: I started working with Dr. Rhoads on a meta-analysis on the effects of yoga-therapy on symptoms of stress in January of 2021. After this I started working with Dr. Fleck on a project that focuses on the possible effects of Peloton exercise on parental outcomes of mothers and had my own research project on achievement motivation as a moderator for test anxiety and academic performance. I also have another project in which we focus on predictors (i.e., quality of life, parental stress, parental self-efficacy, shame, guilt, depression & happiness, exercise, and

Julie Lee
Major: Biology Mentor: Megan Filbin
Year of anticipated graduation: Fall 2022
What you have enjoyed about your research experience: I loved problem solving way through my research. Failing research can be hard but I noticed that I learn how to problem solve and navigate along the way. Also, I get to learn new methods and procedures because alternate ways might be more efficient. Thus, when I get to the end, I learn not only clear understanding of why we do certain things but also alternate ways to solve the issue. This will serve benefits in lab but also in my future studies and career.

Dominic Martinez
Major: Music Industry Studies
Mentor: Elizabeth McLean Macy
Creative Sound: Developing an Online Database for Music Production
(Photo not available)

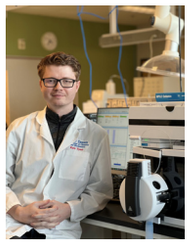
Nathan Nowling
Major: Biology
Mentor: Megan Filbin
Year graduating is 2022
Research exp quote "You must be more ready for failure, then you are ready for success. Not everything works the way you want but they will give you insights to your research."

Samantha Nuanes



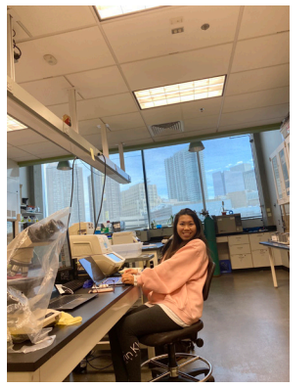
Major: Music
Mentor: Elizabeth McLean Macy
Graduated December 2021
"This project is something that I've wanted to do for a long time. I'm very grateful for the opportunity to have gotten that chance."

Kyle Tyner



Major: Chemistry
Mentor: Shailesh Ambre
Graduating year: Spring 2022
Quote: "Research has allowed me to explore topics and interests beyond those covered in classes. It has allowed me to gain practical skills and a sense of focus to carry into graduate school and beyond."

Liheng Zhou



Major: Double major in Biology and Chemistry, Bachelor of Science.
Mentor: Megan Filbin
Year of anticipated graduation: Spring 2022
What you have enjoyed about your research experience: I enjoyed most about learning knowledge that is out of the book or lecture. When we do research, we need to read additional journal paper in order to understand the background of our research. I am very enjoying in filling the grey area of the knowledge by doing research. This also allow us in learning how to read scientific paper. I think learning how to read a scientific paper is a very useful skill because we can learn new ideas, updated knowledge and new techniques from all the journal paper. Even more, I am very enjoying in doing experiments. When you take a lab class, we usually only perform a certain experiment one time, but in research we get a chance in performing the same experiment more than one time (especially when you keep failing your experiments).

Madison Barber

Major:Psychology and Criminal Justice Double Major
Mentor: Jovan Hernandez
Graduation Year: 2023
Research has opened my eyes to the way that progress gets made in the real world. There are few things more rewarding than researching something and being able to add to the collective knowledge of our ever-expanding world.

Aaron Dooley

Major:Commercial Music Performance Mentor: Elizabeth Macy
Anticipating graduation this Spring 2022
-My qutoe about the experience: "Finishing this album has tested and honed my abilities as a musician, artist, and self-manager. Though frustrating at times, I am confident the skills I've applied to this project have only become stronger."

Callie Earles

Major: Biology with a minor in Beverage Management
Mentor: Helene Ver Eecke
Graduation: Fall 2023
This research experience has been a great introduction to yeast procurement and testing in the brewing world. I have gotten a lot of hands-on experience in the lab and it has been beneficial to prepare me for the work I hope to do when I graduate. Thank to you Dr. Kristy Duran for organizing this opportunity and the helpful workshops, to my project partner Michael Burke and my faculty mentor Dr. Helene Ver Eecke.

Maria Green
Major: Biology
Mentor: Maria Cattell
Year of Graduation: 2023.
Participating in undergraduate research has allowed me to increase my understanding of laboratory protocols and build closer relationships with my mentor and other MSU faculty. It has also reaffirmed my desire to pursue a post graduate research program. I couldn't be more thankful for this opportunity to thrive on a professional and personal level.

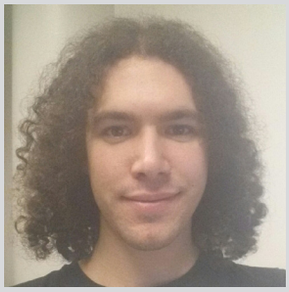
Alden Gruidel
Major:Human Development & Family Studies Major
Mentor: Cynthia Erickson
Anticipated year of graduation: 2023
My research experience has given me the opportunity to learn from and work with incredible individuals. I am grateful for the mentorship of Dr. Erickson and being given the opportunity to see what a strong woman can do in the field of psychological sciences. Above all else knowing that the research I want to contribute to is part of a greater conversation.

Faith LaRue
Major: Sound Healing for Reducing Tension, Stress and Anxiety
Mentor: Cynthia Erickson
Sound Healing for Reducing Tension, Stress and Anxiety
(Photo not available)

Traci Metzner
Major: Biology
Mentor: Robert Hancock
Graduation year: 2022
I am grateful for this wonderful opportunity, in which I am able to create my own research project and continue developing skills in preparation for the next phase of my academic career.

Anthony Dicicco
Major: Biochemistry
Mentor: Robert Hancock
Graduation: 2023
This mini grant has helped me gain experience with fundamental lab techniques as well as learn what it takes to pursue research in the future. I have learned a lot about immunoassays, as well as experimental design, and look forward to continuing this project!

Charles Unseld
Major: Biology major, B.S.
Mentor: Helene Ver Eecke
Graduation: Spring 2022
Quote: "I appreciate this opportunity to take part in research this semester. I was involved in both hands-on lab work as well as planning and organizing the project, which was a good experience."



Acknowledgements

Undergraduate Research Grant Reviewers

Pamela Ansburg
Rebecca Canges
Bill Carnes
Megan Filbin
Andrew Holt
Megan Hughes
Deborah Horan
Sara Jackson
Jackson Lamb
Bridget Murphy-Kelsey
Jeffrey Parker
Siva Priya Santhanam
Mandi Schaeffer-Fry
Nona Shipman

Undergraduate Research Program Advisory Council

Pamela Ansburg
Philip Bernhardt
Bill Carnes
Andrew Holt
Deborah Horan
Megan Hughes
Sara Jackson
Kim Klimek
Jackson Lamb
Sandra Lane
Jeffrey Parker
Siva Priya Santhanam
Nona Shipman
Sheryl Zajdowicz

Scheduling: Kristy L Duran, Ph.D.

Moderator Coordinator: Mandi Schaeffer Fry, Ph.D.

Budget Coordinator: Jill Lange

Conference Program and Cover Design: Anna Juliano

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

Janine Davidson, Ph.D.
President

Alfred Tatum, Ph.D.
Provost & Executive Vice President Academic Affairs

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

Keynote Speaker: Sheila Carter-Tod, Ph.D.

Session Moderators

All Volunteers

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

The Undergraduate Research & Creative Scholarship Program promotes, supports, and celebrates MSU Denver faculty and student engagement in undergraduate research activities. We are now part of Undergraduate studies in the Office of Academic Affairs. Meet our staff!

Kristy L. Duran, Faculty Director of Undergraduate Research

Kristy L. Duran grew up in the San Luis Valley, Colorado. She earned a B.S. in Biology from the University of New Mexico,M.S. in Neurobiology from Colorado State University, and Ph.D. in Evolutionary Biology from the University of Colorado, Boulder. As an undergraduate student, she was fortunate to become involved in a variety of different research programs. She credits her undergraduate research experiences for starting her on her career path. Since then, she has been passionate about introducing undergraduate students to research, involving them in her research on the ecology of dwarf mistletoe, and encouraging them to develop their unique research ideas. She collaborated with undergraduate students on her research projects as faculty member at Colorado Mesa University and then at Adams State University. She joined the MSU Denver team as a Professor of Biology and Faculty Director of Undergraduate Research in July, 2020.

Mandi A. Schaeffer Fry, Faculty Associate, Undergraduate Research

Dr. Mandi A. Schaeffer Fry is an associate professor of mathematics at MSU Denver. Her research is in the field of representation theory of finite groups, an area of theoretical mathematics. Along with her own active research program, "Dr. Mandi" is passionate about undergraduate research. In her time at MSU Denver, she has mentored over 30 students on independent studies and 12 students on research projects resulting in presentations and/or publications.

Dr. Mandi grew up in Peoria, AZ and went to the University of Arizona for both her B.S. and Ph.D. in Mathematics. She spent a year as a Visiting Assistant Professor at Michigan State University before finding her home at MSU Denver in 2014. She loves the students, faculty, and environment at MSU Denver, and counts herself extremely lucky to have found such a great place to share her enthusiasm for math and research! In her free time, Dr. Mandi is a competitive weightlifter and dabbles on the flying trapeze!

Jill Lange, Assistant to the Associate Vice President for Undergraduate Studies

Having worked in higher education administration for over 15 years, Jill Lange has worked in several roles at MSU Denver since 2018. She is the Assistant to the Associate Vice President for Undergraduate Studies, Dr. Elizabeth Parmelee. Jill assists Dr. Parmelee with a range of activities and projects while also lending administrative support to Dr. Parmelee's team of 10 directors, as needed. Born in Michigan and raised in Colorado, Jill earned a B.A. in Anthropology from Colorado State University and later earned a M.A. in Higher Education–Organization & Governance from the University of Denver. She enjoys playing volleyball, traveling, writing, listening to music, and is an avid sports fan as well as a voracious reader.

CONFERENCE-AT-A-GLANCE

8:15-3:30 pm: Conference presenters and all guests sign-in
Jordan Student Success Building (JSSB)

9:00-10:30 am: Conference Session I
Oral Presentations – Jordan Student Success Building
Room 200
Room 203
Room 205
Room 207
Poster Presentations (9:45-10:45) – JSSB Mezzanine

10:45 am- 12:00 pm: Conference Session II
Oral Presentations – Jordan Student Success Building
Room 200
Room 203
Room 205
Room 207
Poster Presentations (11:00- 12:00) – JSSB Mezzanine

12:15 pm: Lunch – Tivoli Turnhalle

12:45 -1:45 pm: Keynote Speaker: Dr. Sheila Carter-Tod: "Embodied Ethical Social Justice Research"

2:15 -3:30 pm: Conference Session III
Oral Presentations – Jordan Student Success Building
Room 200
Room 203
Room 205
Room 207
Poster Presentations (2:00- 3:00) – JSSB Mezzanine

3:30 -4:30 pm: Conference Session IV
Poster Presentations (3:30- 4:30) – JSSB Mezzanine

Map

Jordan Student Sucess Building: Presentations
Tivoli Student Union: Lunch

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

Oral Presentations will be held in upstairs classrooms 200, 203, 205, 207 and Poster Presentations will be held on the mezzanine. Enter the building using the doors under the Student Sucess sign and the staircase to the left will lead to the mezzanine, walking further past that to the right will be the different classrooms.

ABSTRACTS

(listed alphabetically by primary presenter's last name)

A Framework for Semantic Similarity in Discussion Board

Ashley Aguilar – Computer Science
Faculty Mentor: Ranjidha Rajan

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

Improvisations in student learning become easy and fast with the support of Learning Analytics (LA) and Educational Data Mining (EDM). Collaborative learning using a Learning Management System (LMS) generates a large volume of digital information. Extracting patterns and insights from this information helps in better decision making and an improved feedback system. The current research focuses on how a Natural Language Processing (NLP) technique can be used to visualize the semantic similarity in discussion board data. The content similarity in discussion board data helps to determine how much a message builds upon previous message contents, it can also measure how many messages matches with the domain-specific concepts. Recent literature shows latent semantic analysis as a promising model for semantic computing. A Long Short-Term Memory (LSTM) model is used in the research project based on the literature review. The LSTM model is trained using post facto data from the different discussion boards. This aim of the research is to build a semantic similarity tool to measure text similarity and visualize unstructured message board data from an online educational platform to help faculty give timely feedback to support student learning. A framework designed based on the current literature review for visualizing semantic similarity in discussion board data will be presented. Future research will be focus on building the tool based on the framework to analyze more cognitive presence aspects in discussion board data.

Effects of Marijuana Legalization on Drug Crimes in Denver

Nassar Ahmed – Criminal Justice & Criminology (CJC)
Faculty Mentor: Hyon Namgung

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

Recreational sales of marijuana in Colorado have begun in January 2014 and some studies have investigated the effect of this new policy on diverse social, economic, and cultural areas. This research study will explore how the legalization of marijuana has affected crimes in Denver in the years following legalization. More specifically, my research is to perform a geographic analysis of drug crimes in Denver from 2016-2021 using crime data in Open Data Catalog.

Through this research, my goal is to examine the spatial distribution of violent crime and the temporal change of such distributions.

Social Dominance Orientation, Right Wing Authoritarianism, and Intergroup Anxiety as Predictors for Attitudes Toward People with Intellectual Disabilities

Elise Alde – Psychology
Faculty Mentor: Maureen Flynn

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 205

The impact of the stigma toward people with intellectual disabilities (ID) can be severe, including effects such as poverty, healthcare inequities, loneliness, and negative psychiatric symptoms (Ditchman et al., 2016; Gilmore & Cuskelly, 2014; Ali et al., 2012). It is important to identify and examine factors that influence these attitudes to help with this problem. The specific areas of attitudes that this study focused on include: the integration or segregation of those with intellectual disability (i.e., how integrated classrooms should be), attitudes toward social distance (i.e., how comfortable people are with those with ID in their neighborhoods or social groups), attitudes toward private rights of an individual to deny services for those with ID, and subtle derogatory beliefs (Antonak & Hearth, 1994) Previous research has shown that social dominance orientation, right-wing authoritarianism, and intergroup anxiety are negatively associated with positive attitudes toward persons with ID (Brandes & Crowson, 2009; Servido & Marcone, 2020). The current study aimed to examine whether social dominance orientation, right-wing authoritarianism, and intergroup anxiety predict attitudes toward people with ID. The sample consisted of 36 undergraduate students, who were recruited from introduction to psychology courses. Participants completed a series of questionnaires online. Results from the multiple regression showed that social dominance orientation was a significant predictor of attitudes related to social distance and social derogatory beliefs toward people with ID. Intergroup anxiety also predicted subtle derogatory beliefs. Although the current study is underpowered, it highlights the need to perform more research on attitudes toward people with ID specifically.

Perceptions of police

Lexie Allen – Psychology

Coauthors: Jenny Valadez Fraire, Alden Gruidel, Logan Green, David Rynhart, Shannon L. Myers, Madison E. Barber, Sara C. Hobbs, Peyton M. Steiner, Sandra M. Larson
Faculty Mentor: Cynthia Erickson

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

Recent events, such as the ongoing COVID-19 pandemic, and the police shootings of unarmed black people, have led to concerns regarding the safety in our communities, including university and college campuses. The aim of this study is to better understand perceptions of the police and their role in public safety. It may be the case that factors such as personality characteristics and social perspectives such as right-wing authoritarianism and social dominance orientation influence

perceptions of the role of police in society. We generated an online survey with several scales and measures inquiring about people's perception of the police, personality, and feelings of safety on campus as well as demographics. Included in the survey were the Right-Wing Authoritarianism Scale (RWA; Altemeyer, 1981) and Social Dominance Orientation scale (SDO; Pratto et al., 1994). Preliminary results show that RWA and SDO did not predict perceptions of police. There was also no difference in scores on the RWA and SDO and perceptions of police when analyzed by student race as indicated by their demographics. The results from this research could start a conversation on how to reduce racial profiling. Future studies could examine the rates of SDO, RWA, and other variables such as implicit bias, perceived discrimination and prejudice within police forces themselves. Moving forward we will be collecting data from a more diverse sample including people outside of the psychology department and community members on campus.

Relationship Between Corporate Social Responsibility Plans and Corporate Financial Performance in Business

Gil Allgood – Hospitality, Tourism & Events (HTE)
Faculty Mentors: Eric Olson and Lincoln Davie

Poster Presentation, Session I (9:45 – 10:45 am), Poster #7

The influence that corporate social responsibility has and the impact it can possess on corporate financial performance is an area that is continuing to legitimize. Currently, there are differing results within the relationship of these two areas and what the relationship actually looks like. In large part this is due to the ambiguity of standardization and uniform agreement as to what we define as corporate social responsibility. There are currently 37 different definitions of corporate social responsibility within an organization. Further research and investigation is important to explore in how we standardize the CSR definition and practice across all industries. However, there are conclusive results identifying the benefits of corporate social responsibility. Benefits of corporate social responsibility can foster positive organizational culture, create better brand recognition, and impact financial gains if implemented and measured correctly. The most important area within business is that of increasing profits and supporting their bottom-line. With this being said, all business is part of the society and most often in proximity to a community presence. All business relies on society at large and the community around them to be able to attain their economic goals. To solve the issue of the relationship between corporate social responsibility and corporate financial performance results can be measured through questionnaire-based surveys and a singular dimension style of approach. I anticipate that once a standardized approach and knowledge of CSR will result in a positive correlation between CSR and CFP. In conclusion, creating a uniform understanding and implementing further measurable results in regard to the practice of corporate social responsibility will continue to legitimize the theory.

Covid-19 Impact Across Varying Socioeconomic Status in United States

Aleiya Anglo – Health Care Management (HCM)
Co-authors: Lauren Carter, Scott Folken
Faculty Mentor: Garvita Thareja

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

Introduction/Purpose: The coronavirus disease 2019 (COVID-19) outbreak was first reported in December 2019 and has since spread worldwide affecting millions. Though isolation measures were taken to mitigate the pandemic, communities of low socioeconomic status (SES) were thought to be faced with the greatest consequences. While COVID-19 poses a threat to everyone, the dangers are much worse for those living by means of lower-income, as defined by Pew's American Trend Panel (ATP) to be 2/3 of the annual median family income. These low socioeconomic status communities face increased vulnerabilities given social and economic deprivation onset by financial-based imbalance within the healthcare industry.

Methods: Our research followed an interpretation of a clinical case study to better understand the role of Covid-19 in affecting the lives of individuals in differing socioeconomic levels. Utilizing a case study conducted by Pew Research Center, the evaluation of 13,200 randomly selected United States adults aided in further analysis of the results shown for stratified demographic categories and the outcomes faced in light of Covid-19. The large sample group provided an ample representation of the population and allowed for an interpretivist approach to explore how socioeconomic status might play a role in seeking preventive and diagnostic Covid-19 treatment.

Results: Lower-income adults who lost their job due to the pandemic were more likely than those with middle or upper incomes to remain unemployed (56%) compared with 42% of middle- and upper-income adults. Additionally, 60% of workers who experienced pay cuts due to the pandemic reported that they are earning even less money than before the outbreak. We viewed the aforementioned income pattern again when looking at the reports of difficulty paying for medical care or losing health insurance. Those who reported that they, or someone in their household had either been laid off/taken a pay cut, furloughed, were more likely to say they lost their health insurance or had difficulty paying for medical care.

Conclusion/Recommendations: The patterns observed supported our hypothesis of the presence of disproportionate negative effects from the COVID-19 outbreak on those of lower income in the United States. Pre-existing economic pains were exacerbated once the pandemic began and have objectively and subjectively worsened financial barriers to accessible healthcare for individuals already at a disadvantage. We recommend further research on the likely decrease in available resources to these individuals in relation to their worsened financial hardships.

Volunteer Organization

Brooke Armbrust – Recreation Professions (RECR)
Faculty Mentor: Eric Olson

Poster Presentation, Session I (9:45 – 10:45 am), Poster #8

Volunteerism is the act of volunteer work in community service. (Volunteerism definition & meaning) The aim of this project is to examine the organization of volunteers. 32.4% of Colorado resident's volunteer. (Volunteering in America) There are over 1 billion people who volunteer worldwide. The efforts of worldwide volunteers equate to 109 million fulltime workers. (Volunteering Facts & Statistics 2021) Volunteerism has grown and is mutually beneficial for both the volunteer as well as the organization. Organizations get more workers without pay and the volunteer gets to help with something they are passionate about. Therefore, an efficient way to organize the influx of volunteers would only enhance both the volunteers experience and help to get more volunteers for the organization. We will be conducting interviews of industry leaders such as the Parks volunteer and Operations Coordinator for Foothills Parks and Recreation District and a former STAR program coordinator at South Suburban Parks and Recreation. As well as create a short survey to send out to other industry leaders in surrounding states via email. This survey will contain five to seven short questions, with a mix of multiple choice and short answer. These leaders are either directly in charge of volunteers for their organization or are a part of the volunteer process within the organization. Once interviews are conducted and surveys are filled out, we will gather the findings. From this research we can look at different options and coming up with a more universal organization strategy.

Student Veteran Experiences of Perceived Discrimination on College Campuses

Madison Barber – Psychology (PSY)
Faculty Mentor: Jovan Hernandez

Poster Presentation, Session I (9:45 – 10:45 am), Poster #13

The impacts of perceived discrimination on a variety of psychological factors have been thoroughly investigated in the context of racial discrimination. These studies have found that perceived discrimination can negatively impact psychological outcomes. However, there has been very little research done on how perceived discrimination impacts student veterans. By investigating the impacts of perceived discrimination on this population, we aim to mend this gap in research. The purpose of this study is to determine how experiences of perceived discrimination, a sense of belonging at their university, and academic autonomy relate to veterans' academic success and retention at undergraduate institutions. The method of this research involves recruiting veterans through social media, snowball sampling, student organizations, and university veteran affairs offices across the country. Veterans that consent will be asked to take a survey that takes about 20 to 30 minutes.

The survey includes questions regarding demographics, perceived discrimination, academic autonomy, sense of belonging, and academic success. Veterans that participate in this study can opt in to be entered into a raffle for a $25 Amazon gift card as an incentive for participation. The expected results of this study are a better understanding of how perceived discrimination impacts veterans' ability to feel as if they belong at their university, as well as insights into how perceived discrimination may impact veteran academic success and autonomy. The implications of this research will be to get a baseline of student veterans' experiences so that there can be future interventions and studies to help veterans achieve better cohesion, autonomy, and academic success on college campuses.

The Benefits of Yoga for Depression: A Meta-Analysis

Madison Barber – Psychology (PSY)
Co-authors: Shannon L. Myers, Savanna P. Miller, Marilyn G. Fuentes Ponce de Leon, Alexandra L. Del Toro, Adam P. Lundy
Faculty Mentor: Michael Rhoads

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 205

Depression is a mental disorder that has drastically increased since the COVID-19 pandemic took hold of the world (Bueno-Notivol et al., 2021). Depression, as with all mental disorders, affects the way a person lives their daily lives, inhibiting them from living a joyful life. There has been an increase in the number of studies on treatments for depression. One such treatment is yoga, which is gaining traction in psychological research today. Yoga has historically been seen as an additional treatment to alleviate symptoms. Our study hypothesizes that yoga is an effective intervention for depression. Prior meta-analyses have been conducted on yoga for psychological health, but these studies have been limited in their ability to conduct a subgroup analysis (Cramer et al., 2013). It is our aim to remedy this and add to the research so that yoga can be evaluated as a type of treatment for depression. In this study, we found research articles and specifically looked at more strenuous forms of yoga, yoga instructors who have more expertise, and when yoga is practiced for a longer duration. We found a medium effect size of g = 0.68, suggesting that yoga is a viable treatment option for depression. Duration of practice was the only significant moderator we analyzed whereby the longer period of time that yoga was practiced, the greater the benefits became.

What conditions in winter promote feeding in large groups of Northern Shovelers in the Denver Metro area?

Drew Bender – Biology (BIO)

Co-authors: Laura Farnsworth and Kaily Meek

Faculty Mentor: Christy Carello

Poster Presentation, Session II (11:00 am – 12:00 pm), Poster #1

Northern Shovelers (Spatula clypeata) overwinter in Colorado. Between November and March, these ducks have been routinely observed feeding in large groups, often exceeding several hundred individuals. They aggregate in large circles and display a massive whirling behavior while feeding. Whirling feeding behavior is observed consistently in the same water bodies throughout the winter but is not observed in other lakes that are nearby. It is unclear why these ducks choose some lakes over others. The objective of our study is to verify where shovelers frequently display this mass feeding behavior and where they do not. A second objective is to identify what properties, both biotic and abiotic, promote this behavior. In the winter of 2020/2021, we repeatedly sampled 4 lakes near each other and determined that the mass feeding behavior regularly occurred at only one of the lakes. In the winter of 2021/2022, we expanded this study to include approximately 20 lakes. Of the 20 lakes, only two lakes consistently had over 100 shovelers mass feeding 100% of the time and this behavior was never witnessed on the other lakes. The lakes where whirling behavior was observed shared similarities in surface area that were not shared by the other lakes. Additional metrics, such as lake depth and water chemistry will be evaluated before the breeding season to establish a correlation between lake properties and feeding behavior. Northern Shovelers are experiencing population decline and our findings will provide valuable information on the specific requirements for winter feeding.

Behavioral Differences in Intrusion Response Between Rural and Urban Populations of Black-Tailed Prairie Dogs

Pauline Marina Bialik – Biology (BIO)
Co-author: Saya Toyoda
Faculty Mentor: Christopher Cooley

Poster Presentation, Session II (11:00 am – 12:00 pm), Poster #2

Urbanization has had many effects on wildlife including populations of species within urban areas as well as in Jungles and forests through carbon dioxide and other effects of climate change. The population of prairie dogs have been drastically affected by urbanization And this study intends to show how urbanization influences the behaviors of these small critters; the Black-tailed Prairie Dogs (Cynomys ludovicianus).The difference of alertness behaviors between a rural population in the Alameda and E-470 area and the urban population by the Chatfield state park was observed.

The methodology was measuring the distance of how close the observer can get before the prairie dogs would notice the approach, and how close the observer can get before they would retreat back into their burrows. Additionally for reference, how long it took the prairie dogs to come out of their burrows was measured using a time watch. They were gradually approached and the distance was measure using the Measuring App: AR Tape Measure.

The statistics for the distance of how close the observer can get before being noticed was (RURAL - M= 5.530, SD= 0.581) and (URBAN - M= 6.507, SD= 1-089) and (T-stat = 4.3330, DF = 58) with the standard error of difference being 0.225. The P value was 5.9179E-16 and therefore, was extremely significant. The distance of how close the observer can get before the prairie dogs had retreated back into their burrow was (RURAL - M= 3.590, SD= 0.853) and (URBAN - M= 6.230, SD= 0.973) and (T-stat = 0.178, DF = 30) with the standard error of difference being 0.236. The P value was 4.3011E-16 and therefore, was extremely significant.

While the rural population had observed their surroundings time to time, it was easier to get closer to the rural population who seemed almost relaxed, while the urban population was consistently vigilante and cautious of their surroundings which supports previous studies.

Does Police Focus on Drug Crime Result in More Officer Involved Shootings?

Walter Brennan – Cybersecurity
Faculty Mentor: Hyon Namgung

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 207

The 21st century looks a lot different than the 20th century in terms of legal drug use. More and more often states have taken it upon themselves to decriminalize and often even legalize the private use of what were once controlled substances. Even so, police focus on drug related offenses is prevalent. Sale, use, and possession are common attributes to find in arrest data throughout the country. Officer involved shootings have become a heightened social issue, and an issue of contention, within the last several years. Efforts of explanation to this phenomenon have given way to hyper polarization within communities around the country. One would expect that areas of drug proliferation often find themselves under increased scrutiny of street level police officers as hot spot policing gains prevalence in criminology. As an attractor to other forms of crime, and an attractor of increased police presence, one might assume that the frequency of officer involved shooting incidents may also increase in areas with many drug crimes. Through the use of publicly available crime data and officer involved shooting data from Denver Open Data Catalog, this research intends to analyze the spatial patterns of these two variables and examine possible correlation using geographic information system.

Escherichia coli bacteria present seasonally in Canada geese (Branta canadensis) vary in antibiotic susceptibility and genetic markers

David Brown – Biology (BIO)
Co-authors: Vanessa Kort, Jaziah Beck
Faculty Mentor: Rebecca Ferrell

Poster Presentation

Drinking and recreational water quality monitoring is an important safeguard of public health, with evaluation typically enumerating Escherichia coli bacteria as indicators of fecal contamination. E. coli is a gut bacterium in many vertebrate species, complicating its usefulness in detecting human sewage, and efforts to develop methods for distinguishing E. coli of human origin have generally not been successful. Despite this limitation, E. coli quantification is widely used for public health and regulatory purposes, and many laboratories are working on understanding the variation among naturally occurring E. coli strains, with the goal of devising better public health strategies. To build an E. coli strain library, our lab collects fecal pellets after observed defecation by Canada geese (Branta canadensis) and swabs them onto eosin methylene blue (EMB) medium where colonies with a green sheen were selected for purification and further characterization. E. coli are generally enumerated using a medium like Colilert, which detects both lactose fermentation and beta-glucuronidase activity, and this is used to screen isolates. Those that fluoresce on Colilert and are further shown to be Indole (+), Methyl Red (+), Voges-Proskauer (-) and Simmons citrate (-) are considered putative E. coli. In the summer (July-September) E. coli is recoverable from over 80% of samples while less than 5% of samples from January to March contain E. coli; this is consistent with the observations of Kullas et al (2002) in nearby Ft. Collins, Colorado. Isolates show variability in resistance to a panel of 6 antibiotics in the Kirby-Bauer assay, and PCR analysis of chromosomes confirms the presence of the uidA gene, while revealing variability in toxin and other strain-specific genes.

Are rural communities at disadvantages of mental health services

Terra Caballero – Integrative Health Care (IHC)
Co-authors: Ayen Macuei, Erika Nava, Cameron Suppes
Faculty Mentor: Garvita Thareja

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

Introduction/Purpose: Mental health is important for everyone to have to live healthy lives and be able to surpass the challenges that life can bring upon individuals. Mental health is often a health illness that is ignored because people don't have much awareness of the symptoms to watch for. Mental health symptoms that are left untreated can bring drastic consequences such as anxiety disorders, depression, or even suicide. The purpose of this study is to determine the disadvantages of lack of access to mental healthcare services in rural communities.

Methods: The observation study was conducted in the following rural counties such as: Fargo, El Paso, and Douglas. For comparison, the metropolitan area of Denver was also examined. Individuals were able to contact mental health facilities and observe the healthcare services. Data from scholarly sources were also utilized to compare findings and results of mental health services in these specific regions.

Results: The findings of this study found that rural access to mental health services is limited. Facilities are prominent in urban areas such as Denver, requiring travel for those located in rural communities. The standing research supports that there is a significant lack of mental health professionals per capita in these rural areas. Additionally, these findings facilitate conversations about mental health in communities and what services can be introduced. Further research could be done on the importance of quality healthcare.

Conclusion/Recommendations: It is concluded that rural communities in specific regions are at a disadvantage to accessing mental health services. Recommendations include promoting comprehensive community-based services and increasing the educational resources available.

Tension and Role Confusion Between Volunteers and Employees

Carson Casey – Recreation Professions (RECR)
Faculty Mentor: Eric Olson

Poster Presentation, Session I (9:45 – 10:45 am), Poster #9

Volunteers in non-profit organizations fulfill many roles, many of them very similar to the roles of paid employees. This similarity can cause confusion and tension between volunteers and paid employees. In addition, employees are often expected to work for less because volunteers perform similar work for no pay (Nickson et al., 2008), which also causes tension. The result of this confusion and tension can be a poor volunteer experience for both the organization and the volunteer. The purpose of this project is to determine whether a poor experience due to this confusion and tension causes a volunteer to be less likely to pursue another volunteer opportunity. Past studies have primarily focused on whether a volunteer should be classified as an employee but have not adequately considered the benefits of clarifying a volunteer's role in a non-profit organization. Role clarity can alleviate confusion and tension between volunteers and employees. A 2017 Canadian study found that funding cuts are drivers motivating non-profit organizations to use volunteers as unpaid workers (Baines et al., 2017). Using volunteers to perform similar work as employees and lack of clarity of roles between employees and volunteers blur the lines between employee and volunteer roles and create role confusion and tension. To examine this issue, focus groups with former volunteers of non-profit organizations will be conducted to gain insight about why volunteers stopped volunteering. Focus groups will also be conducted with employees of non-profit organizations with volunteer programs to identify themes regarding relationships with volunteers and organizational communication concerning volunteer roles. Anticipated results include confusion regarding volunteer and employee roles and tension between volunteers and employees. The results of this project will help non-profit organizations determine how to better retain volunteers, a critical part of their service delivery models.

TRIO Research Study

Valeria Castaneda Saucedo – Sociology (SOC)
Co-author: Syntya Guzman
Faculty Mentors: Lauren Koppel and Allyson Garcia

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

This study is intended to further understand the meaning of success for TRIO scholars, to encourage students to apply for grants and scholarships, and to help better serve students in ways they need. The questions we are trying to answer through this study are: What does success mean to college students who identify as first-generation, low-income, and/or with a disability? How does this definition of success impact their college experience? How will this definition influence their choice of applying for grants and/or scholarships? Are there any recurring themes throughout student's answers of their definition of success?

This study consists of generally 30 students out of the ~200 TRIO participants at MSU Denver. Participants are asked what their personal definition of success is and whether they have applied for any grants or scholarships, through an initial survey. A small number of selected participants are asked to be part of individual virtual interviews, which will consist of more in depth questions about their definition of success and their experience with applying to grants and scholarships. The scholars result from the interviews will be compared to their initial survey answers to find any differences. Although there are no final findings at this moment, it is hopeful that the results will offer encouragement for students to apply for grants and scholarships. As well as knowledge on what students associate with success. Lastly, we hope this study will help the TRIO SSS, and Scholarship and Retention Center at MSU Denver find different ways to support these scholars.

The Center on Colfax: Community Engagement and Curriculum Collaboration

Samantha Ciaravola – Health Care Management (HCM)
Co-author: Betty Granados
Faculty Mentor: Garvita Thareja

Poster Presentation, Session I (9:45 – 10:45 am), Poster #1

The purpose of the study conducted at the Center on Colfax was to understand the health disparities and challenges LGBTQ communities experience, achievements accomplished, and create a more accessible future for all, regardless of sexual identity. It corresponds to the curriculum in a Public Health course (PUB 3010: Community Health Survey, Assessment, and Health Improvement Planning) taught at Metropolitan State University of Denver.

I chose a qualitative, participant observational approach to collecting data for the study. I decided on a day during the week when I could volunteer at the Center on Colfax. During this time, I engaged with community members within their environment. I documented my observations in detail with a notebook, participated in group discussions, informal interviews, and self-analyzed my own experiences. Nurturing relationships with LGBTQ identities exposed daily barriers and challenges the LGBTQ community encounters. I felt this was the best approach to collecting research for the study because it provided the ability to engage with members of the LGBTQ community outside of a controlled environment, allowing authentic conversations and relationship development with key informants, participants, and gatekeepers. During the study, I toured the building and the several spaces it has for community members. The library with LGBTQ inclusive literature and resources, or rainbow ally, an affirming environment for LGBTQ youth ages, a rooftop for outdoor fitness classes, and many accommodations for gatherings and social events. Since I had chosen to collect research through a participant-observational approach, I used two types of observation for data collection, objective, and subjective statement. I defined objective observation as factual; the information collected in this category was considered exact and supported with historical records. Personal observation, however, is based on opinion subjective to the individual; therefore, the research collected in this category was a combination of statements stories that members of the community had experienced supported by their own belief or theory.

In conclusion, the Center on Colfax was an enriching, wholesome, and educational experience. With the participant-observational methodological approach, I engaged with community members through nurturing relationships forming a foundation for trust and friendships. In addition, I actively participated, was receptive, and absorbed diverse considerations contributing to overall health, disparities, and quality of life.

Spring and Autumn Winds: Women authors in Tang Dynasty and Heian Period and their relationship with the syncretism of religions in China and Japan

Nicole Colvett – History (HIS)
Faculty Mentors: Kimberly Klimek and Thomas DeZauche

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

My presentation would be on Imperial women in Tang Dynasty China and Heian Period Japan and their relationship with the syncretism of religions created spaces of literary expression during their respective "Golden Age" of literature. Confucianism, Buddhism and Daoism/Shinto are the religions that have become woven through Chinese and Japanese culture. During the Tang Dynasty and Heian Period, Buddhism had much more influence than Confucianism, in addition to the prevalence of Daoism in China and Shinto in Japan. This can be seen in the proliferation of female writers like Ban Zhao and Xue Tao in China to Sei Shonagon and Murasaki Shikibu within Japan, which had more women writers within its courts than any other across the world at this time. The sources I am pulling from have

been translated for over a century now, however, the same cannot be said of many other women whose voices are not only separated from the "main" narrative but ignored altogether. Ban Zhao is the first recorded female historian, and yet her name is rarely referenced in the field of history compared to Herodotus. The way these religions defined gender differed from each other, and within those spaces or gaps, scholarly and artistic opportunities for women were able to propagate, and therefore reaffirm their own shaping of the "main" narrative. My hope is to contribute to the conversation about these women, and how the relationship with religions that had syncretized together facilitated the opportunities they had to put their thoughts and voices down on paper, though they lived in a world which considered this to be unnatural and unimportant.

Antimicrobial Efficacy of Medi-Honey

Rose Cruz – Biology (BIO)
Co-author: Megan McConnell
Faculty Mentor: Sheryl Zajdowicz

Poster Presentation, Session II (11:00 am – 12:00 pm), Poster #4

Honey is known to have medicinal and healing properties. Previous studies show that honey has varying effects on the growth of certain bacteria and can impact wound healing. With increasing microbial resistance to antibiotics, the use of honey has been proposed as an alternative form of treatment, most notably in the prevention of skin infections. There are two categories of honey: peroxide-producing honey and non-peroxide-producing honey. In this study, we aim to investigate the inhibitory effect of a non-peroxide-producing honey on planktonic and biofilm-associated microbes. Twelve representative species of microorganisms, including Gram-negative and Gram-positive bacteria, as well as a fungal species, commonly associated with skin and opportunistic infections were tested. The organisms were grown on Brain Heart Infusion agar plates, were exposed to two brands of honey ointment, and were observed for zones of inhibition. Preliminary analysis showed that some of the microorganisms plated were in fact susceptible to the honey ointment. On some of the plated media, small but well-established clearing surrounding the ointment applied was observed. Following the determination of susceptible organisms, a minimum inhibitory concentration will be determined for the honey compound, and further analysis will determine its effect on mature biofilms.

The Impact of Early and Current Life Stress on Higher Education Faculty: Examining Possible Buffer

Otavaia Davis – Psychology (PSY)
Faculty Mentor: Lisa Badanes

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 205

Faculty in higher education may experience anxiety and depression (Manaf et al., 2021), as well as workplace burnout (Lashuel, 2020), which may adversely affect their productivity in research, teaching, and service. Given that student success is largely driven by the psychological health and job satisfaction of their faculty (Ascione, 2021) efforts in understanding how to promote and support faculty wellness are important for understanding academic outcomes. The purpose of this study is to examine the effects of both early and current life stress on several employment-related outcomes in a sample of faculty in higher education. We are particularly interested in the effects that both childhood adversity, as well as current life stress (such as daily hassles and discrimination), has on faculty job satisfaction and overall well-being. Most of the previous work in this area has focused on an undergraduate sample examining academic outcomes. Data collection will take place online via a Qualtrics survey. Using linear regression models, we will examine our risk factors (including stress and mental health) against several outcomes related to job satisfaction and productivity. In addition, we will test for potential moderators. Results from the study could inform intervention efforts to better support faculty well-being and satisfaction. This may be particularly relevant for faculty who endorse a history of early adversity or who are experiencing high rates of current life stress such as COVID-related anxiety or societal and racial inequities.

Intrinsic and Extrinsic Barriers to Third-Tier Convention and Visitor Bureaus' Marketing Outreach to Meeting and Event Planners

Samantha DeFilippo – Event and Meeting Management (EVT)
Faculty Mentor: Inna Soifer

Poster Presentation, Session I (9:45 – 10:45 am), Poster #10

This qualitative study aims to identify the intrinsic and extrinsic barriers within the third-tier Convention and Visitor Bureaus' (CBVs) marketing outreach strategies towards meeting and event professionals. CVBs are unofficially ranked into three tiers based on their city's airport size, convention center size, and the number of sleeping rooms available (Shimasaki, 2015). Previous research has focused on first-tier convention centers, examining website performance as far back as 1999, and, later, identifying the unique needs of meeting planners, and comparing Chinese versus U.S. CVB's marketing strategies (Ismail et al., 2002; Kim et al., 2002; Morrison et al., 1999). However, little is known about third-tier cities and their marketing efforts.

Two approaches will be used to address the study's goal, specifically content analysis of CVBs' websites and interviews with CVBs' middle- and upper-management. Using the list of convention facilities obtained at Cvent Destination Guide (Cvent, n.d.), 43 CVBs were selected out of 407, all designated as third-tier destinations, located within the continental United States - one location per state - within a region with fewer than 100,000 residents. Each CVB's website will be reviewed and analyzed for the marketing content and tools designated for meeting and event professionals by using a matrix to compare data points. This website data

will inform the guide for semi-structured interviews with employees of the regional CVBs to determine intrinsic and extrinsic barriers to effective marketing towards meeting and event professionals. Finally, the data will be analyzed using qualitative coding and following grounded theory (Merriam, 2002).

This study will provide insights into third-tier CVBs' marketing strategies, identify the barriers for effective marketing towards event and meeting professionals, and develop recommendations for streamlining CVBs' websites and offering easy access to information and contacts. That should help increase CVBs' sales, including regional groups' events and meetings.

Determining Reproductive Behavior in Convict Cichlids Using Genetic Markers

Colette Dolby – Biology (BIO)
Co-author: Caroline Rice
Faculty Mentor: Hsiu Ping Liu

Poster Presentation, Session II (11:00 am – 12:00 pm), Poster #5

The evolution of genetic monogamy, in which an individual shares fidelity and parental responsibility with their mate, has been perplexing. Convict cichlids, a species of neotropical fish, have been used as a model species for genetic monogamy for the last 50 years. In 2017 Lee-Jenkins et al. study suggested that convict cichlids could be exhibiting social monogamy in which the mother and father share parental responsibility, but have extra-pair copulation. The objective of our study was to genetically determine if convict cichlids are socially or genetically monogamous using microsatellite markers. Thirty-eight mated pairs and their broods were collected in Costa Rica. Microsatellite analysis was performed in four different loci to determine the paternity/maternity of each offspring. Early results show 44% of families had social monogamy, and 56% exhibited genetic monogamy. Surprisingly 66% of the families exhibited adoption and one family out of 18 analyzed had no adoption and was a complete genetic match. These results demonstrate social monogamy and adoption in convict cichlids for the first time using parental and offspring genetic markers.

Totem Pocket: The Debut Album

Aaron Dooley – Music (MUS)
Faculty Mentor: Elizabeth Macy

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

For the last two years, I have been writing and recording an album with my musical collaborators under the name Totem Pocket. The goal of the project is to complete and release Totem Pocket's debut album in a manner that satisfies the band's artistic endeavors.

Taking on the role of the project's director, I identified the key objects and the steps needed to complete them. The four objectives I identified as being essential to the project are recording, mixing, mastering, and promotion of the album.

While much of the recording of the album was completed prior to this spring, final touches like drum and vocal recordings were completed at the studios on Auraria campus with the assistance of our engineer, Zoe Moff. Once every part has been recorded for a song, it is sent to Ian Sheridan to be mixed. The album's roster of songs completed they are lastly sent to industry professional Carl Saff to be mastered for final distribution.

Beyond these actual musical aspects, the release and promotion of the album is central to this creative project's success. Utilizing the music business skills I learned in the DIME program, I've crafted one-sheets and electronic press kits to promote the album on social media, radio/playlists, and press. Before the first single, "Keep It in Your Mind," is released in May, I will be sending selections of the album to prospective labels in hopes that they find the music worthy of releasing. Intended to drop in mid-June, Totem Pocket's debut album will coincide with a release show in Denver to build further interest.

Novel Yeast Isolation and Characterization from a Honeybee Habitat for Use in Brewing of Beer

Callie Earles – Biology (BIO)
Co-authors: Michael Burke and Noah Schindler
Faculty Mentor: Helene Ver Eecke

Poster Presentation, Session II (11:00 am – 12:00 pm), Poster #6

Humans have been making fermented beverages for millennia. However, only until the last few hundred years have we discovered how important yeast is to the process of fermentation and began to study it to find out how the process, and yeast, can be manipulated into giving us the desired aroma, flavor, and color for a specific beverage. While wild yeast can be found virtually everywhere around us, the genus Saccharomyces has been the primary yeast strain used in the fermentation of beer. We intend to find suitable yeast strain candidates within a honey-bee environment provided by Breckenridge Brewing in Littleton, Colorado, including hive and surrounding foliage, that could be viable for the wanted aroma, flavor, and color profiles desired for the fermentation of beer. While yeast strains from this environment have been used to ferment honey, whose primary sugars are glucose and fructose, to make mead, we intend to find strains that are able to ferment the primary sugar in malted barley, maltose, which is used in brewing beer. After collection of the yeast samples, we will test for attenuation rates, sensory notes, and tolerances to a variety of conditions including ethanol concentrations, different strains of hops, and interactions with other yeast strains during the brewing process to isolate the best strains. We will use molecular techniques including DNA sequencing, bioinformatics, and taxonomic analysis to identify the yeasts and their

evolutionary neighbors. Since the primary goal is to find a yeast strain to provide a honey aroma and/or flavor to the beer, we are open to the possibility of using a Saccharomyces strain to help in the fermentation process. Hopefully, this research will be able to identify yeast strains that can be used for sensory characteristics that are desired by brewers.

Synthesis of hydroxybenzoic ether and cholesteryl ether liquid crystals

Connor J. Edelman – Chemistry (CHE)
Co-author: P. Blackwell
Faculty Mentor: Lisa M. Eytel Community College of Denver

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

Most people are familiar with the mood ring, a children's toy which contains a liquid crystal. Liquid crystals are compounds that show properties of both a solid and a liquid in phases categorized as nematic, smectic, and cholesteric. However, liquid crystals also have many applications in technology. We will present different synthetic schemes to produce hydroxybenzoic ether and cholesteryl ether liquid crystals, including analytic data and experimental properties of our synthesized compounds. These procedures and results can be adapted as a future organic chemistry teaching lab, introducing students to the synthesis, properties, and applications of liquid crystals.

Synthesis and evaluation of cell-penetrating peptides for therapeutic delivery

Ana Elfring – Biochemistry (BCHM)
Faculty Mentor: Ahailesh Ambre

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

Peptides, which are short amino acid chains produced naturally in the body, play roles in hormonal, signaling, and antibiotic processes. We are developing modified peptides to investigate novel drug delivery pathways. Cell-penetrating peptides (CPPs) are a current topic of biomedical research toward improving targeted drug delivery, as they can facilitate passage of a charged cargo molecule (which, on its own, would not be able to enter the cell) past the plasma membrane and into the cytoplasm.

Despite modern development of many drugs that effectively treat disease, most are still hindered by a myriad of undesirable side effects. For example, chemotherapy treatment of cancer may effectively destroy tumors, but also damages healthy tissue to the detriment of the patient. There is room for improving drug delivery systems to overcome physiological hurdles preventing efficient, highly targeted drug delivery on the cellular level.

Solid-phase peptide synthesis (SPPS) is an established technique to build specific amino acid chains via successive addition on an immobilized resin surface in a reaction flask. SPPS will be implemented to synthesize three CPPs with known amino

acid sequence. Two of the three peptides are derived from viruses (HIV and SARS-CoV-2), and the third is a fragment of the human alarmin protein HMGN1. The HIV-1 Tat peptide is a benchmark for comparison, as it has been extensively studied for delivery of small molecule drugs and large DNA vaccines. Performance of the MinP fragment from HMGN1 and a fragment of the SARS-CoV-2 spike protein virus will be compared against HIV-Tat using a cell-based luciferase assay.

Food Insecurity in Low-Income Aging Adult Populations

Crystal R. Elliott – Individualized Degree Plan (IDP)
Faculty Mentor: Meghan Hughes

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

Food insecurity among low-income aging adult populations is a chronic issue. Maintaining good health, consuming a nutritious diet, and managing an existing chronic disease can be incredibly challenging for aging adults struggling with food insecurity for various reasons; limited income, and resources, the cost of healthy foods, competing priorities, such as household bills, medications, and functional limitations, transportation, stress, and illness. Many are homebound, sometimes alone, and sadly, these individuals suffer silently from hunger. Poverty, parallel with food insecurity and poor nutrition choices, has harmful impacts on the health and well-being of aging adults, limiting their ability to carry on daily activities and live independently. Chronic disease is a significant indicator of food insecurity among older adults, and so too are functional limitations. This limitation classification is based on research data of individuals claiming the inability to perform or having difficulty with specific activities. These activities include walking without special equipment, lifting or carrying something that weighs five to ten pounds, doing chores, and pushing or pulling large objects. Based on national survey data, low-income aging adults with functional limitations have over 70% higher odds of food insecurity and over 60% higher odds of poor dietary quality. These associations are even more significant for those living alone without family or a caretaker.

A community call-to-action plan could include advocacy efforts beginning with municipalities: elected officials. Community members could propose an intergovernmental bill to present to the state legislature while identifying vital agencies providing food to LIAA within each municipality. The collaborative outreach allows to branch out to partnering local governments, extend outreach and combine resources. Instead, these organizations could combine efforts in applying, not competing for grant funding opportunities, and expanding their bandwidth. Ultimately linking arms with agencies that provide similar services and resources creates more significant opportunity and sustainability.

A Framework for Visualizing Discourse Coherence

Edom Eshete – Computer Science (CS)
Faculty Mentor: Ranjidha Rajan

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

Student engagement is a key factor for learning environments. Collaborative learning activities is designed in a way to improve student engagement and to learn from different aspects of cognitive presence. In collaborative assessments different aspects of cognitive presence are motivated for an improved learning experience. The study explored various aspects of cognitive presence in collaborative assessments from current literature. One of many factors that improve cognitive presence is coherence as explained in the Community of Inquiry (CoI).

Considering the study, a machine learning tool to visualize discourse coherence in online discussion boards is being developed to support teaching and learning with a better feedback system. The research analyzes discourse coherence using machine learning algorithms in Natural Language Processing (NLP). This model measures the degree of logical reliability among the discourse in an online discussion forum. The post-facto data from the different discussion boards from Canvas learning Management System will be used for training the model. The framework for the model to visualize coherence in the discussion board will be presented. The framework explains how the unstructured discussion data will be used to build a Learning Analytics (LA) tool to support faculty and students in improving the learning environment. As a future direction, the model will be developed and will be used as a full-fledged tool to visualize cognitive presence in an online discussion forum.

How The Covid 19 Pandemic Impacted Domestic Violence in Denver

Mallorie Estes – Criminal Justice & Criminology (CJC)
Faculty Mentor: Hyon Namgung

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

Mental health has recently become a serious issue in our society and many experts are concerned about the effect of COVID-19 pandemic on aggravating the mental health problems and behavioral issues. The goal of this research is to test a hypothesis that the pandemic might have changed how people interacted with others, especially for couples who lived together during these challenging times. More specifically, it will explore spatial and temporal distribution of domestic violence in Denver using the crime data from Denver Open Data Catalog for the past five years. Thus, this research will help us understand whether or how the pandemic has changed this unique type of crime and where resources need to be allocated.

SARS-CoV-2 proteins with variations in omicron linage BA.1

Autumn Fineran – Biology (BIO)
Co-author: Erin Austin, Ashley Dillon, Ana Elfring, Cayley Perlman, Felicia Stambaugh,and Adrian Thomas
Faculty Mentor: Emily J. Ragan

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

SARS-CoV-2, the virus that causes COVID-19, undergoes gradual mutation that can lead to new variants of the virus. The omicron variant emerged in November 2021 and is different from the 2019 strain in multiple ways. While much attention has been directly interacts with human cells during infection, there are other proteins with distinct differences in the omicron BA.1 variant. The impact these changes have on virus fitness remain unclear. The Spring 2022 Biochemistry II class investigated four proteins that differ by at least one amino acid in the BA.1 variant: papain-like protease (PLpro, nsp3), 3C-like protease (nsp5, main protease), nonstructural protein 6 (nsp6), and N (nucleocapsid protein). We share our investigations into the structures and functions of these proteins, including 3D images of the structures made using the structure viewing program Chimera.

COVID-19 in Comics: The Visual Arts as a Mechanism of Science Communication.

Mika Futz – Biology (BIO)
Faculty Mentors: Anil Rao, John Rinn (CU Denver), Catherine Musselman (CU Anschutz),Megan Filbin, Megan Lazorski, and Helene Ver Eecke

Poster Presentation, Session II (11:00 am – 12:00 pm), Poster #7

Over the past decades, scientific information has become less accessible.1,2,3 The COVID-19 pandemic in particular has exposed challenges in how critical health information is disseminated and interpreted. The visual arts represent an alternative mechanism to relaying scientific and public health information to the lay public in a more inclusive manner. It has been shown that graphic design can cultivate interprofessional collaboration and interaction with scientific literature.

Inspired by the challenges scientific and policy communication posed throughout the COVID-19 pandemic, this project explores illustration to establish a foundation of scientific literacy, reaching diverse populations, merging boundaries, and bridging gaps in knowledge. Specifically, the nostalgia of the classic comic book has the potential to render complex scientific topics as approachable while inviting individuals from across generational, educational, and linguistic groups.

Here I present the use of comic book rendering to relay information critical to understand SARS-COV2, COVID-19 and the pandemic response. All imagery presented references the visual lexicon associated graphic novels and comic books. This project is comparable to a literature-based review that yields visual output instead of a final written product. Artwork was created using traditional illustration

techniques, ink, graphite, and watercolor. Besides hand-renderings, digital painting and 3-D digital modeling were performed in Keyshot Rendering, SketchUp Pro, InDesign, Illustrator, and Photoshop software.

Haiti's Youth: Trauma, Resilience, and Resignation

Ellena Gallegos – Human Services (HSP)
Faculty Mentor: Shawn Worthy

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 205

Multiple studies have been conducted on the basis of Post-Traumatic Stress Disorder (PTSD) and resilience levels within Haitian residents- especially after the earthquake that occurred in 2010, approximately 25 kilometers west of Port-au-Prince, Haiti's capital. Researchers will explore how resignation plays a role in Haitian youth's coping with trauma in order to better understand the relationship between resilience, resignation, and PTSD. Researchers will do so by finding out the portion of Haiti's youth population utilizing the coping mechanism of resignation as a means to live and building off of the research that has already been conducted. This will be done through the use of different questionnaires. The study sample will consist of Haitians aged 18 to 24 that lived in Haiti during the time of the 2010 earthquake. Our sample will primarily come from students studying at the State University of Haiti. We will have a sample size of about 100 students. Adults unable to consent, children under the age of 18, and prisoners will be excluded from the sample size. Haiti is a place where western concepts of mental health are not widely known or valued. In fact, in the very rare case that a Haitian individual attempts to use western mental health concepts and treatment they are typically stigmatized by their community. Most issues that the U.S. would consider as mental health issues, individuals in Haiti consider to be spiritual in nature. The results could indicate a need for western mental health interventions.

Witness Preparation for the Female Sexual Assault Victim

Cassie Gibbs – Psychology (PSY)
Faculty Mentors: Denise Mowder and Philip Bernhardt

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 207

The purpose of this study is to examine different methods for effectively preparing female rape victims, who can be considered vulnerable witnesses, to reduce confidence-accuracy bias and increase conviction rates in female sexual assault cases. Through a semi-structured interview process interviewing advocates within the criminal justice system, who work directly with female sexual assault victims, we hope to better grasp how the system can better facilitate this vulnerable population in trial and answer the question: How can effective witness preparation reduce confidence-accuracy bias for female rape victims in jury trials? The lack of research available on this topic makes it an important area of exploration. Differences in how juries perceive rape victims vs. other vulnerable witness populations make

studying the unique dynamics involved in these cases necessary. The researcher's hope to be able to explore a more trauma-based approach that shows empathy and compassion for female sexual assault victims, decreasing revictimization, while increasing conviction rates.

Understanding Internet Extremism

Katy Gillivan – Psychology (PSY)

Faculty Mentor: Christopher Garris
Poster Presentation, Session IV (3:30 – 4:30 pm), Poster #12

The way that people interact with content online may influence their social attitudes and beliefs, and the internet has been viewed as an incubator for various disparate extreme social movements. The result of extremism is often violence, and so it is important to try to understand the patterns that result in radicalization. Evidence that extremist materials online play a role in radicalization processes is anecdotal and there is a lack of empirical evidence (Frissen, 2021; Reeve, 2021). Stereotypes exist about what kind of people end up radicalized online and how. This study seeks to examine the interactions between several variables regarding internet use habits and the media consumed online, personal identity and gender role identity, and conspiratorial and authoritarian thought. The research that does exist indicates that certain people may be more susceptible to internet extremism. A qualitative study found that rather than being "lone wolves" involuntary celibate, or "incel", murderers undergo indoctrination processes that are consistent across personal experiences, turning lonely people into angry people (Regehr, 2022). Students in one experiment, when given the option to explore a fake extremist website created by the researchers, mostly did not engage with the extremist material, but those who did preferred dominance and hierarchy in society and possessed strong ingroup identification and more outgroup hostility (Reeve, 2021). In past research authoritarianism was found to be a predictor for apredisposition towards conspiratorial beliefs (Richey, 2017). There may be certain social vulnerabilities and social beliefs that cause people to be receptive to increasingly radical content. Gender role identity and attitudes are of particular interest. Research has shown that people who identify more strongly with the gender role that matches their gender identity are less likely to support women's rights, and the inverse was true as well (Toller, 2004), which could indicate a link between gender role identity and political beliefs that is complex. There is a loose confederation of men's rights, incel, antifeminist, and pick up artist communities online colloquially known as the "manosphere" where much of the information that circulates can be traced to a few sources (Mountford, 2018; Rafail, 2019). Much of the speech found in this online space is political (Mountford, 2018; Rafail, 2019) indicating that there could be an interplay between gender role attitudes and beliefs, and internet habits. This exploratory research will examine the relationships between these variables.

Project 2

Ashlin Gleason – Hospitality, Tourism & Events (HTE)
Faculty Mentor: Eric Olson

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

At the Food Bank of the Rockies, if you would like to sign up for volunteering it's pretty easy, go to the website and click the button that says sign up to volunteer, there are a lot of options to choose from that you would want to do. Financial success is good because anyone can sign up to get food kits, meals and it's not expensive. There is a lot of volunteer work which saves a lot of money for the company. When people sign up and show up, there are a lot of reasons for that, family emergencies, sickness, car breakdown, etc.. Social responsibility, everyone has to talk and get to know each other to be on the same page of what needs to get done. Governmental reports say it's a great place, a lot of people rely on this to feed their kids and themselves, anyone can use the food bank of the Rockies and to volunteer it shows you how lucky it makes people, a lot don't know what it's like. Following up with people at the Food Bank of the Rockies, asking how they are doing during the shift, asking if they need any help and making sure everything is organized and ready to go for the next groups to come in and help with volunteer work. There is always a person having to do qualitative work making sure the explanation to volunteers is going well and knows what to do and get done. Someone who is quantitative and focuses on numbers such as money, meal kits and making sure we don't have more or less of something. Results more people coming in and helping with volunteering, and it can be formatted as serving the community as needed. I would tell my manager that this is a great thing for the community and more of this needs to happen because it's a tough time right now lots of people have lost jobs, an other money finding it because of the pandemic and food all over is expensive right now so anything to serve the community is good.

What is the relationship between weapon fire into an occupied building vs. weapon fire into and occupied vehicle and how has gun crime changed over the past three years?

Axel Gonzalez – Criminal Justice & Criminology (CJC)
Faculty Mentor: Hyon Namgung

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 207

Gun violence is a growing problem that is happening in the US right now. Politics and Congress can only do so much to stop the illegal use of guns. For first responders like the police, knowing how crime involving guns can increase their chances to help deter gun crime throughout the United States. In highly populated cities like Denver, we can see a change in crime patterns and distribution due to numerous factors. Because most crimes are location-based phenomena, spatial analysis can establish an in-depth analysis and solution to the problem. The goal of this research is to examine the spatial distribution of two types of gun violence: (1) weapons

fired into occupied buildings and (2) weapons fired into occupied vehicles. By using the crime data from Open Data Catalog, I will describe these specific categories of gun violence in Denver for the past three years on ArcGIS Online (cloud-based geographic information application). Further, this study will investigate factors that could contribute to increase or decrease of the gun violence. Identification of hot spots will help police develop better tactics and preventative measures to address gun violence in Denver.

In-silico guide RNA design for CRISPR-mediated mutation of the gene ndnf

Frost Gordon – Biology (BIO)
Faculty Mentor: Vida Melvin

Poster Presentation, Session II (11:00 am – 12:00 pm), Poster #8

Neuron derived neurotrophic factor (ndnf) regulates the growth and survival of neurons and aid in their differentiation and migration. Through recent studies it has been found that ndnf also plays a critical role in the development of craniofacial cartilage in zebrafish. Knockdown of ndnf using antisense morpholinos resulted in reduction of the ethmoid plate, a cartilage that is similar to the palate in humans. These data suggest that understanding the function of ndnf in zebrafish ethmoid plate formation could provide insight to complications such as cleft lip and cleft palate in humans. Unfortunately, the use of morpholinos in zebrafish has been linked with non-specific effects on development, including disruptions to craniofacial development that are not associated with specific gene knockdown. We propose to use the CRIPR-Cas9 system to create a loss of function mutation within the ndnf genomic sequence. The CRISPR-Cas9 system has three major components. crRNA binds to the gene of interest, here ndnf. trcr RNA binds to the crRNA and the Cas9 protein, which induces a double-strand break in target DNA sequences. The normal cellular pathways involved in double-strand break repair can introduce insertions or deletions in the target gene that will disrupt coding. Here, we present the in-silico design of crRNAs that target the ndnf gene in zebrafish.

Comparison of DNA extraction protocols on different conditions of coral tissue

Maria Green – Biology (BIO)
Faculty Mentor: Maria Cattell
External Collaborator: Ann Money

Poster Presentation, Session II (11:00 am – 12:00 pm), Poster #9

With increasingly damaging effects of climate change on coral reefs, there has been a demand for genetic conservation efforts to rehabilitate these underwater ecosystems. Genetic research on coral is possible to implement from non-coastal areas, but requires different levels of effort to obtain tissue samples depending on the type of tissue-preservation method used. Many genetic applications, such as PCR and DNA sequencing, require higher quality DNA for implementation. Tissue-preservation method can directly affect the quality of extracted DNA to be used in

further genetic research. Fresh tissue requires the most effort and cost to obtain and maintain. Frozen tissue is somewhat easier, less costly to store, and is expected to yield DNA of similar quality to fresh. Formalin-preserved tissue is expected to yield the lowest quality DNA, but shipping and storage is the most cost and time efficient. The type of DNA extraction protocol used has also been observed to yield DNA of ranging quality when combined with each tissue preservation method of different species. During this research we tested these conditions by extracting DNA from fresh, frozen, and formalin-preserved tissue of the coral species Echinophyllia lamellosa, using three extraction protocols—CTAB, SDS, and a commercial kit. The recovered DNA segments were then used as templates for PCR amplification to determine the levels of quality. Primers were designed to amplify DNA segments of three different lengths— 200 base pairs, 500 base pairs, and 1000 base pairs. Tissue fragments containing DNA that was successfully amplified up to 1000 base pairs in length were considered high enough quality for use in most genetic applications. The results from this research will directly contribute to future genetic studies on E. lamellosa, and other coral species, by providing foresight that will allow for more methodical extractions of DNA and the most efficient resource utilization of supply.

Safety of Students: Addressing Fears on Campus

Alden Gruidel – Human Development and Family Studies (HDV)
Co-authors: Jenny Valadez Fraire, Lexie Allen, Shannon L. Myers, Sara C. Hobbs, Madison E. Barber, David Rynhart, Tianna Nuearth, Peyton M. Steiner, Sandra M. Larson, Logan Green
Faculty Mentor: Cynthia Erickson

Poster Presentation, Session IV (3:30 – 4:30 pm), Poster #15

With the rise of COVID-19 in 2020, people across the globe were in a fear-inducing, disorienting, and unprecedented situation. For many students, safety became an immense concern in every aspect. Due to these concerns, the MSU Denver's Psychology Research Club conducted a study addressing safety on the Auraria campus. Much of the discussion of campus safety this year has focused on the safe return to campus following the COVID-19 pandemic. The question we posed was "What are students who attend MSU Denver afraid of?" Furthermore, how can we address these fears to come up with preventive and just measures for a safer campus? The participants consisted of MSU Denver introduction to psychology students. Participants were asked to fill out an online survey with questions regarding demographics, personality, perceived stress, and perceptions and attitudes of police/police interactions. The data collected thus far suggests that the top three fears of MSU Denver introductory psychology students are: violent crime, harassment, and illness, such as COVID-19. The results indicate that students feel less safe on campus at nighttime when compared to feelings of safety while on campus during the day. The demographics of our study is as follows: 63% of our student participants were female, 50% of participants identified as white, 31% identified as Hispanic, Latino or of Spanish origin, 6% of our participants identified as Black. 57% of our participants were first generation college students. We hope the results of this study can be used as a starting point to address fears, safety

concerns and biases on campus. This can help MSU Denver leadership in making, and changing, policies that impact student safety on campus. In addition to this, we would be interested in addressing more underrepresented students at MSU Denver to bring awareness to fears that may be overlooked by the white majority.

The Rise of Telehealth: Attitudes Towards Online Therapy in 2022

Alden Gruidel – Human Development and Family Studies (HDV)
Faculty Mentor: Cynthia Erickson

Poster Presentation, Session III (2:00 – 3:00 pm), Poster #15

In 2019, our research group conducted a study on attitudes towards online therapy. The results we report here replicates the previous study which was conducted before the COVID-19 pandemic. The pandemic saw a substantial rise in depression and anxiety among young adults (Turna et al., 2021). In addition, worsening symptoms of eating disorders increased as well (Linardon et al., 2021). We reported that, prior to the pandemic, attitudes towards online therapy were more positive by individuals who had been in online therapy previously, were currently in online therapy, and or were considering online therapy; in comparison to individuals who had not been exposed to online therapy (Knechtel & Erickson, 2020). Given that our collective experience with tele-health has changed dramatically over the course of the last two years, we were curious if attitudes have changed as well. Additionally, this study will examine disordered eating behaviors, and attitudes towards online therapy by individuals who may live with disordered eating. Participants filled out a survey asking about their experience with therapy, technology, attitudes towards counseling, and eating behaviors. Compared to 2019, 93% of our participants have heard of online therapy relative to 86% of our participants in 2019. We hope by understanding attitudes surrounding online therapy, we can bring about awareness to its potential of accessibility in the field of psychological and eating disorder treatment.

Neoliberalism, Inequality, and Violence

Jake Hall – Political Science (PSC)
Faculty Mentor: Sheila Rucki

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 207

There was a drastic shift in United States economic policy beginning in the in the 1970s and 1980s. These policies can be ideologically categorized as neoliberal policies. The purpose of this study is to examine the relationship between neoliberal policies and economic inequality and then examine economic inequalities impact on general and racial violence, with the goal of exploring a potential connection between neoliberal policies, violence, and racial violence. This study uses a methodology that first entails creating a timeline of neoliberal policy implementation compared to historical data contained in the GINI coefficient and index, then comparing the GINI coefficient and index data to general violence and racial hate crime rates in a correlational analysis. My research indicates that there is

a correlation between neoliberal policy implementation and growth in inequality but a spurious relationship between inequality and violence. There are additional confounding variables influencing general violence and racial hate crime rates that were not discovered in this analysis. Further examination of influential factors contributing to or diminishing crime rates should be explored.

Pet ownership and depressive symptoms: The role of social support as a moderator

Sara Hobbs – Psychology (PSY)
Faculty Mentor: Maureen Flynn

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 205

Research on the relationship between pet ownership and depression levels shows mixed results. Some studies show that pet ownership is associated with lower depression levels (e.g., Bohn et al., 2021), while others show pet ownership is associated with higher depression levels (e.g., Barker et al., 2020). Therefore, it is important to assess potential moderators involved in this relationship. Antonacopoulos and Pychyl's (2010) examined whether social support moderates the relationship between pet ownership and depressive symptoms and their findings did not support social support as a moderator. The current study sought to replicate and extend Antonacopoulos and Pychyl's (2010) study by separating out three forms of social support (i.e., friends, family, and significant other.) rather than assessing overall social support. Therefore, the current study aims to evaluate whether social support (i.e., family, friends, and significant other) moderates the relationship between pet ownership (i.e., dog and cat) and depression. A sample of 63 undergraduate participants completed a series of questionnaires in an online format. Results showed that scoring low on social support from friends strengthened the negative relationship between having a dog and depression scores. Scores on social support from family and one's significant other did not moderate the relationship between dog ownership and depression. None of the three forms of social support moderated the relationship between cat ownership and depression. This study was unique in separating out the three forms of social support as potential moderators for pet ownership and depression. It also showed that dog ownership may potentially be helpful for individuals with low levels of social support from friends. Future research is needed to determine the differential impact of pet ownership on mental health.

Investigating the Ability of Human Lymphocyte Antigen B27 to Bind SARS-CoV-2 Spike Glycoprotein

Liesl Jensen – Biochemistry (BCHM)
Faculty Mentor: Megan Filbin Wong

Poster Presentation, Session II (11:00 am – 12:00 pm), Poster #13

SARS-CoV-2, the causative agent for COVID-19, initiates an immune response once its viral antigens are presented on host cell surfaces by major histocompatibility complexes (MHCs). One of these MHC molecules presented is HLA-B27. HLA-B27 proteins present foreign peptides, which are recognized by T-cell receptors on the surface of white blood cells, as a mechanism for determining 'foreign' and 'self' within the human body. Yet, to date, it is unclear if HLA-B27 presents SARS-CoV-2 peptides, such as the spike protein. Interestingly, HLA-B27 expression is correlated with an increased risk of severe COVID-19, begging the question: does HLA-B27 present SARS-CoV-2 peptides during the innate immune response? To answer this question, we employed a computational modeling approach in Chimera and HDock to find the potential binding interaction between HLA-B27 (and subtypes) with SARS-CoV-2 spike protein. Using structures of HLA-B27 subtypes bound to Vasoactive Intestinal Peptide Type 1 Receptor (VIPR) protein as the model antigen, we found four differences in subtype binding site amino acids that alter side chain torsion angles. HDock binding models with HLA-B27 and SARS-CoV-2 spike correlate with high RMSD values for each subtype. From this data, we hypothesize that HLA-B27 likely does not bind/present the SARS-CoV-2 spike protein, decreasing the immunological response to SARS-CoV-2 infection.

Parental Outcomes of Working Mothers who Participate in Peloton Exercise

Isabel Kool – Psychology (PSY)
Faculty Mentors: Bethany Fleck and Michael Rhoads

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 205

The purpose of this study is the better understand parenting outcomes among mothers who exercise using Peloton classes. We are exploring variables such as parental stress, parental self-efficacy, maternal guilt and shame, depression/happiness, and quality of life. For our study we are hoping to answer the following questions: 1) What relationships exist between Peloton exercise and parental outcome variables and certain demographic variables? and 2) Does Peloton exercise mediate negative emotions related to being a working mother? To answer these research questions, we asked participants to complete an online survey that included the World Health Organization's Quality of Life Brief Scale, Caring Shame and Guilt Scale, The Short Depression-Happiness Scale, Parental Stress Scale, Parenting Self-Efficacy Scale, demographic questions, and exercise questions. In the following week, we will run several analyses to get our results and analyze the data. Since past research has shown that combining motherhood with working can have negative effects on mental health and exercise can have positive effects on mental

health, this study connects to the field by giving more insight on the topic since it's using metrics that are being recorded using Peloton rather than self-report. Future research could include a more diverse sample and perhaps from different countries to generalize or degeneralize the results of the studies.

Fifth Grade STEM identity at Crawford Elementary

Jeff Lamble – Education (EDU)
Faculty Mentor: Hsiu Ping Liu

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

STEM (science, technology, engineering, and math) identity and making meaningful experiences related to these subjects can influence a students' interest and career path. Although STEM-related jobs and careers continue to grow, there are small proportions of students who choose this academic and career-path. Their decision for this is oftentimes influenced by factors beginning as soon as elementary school. This study aims to assess fifth grade students' interest and confidence regarding STEM identity at Crawford Elementary School in Aurora. Before and after questionnaires and content knowledge analysis will provide a glimpse into the confidence acquired through introductory STEM content and labs over the span of one year.

Safe Spaces in Writing Centers

Cassandra Langton – English (ENG)
Faculty Mentor: Elizabeth Kleinfeld

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 205

Writing can be a very stressful and intimate process for students. Trying to formulate the right words for what you need to say and then having to share them with others for correction is a huge site of anxiety and stress for students. The uncomfortable intimacy of writing comes from students' beliefs that they are bad writers, or they feel self-conscious about sharing their writing with others, especially when they are sharing their writing with someone who they think is better at writing than them. We want students to walk into our writing center and feel at ease by the space, not add more stress to them. While they are in our space to get feedback on their writing, students can be too uncomfortable to retain any of the information they get on their writing while in a physical writing center. We are surveying clients who use the JSSB and KC writing center locations to gauge how they feel about the physical look and feel of the room. This research will be able to help writing center employees know how the physical aspect of the writing center can help students feel comfortable when they are in their sessions. By asking students their thoughts on the "cozy" spaces within the physical writing center space, employees can tailor those spaces to best fit the needs of the student population. Grutsch-McKinney argues against making a writing center "homey" and this research will help aide in knowing whether students want a homey or cozy space or whether they want a space that just allows them to be comfortable.

Sound Healing: The Utilization of Vibrations and Frequencies for Wellbeing

Violet LaRue – Music (MUS)
Faculty Mentor: Elizabeth Macy

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

Sound healing is an ancient practice that originated in Tibetan and Himalayan cultures involving the use of frequencies and vibrations to promote overall physical, mental and spiritual well-being of an individual. Proponents of sound healing state that "'sound therapy' stimulates the capacity of the human body to heal itself" (Masala & Merolle 2017). This creative project sought to compose music using sound healing techniques to ease tension and aid in relaxation. Using a purposeful and evidence-based combination of healing music elements revolving around specific frequencies and vibrations for specific intention (in this case easing anxiety), such as a crystal bowl, humming vocals, and purposeful intervals and rhythm, this composition will offer a moment of meditation to lower the heart and breath rate of the listener, encourage the production of delta and theta waves in the brain, and bring them to a more peaceful, grounded state. This review contains a brief discussion of the history and origins of sound healing. I will talk about the current research and evidence behind this ancient art. Mentioned are a variety of sound healing's practical application and benefits, and why this field is important and relevant as a legitimate treatment option. I review neurological and physiological effects of sound healing: essentially "how it works." And finally, I will tell you about this project I have been working on, the sound healing techniques I have implemented, and why I used them, followed by a performance of the composition.

Significance of the Translation Initiation Machinery Recruiting Structures in the Blackcurrant Reversion Virus RNA 1

Julie Youngin Lee – Biology (BIO)
Faculty Mentor: Megan Filbin

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

Black currant reversion virus (BRV) is the first identified mite transmitted Nepovirus that infects black currant plants and causes black currant reversion disease (BRD). Unlike most eukaryotic translation which is initiated by the 5'-m7GpppN cap (5'cap), Blackcurrant Reversion virus (BRV), which lacks a 5' cap, initiates translation using a structured RNA in its 3' untranslated region (UTR) called a cap-independent translation enhancer (CITE). CITE RNA structures bind translation initiation machinery and deliver the machinery to the 5' UTR, typically via an RNA kissing-loop interaction between the UTRs. Our research focuses on the specific RNA structures called translation initiation machinery recruiting structures (TIMRS) in the BRV RNA 1 3' CITE and 5' UTR. We are identifying which structures are important for recruiting translation machinery and/or forming the kissing interaction. We are analyzing the structure-function relationship using site-directed mutagenesis (to alter RNA structure) and translation reporter assays (to measure function). Thus far, we have

found altering the TIMRS in the 3' CITE structure does show a difference in protein production compared to the wild type, which indicates the structures' significance and their contribution in translation efficiency. This study can aid in understanding not only plant viruses but other animal or human RNA viruses that utilize 3' or 5' structures to regulate cap-independent translation.

Gene expression of ndnf and macc1 in zebrafish embryos

Jessica Lee – Biology (BIO)
Faculty Mentor: Vida Melvin

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

Craniofacial development refers to the development of the head and face, which are prone to disruption leading to abnormalities apparent at human birth. Genes that are important in human craniofacial development are conserved in other vertebrates, including zebrafish. Zebrafish are a great model to study development because the embryos are transparent and have a relatively short embryonic period which allows researchers to observe different developmental stages in detail. Previous work from the Melvin lab identified zebrafish genes that have a role in craniofacial development, including two previously uncharacterized genes, neuron derived neurotrophic factor (ndnf) and metastasis-associated in colon cancer protein 1 (macc1). Loss of function in these genes led to reduction in cartilages of the zebrafish embryonic head and expression of both genes was detected in the craniofacial tissues of zebrafish embryos at two timepoints important for craniofacial development, 24- and 48-hours post fertilization. To better understand the role of ndnf and macc1 in the steps of craniofacial development, we propose to look at expression of these genes at additional timepoints that are critical for craniofacial development, including before 24 hours and after 48 hours postfertilization. We will use in situ hybridization (ISH) to obtain gene expression patterns of ndnf and macc1 in zebrafish embryonic head. ISH uses an RNA probe to detect complementary sequence in expressed mRNAs. The probe will be labeled with a digoxigenin tag, which can be detected by anti-digoxigenin antibodies leading to a colorimetric change where the genes are expressed. We hope to make predictions about the specific function of macc1 and ndnf based on their expression patterns.

Lack of Diversity in the Healthcare Workforce

Renada Linnear – Health Care Management (HCM)
Co-authors: Amina Hassan, Mulugeta Omata
Faculty Mentor: Garvita Thareja

Poster Presentation, Session I (9:45 – 10:45 am), Poster #2

Introduction: The purpose of this study is to examine a lack of diversity in the healthcare workforce.

Literature Review: Lack of diversity in health care can cause extreme moral and social justice problems for our society. It can hamper efforts to improve the country's health system and costs. It is imperative to have diverse health care professionals to support the growing number of diverse patients. This study focused on the factors that influence diversity in health care and reviewed existing data.

Methods: This study looked at the last five years' racial and ethnic data in health professions. Further, we investigated cultural competence of a racial and ethnic representation of the healthcare workforce. Data were gathered in various ways, including online publications, journals, and news items. Journal articles examined the consequences of a lack of diversity in the healthcare industry. Results: We found that health care workers, in general, are becoming more diverse in healthcare support occupations. However, the percentage proportion of whites and minorities in health care differs significantly in healthcare occupations. The percentage of individuals who identify as belonging to racial/ethnic minority groups in medical facilities has continued to remain below 50%, especially in healthcare practitioners and technical occupations for the last five years. During these years, the average percentage of whites was 75%, and the percentage of minorities was about 30%. When the professional level increases in health care, the percentage change of white people is more than twice that of a minority group. In 2020 and 2019, the average percentage of Doctor of Osteopathic Medicines (DOs) was about 33%, which is less than double the percentage of whites (67%). To provide high-quality and accessible care to patients and the public, it is crucial that we advocate for diverse health care and provide opportunities for students to learn about each other to improve patient outcomes.

Future direction and conclusion: In order to develop responsive policymaking and cross-cultural relationships, it is important to encourage minorities to enter health professions programs. Health professional education programs should use this information to increase student diversity through racial and ethnic diversity and to offer culturally responsive education. In addition, they should provide training for existing healthcare workers.

Pattern of Homicides in Denver Before and During the Pandemic

David Lopez – Criminal Justice & Criminology (CJC)
Faculty Mentor: Namgung Hyon

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 207

Homicide is a crime that every city in the United States has experienced with tragic consequences and there has been a concern about recent increases of homicides in major cities around the country during the COVID-19 pandemic feeling like a second Great Depression that hit our country again. This research investigates the spatial and temporal distribution of homicides in Denver using crime data from Open Data Catalog for the past five years. This specific context will be analyzed using crime maps on ArcGIS Online and this study will examine if there has been a change

of spatial pattern of homicides before and during the pandemic. Connecting the patterns of homicide during pandemic connected with mental illness and stress that most people in Denver experienced during the quarantine not being able to go out or release stress.

Taxonomic Classification of Coleoptera

Leah MacAlpine-Switzer – Biology (BIO)
Faculty Mentor: Robert Hancock

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

The 56-year old entomology collection at Metropolitan State University of Denver boasts over 10,000 specimens used for scientific and educational purposes. The collection was started in 1966 by Professor of Biology Dr. George C. Becker, and, since 2008 has been continued by Professor of Biology Dr. Robert G. Hancock and affiliate biology faculty member Dr. Michael Weissmann. I am currently involved in the curation of the order Coleoptera (beetles). My specific activities include the phylogenetic organization, sorting and intensive identification to genus or species level within the families Tenebrionidae (Darkling Beetles), Scarabidae (Scarab Beetles) and Carabidae (Ground Beetles). At the genus level intensive identification and organization is being performed on such genera as Calosoma (Caterpillar Hunters), Tribolium (Flour Beetles) and Bothrotes (Darkling Beetles) and many others. At the species level I am researching methodology for identification and organization of various species such as Tribolium confusum (Confused Flour beetles) and Embaphion muricatum (Scalloped False Wireworm beetles). I report here the overview of the vast collection, as well as my current activities. Extensive research is underway to ensure easier identification down to genus and species level in future endeavors regarding the important collection of insects at Metropolitan State University of Denver.

Novel Awareness in Providing Society with Personal Information Protection

William Maddock – Computer Science (CS)
Faculty Mentor: Katy Schmidt

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 207

The idea of why society morally, should do more to protect personal information overall would be fair and equal, therefore distributive justice. Identity theft and fraud have exponentially caused societal financial burdens on many individuals within them. Is there a way to provide everyone in society with Identity Theft Protection and Monitoring (ITPM)? Were you aware that it is in fact, financially possible to do so in the United States? This work raises awareness on how society can and should provide everyone with ITPM. Doing nothing only causes extreme financial burdens in a society of those who cannot afford ITPM or who were not aware of it.

Creative Sound

Dominic Martinez – Music (MUS)
Faculty Mentor: Elizabeth Macy

Poster Presentation, Session IV (3:30 – 4:30 pm), Poster #9

The goal of Creative Sound is to present an online website that allows musicians, specifically artists and producers, to have a central hub where they can have access to various sound kits that I created myself. Within this website I've analyzed instruments ranging from piano's, synthesizers, strings, violins, guitars, drums, and many more to find ways of incorporating each element into its very own pack of sounds created by me. The focus for these first sound kits is known as "loop kits," which are taking each instrument, running them through a DAW (Digital Audio Workstation), and creating a melodic loop to give musicians inspiration for their own music. As a producer who is actively working in the music industry, us musicians are always looking for new sounds to keep us inspired and spark creativity. With Creative Sounds, this platform allows people from all over the world to work directly with me by incorporating the tools I provide.

Pattern of Mass Shootings in the U.S. from 2012 to 2022

Eliana Massman – Linguistics (LIN)
Faculty Mentor: Hyon Namgung

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 207

The goal of this research is to determine if the number of mass shootings has increased over the past 10 years and during what months mass shootings are more likely to occur. It is hypothesized that mass shootings are more common in summer relative to other seasons. To test this theory, I use mass shootings data collected by the Mother Jones magazine and investigate spatial and temporal distribution of mass shootings on ArcGIS Online. The results have shown that while there was an increase in mass shootings in 2016 through 2018, the overall numbers have remained consistent.

Spatial and temporal distribution of robberies in Denver

Abril Mendoza Altamirano – Criminal Justice & Criminology (CJC)
Faculty Mentor: Hyon Namgung

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

The goal of this research will examine the robbery rates in Denver for the past five years by describing spatial and temporal distribution of robbery in the city. This research will show if there have been any significant changes in this type of crime during the pandemic, especially relative to pre-pandemic period. To answer the question, I will use the crime data from Denver Open Data Catalog and import

data on ArcGIS Online for spatial analysis. This research will contribute to recent discussions on the increase of crime during COVID-19. The main reason behind why I have chosen to pick this area is because as a student who is around this area a lot, I see there is a lot of work still to be done to decrease the crime rate in this location.

A survey of larval Chemoattractants in the Yellow Fever Mosquito Aedes aegypti (Diptera: Culicidae)

Connor Menzies – Biology (BIO)
Faculty Mentor: Robert Hancock

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

Mosquitoes are important vectors for many diseases and as such controlling their population size is vital in mitigating the spread of these diseases. Many population control techniques involve trapping larval mosquitoes before they become adults. Mosquito larvae use a variety of senses to orient themselves in their environment including photoreception, mechanoreception, and chemoreception. Chemoreception is the main modality used by these mosquito larvae to orient themselves toward food or away from harmful water conditions. With chemoreception being such an important sense, I used an infrared video bioassay to study orientation responses by larval Yellow Fever Mosquitoes (Aedes aegypti) to a variety of compounds. Many of these compounds had a common chemical theme in being 6-membered aromatic rings. In this experiment, one control (dechlorinated water) and four experimental compounds with 6-membered aromatic rings were tested: m-Cresol, L-Phenylalanine, L-Tryptophan, and L-Tyrosine. All experimental compounds were tested using a concentration of 10mg/ml. Video data of mosquito orientation movements was collected in total darkness using an infrared camera to prevent innate negative phototaxis responses. Experimental subjects were introduced to the bioassay arena and given a 15 minute acclimation period before introduction of possible chemoattractants. Subjects were then recorded for 2 minutes. Data points were taken every 5 seconds by measuring the distance from where the test chemical was introduced to the position of the larva. On-going investigations under the current test concentration of 10mg/ml indicate chemoattractiveness of phenylalanine and possible chemorepellency of Tryptophan. Overall and here was a significant difference in the attractiveness between the different compounds and control with Kruskal-Wallis H test mean rank scores of 60.94 for Control, 56.33 for m-Cresol, 101.29 for Phenylalanine, 15.38 for Tryptophan, 68.56 for Tyrosine. ($H=75.07$, $p<0.001$). Dose response tests using serial dilutions are currently underway.

Heat Shock protein (HSP70) expression in the sea star Asterina coronata (Valvatida, Asterinidae) as a measure of stress by pesticidal copper sulfate

Traci Metzner – Biology (BIO)
Co-author: Anthony Diccicco
Faculty Mentor: Robert Hancock

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

Asterina coronata is an understudied invasive species of minute sea stars in commercial and hobbyist aquaria with a rapid reproduction rate. Because it is known as a pest, it is often treated with little regard and is usually the subject of various chemical or mechanical extermination methods. However, the physiological stress response to these extermination methods results in an increase in coelomocytes (cells of echinoderm immune system) and heat shock proteins (HSP). Live samples of As. coronata will be exposed to a range of concentrations of Cupramine (copper sulfate), a commonly used toxin for pest control in marine aquaria as exposure to copper has been known to result in HSP70 expression. After Cupramine exposure, HSP70 will be verified and quantified by performing the western blot procedure: collecting coelomic fluid, preparing protein samples, polyacrylamide electrophoresis (PAGE), primary and secondary antibody binding, and photometric detection. We expect to find that within 24 hours, that Cupramine-exposed As. coronata will exhibit HSP70 proteins in a dose-dependent response.

How Do We Gain Immunity?

Mia Miller – Biology (BIO)
Faculty Mentors: Megan Filbin and Anil Rao

Poster Presentation, Session II (11:00 am – 12:00 pm), Poster #14

The Covid-19 pandemic has created a public interest in virology, immunology, and vaccination. These topics have become common in everyday conversation. This newfound interest has created an opportunity for education. Yet, conflicting and misleading information, often with little-to-no scientific backing, has become commonplace. From the scientific end, much of the available content is either too vague or too technical. Much of it is not accessible to audiences outside of the academic community. The purpose of this project is to create content that would help bridge that gap. The project started under the guidance of the Art of Science Fellowship. The motivation is to explore an interdisciplinary approach to communicate biological topics. The hope is to reach audiences outside of the scientific community. Hence, the consultation of both the academic and lay communities was crucial. I asked people from around the United States to voice their biggest Covid-19 concerns. Search engine analytics tools (such as Google Trends) were used to find popular questions. This helped to condense the range of topics to what the public was curious about. I then brought these questions to academic professionals. They helped me to find resources to further research those topics. From there, different art styles were explored. I decided to use techniques that

already exist in comic book art and educational media. Accessible color palettes and fonts were chosen for easy viewing. The goal of this project is to make a fun artwork that invokes visual interest. I also want to make something easy to share across many platforms. The idea is to create engaging media adapted for teaching in the digital age.

The Diagenesis of the Green Cryptocrystalline Quartz Found in the Grande Ronde Basalt in Oregon

Kira Mitchell – Applied Geology
Co-author: Nick House
Faculty Mentor: Uwe Kackstaetter

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

A cryptocrystalline quartz of green variety has been found in the Grande Ronde Basalt Formation of the Colombia River Basalt Group located in the north-western coastal mountains in Oregon. The sample has been submitted by a client for mineral identification and the diagenesis of the mineral is in question. The host rock of the mineral is a mesocratic tholeiitic basaltic andesite meaning that the concentration of silica and iron are high, and aluminum is low within the mixed felsic and mafic sample. This begs the question, under what conditions did a felsic crystal grow within an intermediate host rock and why is it green? Experiments such as XRF, XRD, and ICP-ms, which are various methods of measuring elemental concentrations, as well as specific gravity, and petrographic thin sectioning are conducted on the mineral and matrix. This gives insight into the formation process and relationship between the host rock and mineral sample. Initial tests on the mineral sample reveal a lack of elemental concentrations associated with green cryptocrystalline quartz varieties found in volcanic host rock. Research available on polymorphs of cryptocrystalline quartz such as chalcedony, cristobalite, and agate also gives indication of the formation processes typically associated with these samples. This contributes a new understanding of green cryptocrystalline quartz varieties in igneous systems lacking the often-associated concentrations of nickel and copper.

Contrasting the Benefits of Chamomile and Tea Tree Essential Oils In Combating Common Viruses

Delanie Mog – Integrative Health Care (IHC)
Co-authors: Ines Calvete Barrios, Tameran Bethel, Lillian Sosa
Faculty Mentor: Garvita Thareja

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

Intro/Purpose: With the most recent viral threat to humanity, COVID-19, the need for alternative methods to prevent or treat viruses is becoming increasingly important as drug resistant viruses are more commonplace, and vaccines are less equipped to fight against new strains. The aim of this study was to synthesize the existing literature results and report which essential oil shows the most antiviral activity, chamomile or tea tree essential oil.

Methods: A systematic review of ten different existing sources was examined to determine the benefits of chamomile and tea tree essential oils and how they can be measured. There was a search criteria and key words were utilized. The databases used to complete the research articles were PubMed, The National Library of Medicine(NLM), is part of the National Institutes of Health (NIH), Cochrane Review, and National Center for Complementary and Integrative Health databases.

Results: Essential oils were shown to have inhibitory influences on several different viruses. The antiviral activity of tea tree essential oil in preventing influenza is promising and shows enormous potential for the use of tea tree essential oils for preventing influenza, supporting the need for continued research, and utilizing different applications. Chamomile oils showed small benefits when it came to combating viral activity in contrast to tea tree essential oil.

Future directions and conclusions: The lack of studies investigating the antiviral activity of chamomile in the prevention of the influenza virus, and the contrasting results reported from the other study demonstrates the need for additional research.

Groups, Representations, and Characters

Brian Moore – Mathematics (MTH)
Faculty Mentor: Mandi Schaeffer Fry

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 207

A group is one of the most fundamental objects in the field of abstract algebra. Simply put, a group consists of a set of elements, such as some numbers, as well as a rule for combining two elements. Additionally, the set and the operation must obey some laws, such as associativity. One of the reasons why we study groups is that they are particularly useful for modelling objects which have symmetry. Linear algebra, the study of vector spaces and linear maps, is another particularly useful area of math, known for its extensive use of matrices. Representation theory combines the two areas and gives us a way of "representing" the somewhat abstract group elements as more tangible matrices, thereby allowing us to use the full power of linear algebra to study the group. It turns out that a lot of the information pertaining to the group is encoded in the matrix representations—the trace of a matrix representation is known as a character, and one of the biggest questions in this area is: what information about the group can we ascertain by looking at its characters? In my work I look at a specific group, the finite symplectic group Sp(4, q), and try to prove an open conjecture which revolves around that question. This work is funded by a grant from the National Science Foundation: Award DMS-2100912.

Photophysical studies of 2-PheCN/Trp within an intrinsically disordered peptide

Ange-Emanuel Morignot – B
Co-authors: Roman J. Martinez, Austin J. Haider, Andrew Melendrez Zerwekh
Faculty Mentor: Joshua P. Martin

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

We report photophysical studies of the 2-cyanophenylalanine-tryptophan Förster Resonance Energy Transfer (FRET) pair within an intrinsically disordered peptide to demonstrate its potential in protein structure analysis. Previous studies of 2-cyanophenylalanine (2-PheCN) have reported that the addition of a nitrile group to the ring in phenylalanine does not result in structural perturbations of peptides and increases the chromophores spectroscopic selectivity by a factor of four, making it a viable candidate for FRET experiments. Integration of the resulting donor (2-PheCN) peak and acceptor (tryptophan; Trp) peak within the peptide emission spectrum allows for quantitative determination of the distance between the two fluorophores. Two olfactory peptides (OFP), Long and Short, were designed to provide a model system of an intrinsically disordered region of the olfactory marker protein. Tryptophan occupies the N-terminus position in both OFP variants; however, in OFP Long, 2-PheCN occupies the C-terminus (10 residues from Trp), while in OFP Short 2-PheCN is two residues away from Trp. The emission of the FRET pair in OFP was compared in 3 solvents: water, 20% 2,2,2-trifluoroethanol (TFE), and 7 M urea. TFE was used to promote the formation of secondary structures in the peptides, thus bringing the pair closer together, and the FRET efficiency was observed to be greater than in water, as expected. Alternatively, urea was used to denature the peptides, with the expectation that the fluorophores would separate as much as the peptide structure would allow and FRET efficiency would decrease. However, FRET efficiency in 7 M urea was measured to be greater than expected, a result that is thought to be due to the disordered nature of OFP. Further experimentation of both OFP Long and OFP Short in various solvents will elucidate the cause of the increased FRET efficiency and the structure of the disordered peptides.

Impacts of Covid-19 on the Perceived Stress of College Students

Shannon L Myers – Psychology (PSY)
Co-authors: Lexie A. Allen, Sandra M. Larson, Peyton M. Steiner, David S. Rynhart, Sara C. Hobbs, Madison E. Barber, Jenny Valadez Fraire, Tianna S. Neuharth, Alden Gruidel, Logan R. Green, Morgan A. Slaski, Cassie M. Gibbs
Faculty Mentor: Cynthia Erickson

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

The goal of this study is to compare perceived stress from college students before the COVID-19 pandemic started, during the pandemic, and now at the start of a post-pandemic world. Perceived stress is the extent to which a person's perception of demands exceeds their ability to cope. The consequences of perceived stress can have a variety of adverse effects in many areas of a person's life, for example,

depression, anxiety, and overwhelm are just a few of the symptoms correlated to perceived stress. The current study aims to assess levels of perceived stress in college students before, during, and after the COVID-19 pandemic. Introductory psychology students took a series of surveys in 2020, 2021, and 2022 and rated their perceived stress by taking The Perceived Stress Questionnaire, (PSQ) (Levenstein et al., 1993). Only participants who passed the attention checks were included in the final analysis. While the general perception is that individuals are more stressed due to the COVID-19 pandemic, no difference was found in perceived stress for any of the time points collected between 2020 and 2022. This data provides a better understanding of stress experienced by college students and how their stress levels have been impacted over the past several years. This study is important because it provides insight into how college students and their stress levels have been or not been impacted by both the COVID-19 pandemic and the slow return to an endemic world.

Spatial and Ontogenetic variation in crayfish diets revealed by stable isotope analysis

Sophiane Nacer – Individualized Degree Plan (IDP)
Faculty Mentor: Jason Kolts

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

Virile crayfish, (Faxonius virilis), are common inhabitants of streams and ponds in Colorado. They are omnivorous and consume a wide variety of plants and animals. A number of studies have analyzed the diets of various crayfish species, although the results have been inconsistent in terms of which life stages of crayfish are more carnivorous. In this project, we are examining the diets of crayfish from three metro-area streams that vary substantially in avai-lable prey to observe how carnivory among crayfish size classes correlates with prey availability. We analyzed tissues from a variety of different-sized crayfish and prey from each site for the stable isotope of nitrogen ($\delta^{15}N$), as incorporation of ^{15}N in animal tissues correlates positively with trophic level. We are comparing the $\delta^{15}N$ of different-sized crayfish and prey within each site as well as among our three study sites. We hypothesized that $\delta^{15}N$ would be higher among size classes of crayfish collected where appropriately-sized prey were more abundant.

Common Mineral and Sand Sample Field Grain Mount Catalog, Practical Methods, and Optical Analysis with an Adapted Consumer Polarized Light Microscope

Wody New-Gallo – Applied Geology
Co-author: Maxwell Buffy
Faculty Mentor: Uwe Kackstaetter

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

A grain mount is a method of analysis in which particle grains from an organic or non-organic substance are observed under a polarizing light microscope and incorporates an optical medium such as immersion oils or epoxies to observe the optical properties and components of minerals, rocks, or sands. There is no information pertaining to the specifics of temporary grain mount development in the field; or any catalog in reference of observing grain mounts for common minerals and sand types. Grain mounts are only produced in a lab setting. Earthscience Education LLC in conjunction with Tensegrity Labs LLC is currently developing an adapted consumer polarized light microscope, which serves this project in the sense that the portable microscope will provide optical analysis of common minerals in a field setting. Creating a catalog for the optimal parameters in constructing temporary grain mounts of common mineral and sand samples for future geologic reference is the focus of this study and benefits optical mineralogy field studies. The mineral specimens are crushed and sieved through varying sizes and are placed on a glass slide. The grains are immersed in refractive index oil and analyzed with an adapted consumer polarized light microscope. The optimal grain size, refractive index oil, microscope settings, and optical properties are recorded and photographed to be included for each mineral type and sand sample. An experiment in the field is conducted to describe materials needed for field production of temporary grain mounts. The final catalog of common mineral and sand sample grain mount procedures will give geologists the most practical methods of developing a grain mount with this revolutionized analysis for use in the field.

Is there an association between having background knowledge of Vitamin D and reducing Deficiency?

Ha Ngo – Health Care Management (HCM)
Co-authors: Brooke Carter, Molly Hundt, Christine Barela
Faculty Mentor: Garvita Thareja

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

Introduction: Conducting a study on vitamin D allowed us to gain knowledge in our community. This project enabled us to participate and document all aspects of our process. We studied vitamin D in a survey method and interpreted and analyzed that data.

Method: The method we utilized in a cross-sectional survey was the data from an existing survey. This survey is specific to our research because it is a survey called "Survey on Knowledge and Attitudes on Vitamin D and sunlight exposure". We are studying the same data in our population concerning vitamin D. The questions in the survey consist of attitude and behavior toward sunlight exposure and knowledge and awareness of vitamin D.

The survey was sent to friends and family via email and group chats. We observed the results of people about their attitude and behaviors toward sunlight exposure, knowledge, and awareness of vitamin D. The measurements we used were the data collected from our questions.

Results: We observed the results from a cross-sectional survey that looks at factors associated with general knowledge and attitudes on vitamin D and sunlight exposure. The findings can be interpreted within the context of the study's strengths and limitations. The participants who had less knowledge on vit D were likely to have deficiency. Our study was conducted in the US population, whose lifestyle and cultural background may differ from other populations. As our case study example, the present findings may not be consistent with those in other parts of the world.

Conclusion/Recommendation: We concluded that our findings are similar or highly consistent with the conclusions in the sample study. Currently, we have more responses from females than males. Also, we have the most participation from people from 31-40 years of age. Nonetheless, this study allowed a deeper look into the public's overall knowledge and attitude towards vitamin D. We recommend using sunscreen and protection from UV rays in any sunlight and receiving a proper amount of vitamin D in one's diet. We will work together as a group to target more people of various demographics. We concluded that there is a link between people with background knowledge and an increased chance of reducing deficiency.

Retaining Volunteers

Nick Nowlen – Hospitality, Tourism & Events (HTE)
Faculty Mentor: Eric Olson

Poster Presentation, Session I (9:45 – 10:45 am), Poster #11

Volunteering is a voluntary act of an individual or group freely giving time and labor for community service. It consists of people giving their generosity to help contribute to an organization to help better society. Volunteers are crucial for organizations as their national value is an average of $28.54 an hour according to an Independent Sector Study. However a major issue companies have is keeping volunteers, the national average volunteer retention rate is 65%. That means nearly 1 out of 3 volunteers will quit within the first year according to GalaxyDigit.com. To solve this issue companies must find a way to keep their volunteers dedicated and invested long term in contributing to keep volunteering. It's about figuring out who the volunteer is, understanding what projects they do, and understanding what their skills are. It's knowing what they care more about whether it be social justice, hospitality, outdoor activities, this helps create a personalized volunteer experience. A quick study that will help us gather information is figuring out how volunteer management promotes and trains their volunteers. To conduct this study, research will be done at multiple different volunteer programs collecting data on how they operate, how many volunteers the program gets per hour, per day, per week, per month, per year. Once data is collected then interviews will take place with those volunteers and with the volunteer management, the volunteer manager will mainly be the ones being interviewed. Questions regarding the volunteer managers will consist of what the manager does to build personal relationships with the volunteers, how do they train their volunteers to develop their hard skills/soft skills, and do they promote or give their volunteers more responsibility the longer they stay. Questions for the volunteers will be to confirm what the manager says is true and if they enjoy volunteering for a certain company.

The anticipation is that Volunteer managers who really promote growth to their volunteers will have a higher retention rate of volunteers. It's a study to see how contributable and important volunteer managers are for an organization to retain volunteers.

Structural Investigation of a Putative Intrinsically Disordered Region Within Deleted in Colorectal Carcinoma That Regulates Protein Synthesis

Nate Nowling – Biology (BIO)
Co-author: John Manalastas

Faculty Mentor: Megan Filbin

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

Deleted in Colorectal Carcinoma, DCC, binds the eukaryotic ribosome and blocks translation possibly in a similar function to other Intrinsically Disordered Proteins (IDPs). In the presence of its ligand, Netrin-1, the cytosolic P3-motif, homo-dimerizes; releasing its bound cellular machinery to promote localized translation near the plasma membrane within the axonal growth cone of nerve cells (Figure 1). This cascade allows for the proper axonal development and commissure formation seen within the Corpus Callosum and the four other major commissure sites. The idea of proteomic regulated and localized translation is relatively novel within the field of molecular biology. Our research focuses on investigating the structure or the propensity to form structure within DCC's translational inhibitory region. Using this information to elucidate how this regulation is accomplished through molecular control. DCC and other IDPs show that a protein can block and manipulate translation based upon that protein's surroundings, either controlled by the cell or the local environment surrounding a polarized cell.

The Creative Process of Writing and Releasing an EP

Samantha Nuanes – Music (MUS)
Faculty Mentor: Elizabeth Macy

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

For this creative research project, I decided to write and release an EP. For me, writing songs helps me cope with the things that I go through or have gone through on a daily basis. That was the premise for this EP. Hills and Valleys consists of 4 songs which all describe what I was going through last semester and during the peak of the 2020 quarantine. These original compositions, "roads", "6", "four walls" and "she's fine" detail my mental state and what I was going through during this time. In addition to composing and writing these songs, I also recorded them on my own. I also worked closely with Arias Goldanloo who was my audio engineer for this project. After recording my songs, he was the person who took my creations and made them have the professional audio quality that I was going for. This project took me on a wild creative journey. While I had written many songs before, going through the

entire process of writing, recording, and working with a producer, was very different from what I had previously been experienced. This project exceeded my expectations and I'm very happy and proud of the outcome. In this presentation, I will explain my creative process and all the steps I took to complete this EP including using a distributor website to upload my EP to all major music streaming platforms. From the songwriting process to recording each instrumental part, this presentation will go over it all and will include the final product.

Corporate Social Responsibility and the right to good shelter (Habitat for Humanity partnership with whirlpool)

Chidiebere Ogbonna – Construction Project Management (CPM)
Faculty Mentor: Eric Olson

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

Habitat for Humanity was founded in 1976 by Millard and Linda Fuller with the objective of addressing issues of poor housing conditions. The idea that became Habitat grew from Koinonia Farm in the outskirt of Georgia into one of the most successful non-profit organizations in the world. The mission of the organization is to work in partnership with families and communities to provide strength, stability, and self-reliance through shelter has helped more than 29 million people build or improve the place they call home. They have equally made it possible to train people with the requisite skills on how to improve their various homes through training and advocacy. They are in 70 countries around the world which remain a landmark achievement within the shortest possible time. Notable organizations like Whirlpool have come forward based on their corporate social responsibility (CSR) policy to partner with Habitat for humanity. They have consistently supplied their high-quality products in keeping with the mission of Habitat as their signature partner. The organization believes in giving back to the community through its products or staff volunteering with various skills at Habitat Construction sites nationwide. This study is aimed at encouraging other corporate bodies to be involved in the fight to reduce homelessness while providing homes to those in most need. Again, it is important to highlight what various organizations are doing within their host communities in order to encourage those who are still on the fence, to get along.

Relativistic Emission Spectra of Accreting Black Holes

Natalie Oikawa – Physics (PHY)
Faculty Mentor: James Dove

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 207

This research is focused on the special- and general-relativistic effects on emission spectra from an accreting black hole—the most significant factors affecting the intensity distribution of radiation we receive. These result from the speed of accretion disk matter relative to our line of sight and space-time warpage in the vicinity of the black hole, respectively. Emission line profiles from this study show

how the wavelength of light emitted has been distorted upon reception due to disk orientation and radial placement of the disk matter around the black hole. The degeneracy of line profiles is currently being studied as well. The spectral analysis of disk material is one of the few known methods used for determining the properties of a black hole. The results of this research will help to understand the data from real production scenarios.

Auto-Theft in Denver

Nancy Ontiveros – Criminal Justice & Criminology (CJC)
Faculty Mentor: Hyon Namgung

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

Crimes in Denver have been studied using maps to try to figure out where more police presence may be needed or if a different approach is needed to help lower activity. With how new models of cars come out every year and how expensive cars can be, it can be considered an easy way to get money if you know what car to look for and what areas to take them from. To better help communities and car owners, mapping what neighborhoods and cars are being taken, a report can be made to see what can be done to help prevent theft or give advice in changes for patrol or warnings. As well as by mapping multiple locations, one can see if there is any correlation between where it was stolen and where it was left and found. If there is then further information can be acquired if it is for certain parts, certain cars, or groups working together. By looking at the past 5 years we can see if there has been a decrease in auto theft and if so where. If not check where the increases of theft occur and check what can be done to lower auto thefts. New models of cars are becoming more technology-driven and installed with some helpful programming to help prevent thefts. Older cars may be more valuable and if a good model is found then by focusing on the type of car it is and including that in the mapping information then further study can be made to prevent theft.

ADHD and Behavior Change

Autumn Ortega – Health Professions
Faculty Mentor: Garvita Thareja

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

Behavior Change on Room Tidiness: This behavior change is a part of the intellectual dimension of health. I have been wanting to change this behavior for six years. This will help me accomplish a feeling of self-efficacy and lower my stress. As a part of "Stages of Change" by the Transtheoretical model, I have gone back to the preparation stage because I need to re evaluate my plan.

Methods: My selected behavior change was followed for four weeks. Every day, a log was filled out for four weeks to track my behavior. I utilized rewarding myself, routine setting, and smart goals as strategies towards the selected behavior. These strategies were planned out for the behavior change after four weeks.

Results: Behavior change was unsuccessful after four weeks. I struggle with ADHD so symptoms like lack of object permanence and getting easily distracted made it hard to change my behavior. My work schedule has been hectic, and it's been hard to remember that I'm creating a new behavior. Lastly, I have been a messy person all my life because of how easily I am distracted. I think more than four weeks is needed to change this behavior. These factors delayed and acted as barriers. The motivator that helped in some of the behavior changes had a clean space to do work. I think I am in the pre-preparation stage of behavior change as I need to change my plan.

Future: I plan to find new strategies that cater to people with ADHD. I think the approach I have been taking would work for a person without it, but I need more hand-holding to accomplish this goal. More research is needed from me to accomplish this goal.

The Role of Stage Managers in Theatrical Intimacy and Suggested Best Practices for Intimacy in Rehearsal

Caden Pazo – Theatre (THE)
Faculty Mentor: Jeffrey Parker and Carrie Colton

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

Staging physical touch in theatrical productions has a long and complicated history. In 2017, producer Harvey Weinstein was accused of sexual misconduct by dozens of women; this sparked what is known as the Me Too movement. This movement called for greater accountability in all areas of life for sexual misconduct, especially in the performing arts sector. These events led to the creation of Theatrical Intimacy Education (TIE), an organization that specializes in teaching different practices for theatrical intimacy to actors, directors, and choreographers to ensure that a person's body feels safe and respected while performing on stage.

My research further expands TIE's work to help stage managers notate intimacy blocking in the prompt book. It is often the role of stage managers to notate blocking in a way that is easy to read and is repeatable. This holds actors accountable for their blocking and it is the stage manager's job to enforce this. It is imperative to execute the choreography accurately for the safety of the actors and to maintain the integrity of the storytelling. Currently, there is no notation system for intimacy choreography in existence.

Through my observations in rehearsals of an intimacy choreographer, collaboration with other stage managers about their systems for blocking, and specialized training in intimacy best practices, I will assemble a notation system to capture intimacy choreography and provide examples of this notation system in use. This system can be used and adapted by stage managers globally to make theatre spaces safer for everyone involved.

Electrochemical DNA Biosensors to Detect Nontuberculous Mycobacterial Glycopeptidolipids

Dylan Poch – Chemistry (CHE)
Faculty Mentor: Andrew Bonham

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

There have been approximately 200 species of nontuberculous mycobacteria (NTM) that have been discovered; many of these species have been classified as pathogenic to humans. While the rate of NTM lung disease (NTM-LD) has been increasing, infections are frequently misdiagnosed leading to improper medical interventions. A major challenge is that the current "gold standard" for NTM diagnosis involves a weeks-to-month long microbiological culture based method. To provide a more efficient diagnostic method, we have developed a novel electrochemical DNA (E-DNA) biosensor to detect NTM. The E-DNA biosensor targets a mycobacterial glycopeptidolipid (GPL) found on the exterior cell wall of NTM, which demonstrates high exclusivity for NTM. To create the E-DNA biosensor, we generated a single-stranded DNA aptamer that selectively binds to GPL in the low nanomolar range (KDapp = 0.73 nM). This sequence was then further engineered to ensure a two-state folding mechanism. The aptamer was synthesized with a 5' thiol linkage to facilitate attachment to a gold electrode along with an internal redox reporter (methylene blue). Currently, square wave voltammetric analysis is being used to quantify the electrochemical signal catalyzed by the conformational change of the aptamer upon binding to GPL. In future studies, this E-DNA biosensor will be verified against NTM-positive patient samples. Ultimately, this approach should provide a rapid, point-of-care diagnostic method that eliminates the current lengthy culturing requirements. The goal is to provide a point-of-care diagnostic alternative that rapidly detects NTM to streamline proper therapeutic interventions of patients infected with NTM.

Nutrient Concentration Impacts on High Alpine Soil Carbon Storage and Carbon Dioxide Emissions

Mike Prado – Environmental Science (ENV)
Co-authors: Charis Glatthar, Sean Leivo
Faculty Mentor: Sarah Schliemann

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

High alpine soils have traditionally served as carbon sinks due to the ecosystem's low temperatures and unique freeze thaw patterns. As temperatures increase, alpine ecosystems are experiencing warmer, dryer conditions, resulting in longer snow free periods. This change in climate may have an impact on the carbon storage potential and carbon dioxide emissions of alpine soils. High alpine soils have a limited amount of nutrients (nitrogen and phosphorus) available for plant and microbial processes, which may also influence carbon storage and carbon dioxide emissions. Ultimately an increase in carbon dioxide emissions from soil can lead to and increase in atmospheric carbon dioxide, creating a feedback loop which further drives climate

change. This portion of the study is to analyze ammonium, phosphate, and nitrate concentrations to rule out nutrient influence on corban storage and carbon dioxide emission. Nutrient concentrations influence both microbial activity and plant nutrient uptake, which both impact carbon dioxide emissions. Soil samples were collected in Rocky Mountain National Park from 2016 to 2021 to be analyzed. Samples were collected monthly from June to October during these years. Samples were taken in high alpine, as well as forested areas for comparison. Soil samples were taken at a depth of 15cm with a one-inch diameter soil corer. These soil samples were extracted with potassium chloride and were analyzed with using a colorimetric approach. After determining nutrient concentrations, a statistical analysis will be performed to determine if any of the nutrient concentrations will have an impact on carbon storage and carbon dioxide emissions.

Behavior change

Kimberly Paschke – Health Professions
Faculty Mentor: Garvita Thareja

Poster Presentation, Session I (9:45 – 10:45 am), Poster #6

Purpose: This behavior change is a part of adequate exercise dimension of health. Based on Health Theories being taught in the Public Health coursework, I had to identify a behavior that I have been wanting to change for a while. My targeted behavior was exercising that I have been wanting to change this behavior since January 1st, 2022. I was able to identify my stage of change as contemplation at the beginning of the project. This behavior will help me in accomplishing muscle gain and a healthier body. As a part of "Stages of Change" by Transtheoretical model, I am in maintenance stage by the end of my behavior change assignment.

Methods: Selected behavior change was followed for 4 weeks. There was a daily log that was filled out every day, till 4 weeks to track my behavior. I was able to utilize use lifting weights, leg machines, cardio machines, and abs strategies towards the selected behavior. These strategies were planned out for the behavior change for 4 weeks. I was able to identify barriers and resolved them I set a reminder and a motivation quote in the morning that helped in achieving all or most of the behavior change.

Results: Behavior change was successful after 4 weeks. I ran into some challenges like having car issues, being sick, and work that delayed and acted as barriers. I think I am in maintenance stage of behavior change. And I will continue towards being consistent in my new behavior change.

Future: I plan to follow my changed behavior and try to find new strategies to be consistent in my muscle gain.

Development of an Electrochemical, DNA-Based Biosensor to the Cancer Biomarker ENOX2

Mary Quansah – Biology (BIO)
Faculty Mentor: Andrew Bonham

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

One challenge to the identification of cancerous malignancies is the ability to detect cancer-specific antigens in a rapid, reliable, and accessible manner. Human Ecto-NOX Disulfide-Thiol Exchanger 2 (ENOX2) is a cell-surface metalocatalyst frequently expressed on virtually all major human cancer types and is critical for cell maturation. Importantly, ENOX2 regularly sheds into the sera, making it an attractive target for diagnostic blood testing. As a strategy for diagnostics focused on utilizing these shed ENOX-2 particles, we here demonstrate an electrochemical DNA-based (E-DNA) biosensor directed against ENOX-2 in solution. To do so, we first exploited a modified SELEX (systematic evolution of ligands by exponential enrichment) protocol to generate aptamers against ENOX2 recombinantly expressed in E. coli. A pool of candidate aptamers was identified by high-throughput sequencing, and gel mobility shift assays were used to characterize the best candidate aptamers and classified those with the highest affinity for ENOX2. The leading aptamer sequence was used as the core of our E-DNA biosensor, wherein changes in DNA conformation upon target binding result in changed dynamics of an appended redox reporter molecule, ultimately generating a rapid and quantitative change in the current of the electrochemical response when interrogated via voltametric methods such as square-wave voltammetry. Our sensor displays robust response to ENOX2 in solution, and may allow accelerated, dose-responsive readout for the presence of ENOX2 in both buffer and blood serum.

Creating Supportive Literacy Kits for Children with Complex Communication Needs

Danie Ramirez – Speech, Language & Hearing Sciences (SLHS)
Co-author: Chelsie Schuster
Faculty Mentor: Marcia Walsh Aziz

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 205

This project helped provide more ready-made tools, therapy manipulatives, and resources for children with complex communication needs receiving services at the Center for Inclusive Design and Engineering (CIDE). Children with complex communication needs typically have severe delays in speech, language, and literacy skills requiring alternative and/or augmentative communication systems. Literacy proficiency is a important part of success in educational settings. The CIDE provides services primarily focusing on literacy skills and provides access to literacy resources for this population to the broader community. MSU Denver SLHS (speech, language, hearing sciences) seniors created literacy kits for use in therapy at CIDE and for the broader community. These literacy kits are a columniation of resources to aid

children with complex communication needs in literacy and phonemic development. Activities in these kits include "anchor activities" which help integrate background knowledge and themes/concepts in the literature at the beginning of a therapy session. These activities also help to orient and excite the child while engaging in the session. Other key types of activities included in each kit relate to phonemic awareness such as rhyming, segmenting, and blending. Other literacy skills targeted include developing narrative skills, language stimulation, receptive listening, and highlighting relevant vocabulary. This presentation will provide context related to the creation of these kits and the process of making them during the spring 2022 semester.

What Hinders and What Helps Student's Help Themselves

Devon Rapken – Psychology (PSY)
Co-author: David Rynhart
Faculty Mentor: Lisa Hagan

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 205

An alarming number of college students experience food insecurity, housing insecurity, and mental health crises. Research demonstrates between 2% and 10% of college students face some level of homelessness or housing insecurity (Crutchfield et al., 2020) and that 40% of students experience some level of food insecurity (Bruening et al., 2017). Additionally, research has shown that 30%-50% of college students are diagnosed with a psychiatric disorder or are undergoing treatment (American College Health Association, 2019).

With increased awareness of students' needs, universities are offering additional student resources. But are students using the resources they need? Past research has found that students do not use campus mental health resources due to structural, intrapersonal, interpersonal, and cultural barriers (Shea et al., 2019). We hypothesize that these same barriers are not exclusive to mental health care but will also impede student use of campus resources that address their food and housing needs.

Another barrier to using student resources could be linked to internalized expectations of college living being characterized by poorer housing, nutrition, and/or a decline in mental health. This study hypothesizes that holding these negative expectations of what it means to be a college student will reduce the number of student resources that are accessed.

In this study, participants are undergraduate students recruited online through Introduction to Psychology courses. Currently, our sample size is 26, but data collection is ongoing. Analyses will be forthcoming.

This study examines the barriers students experience in accessing campus resources. It is our hope that upon identifying student barriers, campus administrators can use this knowledge to address solutions.

Homicide Rate Patterns Before, During, and After Covid Lockdown

Taylor Reed – Criminal Justice & Criminology (CJC)
Faculty Mentor: Hyon Namgung

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 207

The research being investigated is the homicide rate from the two years before the covid lockdown, during the covid lockdown, and up to now when the covid lockdown about done.
The research will look at the temporal rate of homicides before, during, and after the main portion of the covid lockdown. What will also be looked into is to see if the homicide rate is random, or if it takes place among people that know each, live together or are married. This was chosen because the covid lockdown is one of the most prevalent widespread events throughout the nation (if not the world) in recent history, and what will be researched is the effect it had specifically to do with homicide and whether it had an effect in the matter. I would answer the question by looking up reported homicide data within the time periods (2018 and 2019, then 2020 and 2021, and into when the greatest portion of the lockdown lifted into 2022) around the Denver area. Since Denver is one of the highest population areas with a diverse mix of people by race and by socioeconomic status. It would provide a great look at how widespread homicide was around this period of time around the Denver area. It could be relatable to other areas that are considered population hubs around the country.

PCR Screening for CRISPR-Cas9 Genome Editing of Metastasis Associated in Colon Cancer-1(MACC1) in Zebrafish

Eric A. Reeve – Biology (BIO)
Faculty Mentor: Vida Melvin

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

Metastasis Associated with Colon Cancer-1 (MACC1) was first identified as a genetic marker for metastatic colon cancers in humans. MACC1 is well known to increase cellular migration and proliferation in cancers, but its normal function is not known. Knockdown of MACC1 in zebrafish embryos using morpholinos resulted in loss or reduction in craniofacial cartilages suggesting an important role for this gene in craniofacial development. Zebrafish craniofacial development utilizes a highly conserved genetic pathway that also influences craniofacial development in humans. Likewise, zebrafish face and skull cartilages are homologous to those found in humans, making zebrafish a powerful model organism for examining craniofacial development. However, morpholino knockdown of gene expression is known to

induce off target effects resulting in phenotypes that are difficult to separate from their intended targets. To better understand the role of MACC1 in craniofacial development it is necessary to establish a stable genetic line of MACC1 mutant zebrafish using a technique other than morpholinos. We will use CRISPR-Cas9 to generate a loss of function mutation in MACC1 of zebrafish. This technique produces stable mutations in target genomic sequences through small insertions/deletions of genetic material. Here we establish a polymerase chain reaction (PCR) protocol to screen for CRISPR-mediated mutations in the MACC1 gene after genome editing.

Implementation of the Transtheoretical Model of Change (TTM) to monitor a specific behavior change over a 4-week period – field experience based on 'Theories of Health' course in the area of Public Health

Lyn Riebel – Health Professions
Faculty Mentor: Garvita Thareja

Poster Presentation, Session I (9:45 – 10:45 am), Poster #3

Introduction: There are many cultural and societal views about the ability for an individual to begin, implement, and maintain a behavioral change. Many beliefs stem from the idea that the type of change the individual is attempting to achieve has a significant impact on the process of changing the behavior. From changes that are perceived as simple, such as "waking up earlier in the morning" to changes that are perceived as more difficult, such as "quitting smoking", behavior changes can come in many forms and interventions. Based on Theories of Health, the Transtheoretical Model of Change (TTM) (also known as the Stages of Change) was selected. TTM suggests that regardless of the behavior change being attempted, there are common stages and processes that all individuals move through to help achieve change.

Methods: The goal of this research was to examine the process of a single behavior change in an individual using the TTM over the course of a 4-week period. The behavioral change selected for analysis was to increase the individual's level of cardiovascular activity, which is a part of the physical dimension of health. Achieving this change will help the individual incorporate a healthier lifestyle through consistent and regular exercise. At the onset of the research, the individual was in the contemplation stage of change within the TTM. The method utilized for this research was to measure the individual's progress in the selected behavior change for 4 weeks by utilizing a log to track behavior, progress, and the current stage of change.

Results: At the conclusion of the 4-week timeframe the result of the behavior change, current stage of change, along with challenges, barriers, motivators, and strategies for achieving the change were identified and analyzed to help the individual achieve future behavioral changes. The individual was able to follow planned strategies and implement them towards a successful behavior change. The individual was able to move further to Action phase based on TTM.

Conclusion: The results of this research can greatly assist the individual in identifying the strategies and motivators for achieving future behavior changes.

Behavior Change Journey to Reduce Anxiety

Andrew Salter – Health Care Management (HCM)
Faculty Mentor: Garvita Thareja

Poster Presentation, Session I (9:45 – 10:45 am), Poster #4

Introduction: This assignment was based on behavior change project that was a part of emotional and spiritual dimension of health. This was a required class project that had a goal of changing a behavior which had an impact on a student's life. Every student identified a behavior that they have been wanting to change for a while. Based on the theories of health being taught in the course, strategies were tailored to reach the goal. Anxiety was the identified behavior for change to help me in accomplishing educational and career goals, and the goal of leading a holistically healthy life.

Methods: Targeted behavior change was anxiety reduction. Specific and customized strategies as well as best practices were followed for 4 weeks. There was a log to track every day's activity for 4 weeks. Various breathing techniques, mediation, and medication strategies were planned towards the selected behavior. Lastly there were rewards associated with achieving small goals.

Results: The targeted behavior of anxiety reduction was successfully followed for 3 out of 4 weeks. In addition personal challenges were identified. This was work and personal life balance. Similarly, work transitions and personal issues created barriers. My motivators in changing the target behavior were, allowing myself to eat at my favorite restaurant, going on a small trip, and lastly, spending time with friends. Based on the stages of change being taught in the course work, I am in the action phase and plan to move into the maintanence phase, with my consistent behavior change.

Future direction: Achieved behavior will be continued further in my personal journey in release to achieve consistent release from anxiety. This will not be easy, and it will require a lot of work and self-efficacy. The motivation of being able to lead a holistically healthy life, anxiety free, at ease, and in the moment serve as a reminder for continued effort towards change.

Research Plan: Combined Toxicity of Heavy Metals Released from the Gold King Mine Spill on Zebrafish Development

Julie Schuyler – Environmental Science (ENV)
Faculty Mentor: Vida Melvin

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

On August 5, 2015, the EPA inadvertently destroyed a holding in the Gold King Mine that caused the release of eleven thousand cubic meters of acid mine wastewater over a nine-hour period, releasing an estimated 490,000 kg of metals into the Animas and San Juan Rivers. The EPA deemed the river to be safe for recreational use shortly after flow from the mine stopped. Water testing by multiple agencies in Cement Creek and the Animas and San Juan Rivers detected heavy metals in the Gold King Mine Plume, including Cadmium, Copper, Lead, Arsenic, and Chromium. These metals are known to negatively impact aquatic species at both the adult and embryonic stages. Based on subsequent studies, it was concluded that that there were no significant effects on fish populations in the rivers in the months after the release. However, no studies have directly examined the effects of the combined toxicity and teratogenic effects of the metals found in the release. Studying the combined effects of these metals (specifically, Cadmium, Copper, Lead, Arsenic, and Chromium) versus individual effects will provide better insight into potential health and environmental related impacts because, in nature, organisms are not exposed to each metal separately, but all of them combined. Zebrafish will be used in a series of experiments to study the effects of these metals on their development. Although zebrafish are not native to Colorado, they are an excellent model for toxicology and teratogenic related research projects because they develop rapidly, are easy to culture, and have transparent embryos which allows for direct observations of multiple organs throughout development. Using zebrafish and the OECD (Organization for Economic Cooperation and Development) protocols, we will test several combinations of Cadmium, Copper, Lead, Arsenic, and Chromium at concentrations comparable to those measured in the days following the release.

Addressing mental health impacts of large-scale trauma with community gardens in low-income populations

Aishie Selway – Social Work (SWK)
Faculty Mentor: Megan Hughes

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

The COVID-19 pandemic has created experiences of shared mass trauma on a global scale. Evidence shows that occurrences of depression, anxiety, and PTSD have increased in almost all demographics as a result of pandemic-related stressors. The World Health Organization acknowledges that this level of large-scale trauma is a public health issue. While responses to trauma range in severity throughout populations, it is well-documented that low-income communities are hit the hardest during times of social distress. Due to health inequities and lack of resources,

individuals, families, and communities are unable to access much-needed mental health care. In addition to individuals experiencing mental health challenges at a higher rate, many families and communities have lost their sense of interpersonal connections. Government restrictions, combined with the fear of exposure to COVID-19, made it difficult to cultivate relationships. The unprecedented scope of this worldwide traumatic event requires creative approaches to address the needs of various populations, being intentional to support diverse cultures. Studies show that implementing uniting and confidence-building projects like community gardens has positive impacts on the mental health of individuals using or frequenting the gardens, while also cultivating a greater sense of community and feelings of security. There is a lack of research on the benefits of community gardens in low-income, urban neighborhoods, specifically, and this study addresses this particular populations. The mixed methods approach to surveying results of locally planned and implemented community gardens on holistic benefits, including decreased feelings of depression, anxiety, and effects of PTSD, as well as increased community resilience and cohesiveness, shows that there is a need for more utilization and efforts to build community gardens.

Social Media and its Association with Anxiety Among College Students

Ashley Shearer – Integrative Health Care (IHC)
Co-authors: Daniella Pena, Patricia Teuton, Pa Thee
Faculty Mentor: Garvita Thareja

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

At the turn of the 21st century, humanity took a leap forward in global communications with the advent of the world wide web. The reach of this technology has almost all but eclipsed every facet of the human experience. At first, with the simple idea of enabling human interactions around the globe. Today, nearly everything is affected by the internet in some way. From finances to manufacturing, politics to commerce, shopping for a grocery list to sharing a funny video, there are many ways technology can be used and defined. One of the most complex and interesting effects it's had at an individual level, involves the mental health of its users. Social media has an endless capacity for encompassing positivity and with that comes potentially detrimental side effects. With popular platforms including Facebook, Instagram, Twitter, YouTube, TikTok, and Reddit, there is a plethora of information that was not available only 20 years ago. These interactive applications, when used properly, may allow for feelings of joy, togetherness, and love. However, even with research suggesting recommended usage times, there may be a negative impact on people.

Purpose: The purpose of this study was to analyze if there was an impact on the general population's mental health, specifically anxiety, with the increased use of social media.

Methods: We took a deeper look at how much time certain age groups spend on social media as well as how their feelings were impacted. We collected the data using an existing survey with multiple choice questions. Questions included on the survey were age, social media platforms used, how much time is spent on the applications, and several questions regarding the perceived impact on mental health. The population group included students enrolled in our class.

Conclusions: There is an association between increased usage of social media and anxiety in the population. Public health interventions should be planned to educate about social media effects as well as reduced anxiety.

Basil Plant Growth Analysis

Erik Sundblad – Computer Science (CS)
Co-author: Noah Kramer
Faculty Mentor: Feng Jiang

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

Machine learning represents a powerful analytical tool for a varied use of applications. Many of these applications are in the field of agriculture, metrics such as yield prediction, pest and disease detection, etc. There are, though, only a few examples of machine learning applied specifically to overall plant growth. The ability to better predict plant growth will allow for improved planning and decision making in modern agriculture. In this project, we have planted 12 basil plants and monitored the environmental parameters of the plants through the whole growth cycle in 3 months. A digital plant-growing system was designed to capture the humidity, temperature and image of the plants every 30 minutes. This system is controlled by an Arduino micro-controller, equipped with a camera, humidity sensors, and temperature sensors. The growth of the plants is captured by detecting the size of the leaves using computer vision techniques. The relationship between growth of the plants and the environmental parameters is modeled using different machine learning models. The growth behavior learned from growing basil plants can be used as an example to guide growing other similar herbal plants in the future, and extended to more generalized growth patterns!

Perceived Effects of Cannabis Use: A Content Analysis

Ariana T. Sweeney – Psychology (PSY)
Co-author: Megan P. Madden
Faculty Mentor: Katherine Hill

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

A content analysis using the social media website Reddit and its public posts were conducted to learn about cannabis users' experiences with the substance. We were interested in the reason for use (recreational/non-medical or medical) and positive and negative consequences (physical and/or mental health effects) from using.

Roughly 50 posts each from four subreddits were coded based on self-reported experiences. The recreational subreddits chosen were r/leaves and r/petioles which are centered around recreational users discontinuing and moderating use, respectively. The medical subreddits chosen were r/mmj and r/medicalmarijuana which focus on promoting knowledge on medical cannabis usage and support. The recreational subreddits yielded more self-reports concerning addiction and positive consequences of discontinuing cannabis use compared to the medical subreddits. However, the medical subreddits yielded more posts surrounding positive consequences for cannabis use and reason for use compared to the recreational subreddits. These findings are unsurprising given that the medical subreddits tend to focus on benefits of use, and recreational support tends to focus on negative consequences of use. There was similar reporting between the forums under the negative consequences for cannabis use. This is surprising because the four forums focus on different aspects of usage. These results suggest that regardless of perception on cannabis use, negative consequences are relatively common among the posts. The findings are limited by the qualitative nature of a content analysis and the possible biases of Reddit users' self-report. This specific content analysis only coded posts from four cannabis forums, but there are numerous other forums focused on cannabis. Future research should address a larger, more diverse sample of forums to capture a more complete reflection of cannabis users' experiences.

Assessing Water Quality in the Denver Metropolitan Area By Macroinvertebrate Community Composition

Janine Taurchini – Biology (BIO)
Faculty Mentor: Christopher Cooley

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

Aquatic macroinvertebrates are known to be ecological indicators of water pollution and other water quality factors (Xu et. al., 2013). For example, macroinvertebrates termed 'EPT' (the Orders Ephemeroptera, Plecoptera and Trichoptera) are sensitive to pollution, such that a high percentage of their presence in a sample indicates high water quality (Jumaat et. al., 2021). The objective of this research project is to evaluate the quality of two Denver Metropolitan area water bodies based on abundance and diversity of aquatic macroinvertebrate communities, along with five water quality parameters (temperature, pH, turbidity, dissolved oxygen, and nutrients). A water monitoring kit (Lamotte, n.d.) will be used to test these parameters, and the Leaf Pack Stream Ecology Kit Biotic Index and EPT Index from Leaf Pack Network (Stroud, 2020) will be used to determine pollution tolerance index ratings for the macroinvertebrate samples. The water bodies to be tested are the South Platte River at two locations in the city of Denver (Globeville Landing Park and Confluence Park), and Cherry Creek at two locations in the city of Centennial (Cherry Creek Valley Ecological Park and Cherry Creek State Park). Sampling at each site will be conducted on two different days, with the water temperature at each site being within a 5ºC range of the other sites for each round of sampling. Correlations between macroinvertebrate arrays and water quality parameters will be assessed statistically. Results between different days at the same sites, as well as between different sites, will be compared. These comparisons may reveal correlations between macroinvertebrate communities and water quality parameters.

Discussing stigmatized mental health issues in the Latinx communities

Gabriel Trujillo – Psychology (PSY)
Co-author: Perla Hernandez
Faculty Mentors: AnnJanette Alejano Steele and Karla Horgan Arévalo

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

The MSU Denver Health Scholars research project features multidisciplinary and interprofessional research on the mental, physical and emotional health of DACA/ Undocumented/ Migrant communities. The research focuses on the needs of these communities, next steps to fill gaps in response, as well as available resources in the state of Colorado. The presentation will be representative of both the Human Services and Psychology departments within the Health Institute. The researchers will emphasize a whole-person approach to health and wellness and offer solutions and possible next steps.

Two prevalent issues challenging underrepresented communities include domestic violence and attention deficit and hyperactivity disorder in Latin/a/o/x/e children. These are issues that are seldom given attention or resources due to the stigma that can accompany both.

Domestic violence is an unspoken and common issue within the Latino community. The effects of domestic violence on mental health can impact victims for a lifetime and can even lead to death.

Research shows there is a correlation between trauma and attention deficit hyperactivity disorder, with similar presenting cognitive and physical symptoms. Trauma response can lead to an over-diagnosis of ADHD overall in children in the United States. However, we see an underdiagnosis of ADHD in children of color from migrant communities.

Our multidisciplinary report represents the key goals of the Health Institute to revolutionize health in Colorado by breaking barriers, empowering and educating communities, fostering collaboration, and embracing diversity. DACA and Undocumented health issues continue to be under researched and we aim to shed light on the discrepancies.

Visualizing Social Dynamics in Discussion Board

Jessica Trujillo – Computer Science (CS)
Faculty Mentor: Ranjidha Rajan

Oral Presentation, Session III (2:15 – 3:30 pm), JSSB Room 205

Learning Analytics (LA) is an emerging area that analyze the digital traces from computer mediated teaching and learning tools and support in decision making for good. In this paper a programming model is used to visualize the social dynamics

in online discussion board. The social dynamics convey the social presence in a discussion board which is equally important as cognitive presence. The learning experience improves with a balance of cognitive and social presence in a collaborative learning activity like a discussion board. The model is built to visualize the social dynamics by showing if the post in the discussion is positive, negative, or neutral. The model visualizes the dynamics of discussion board as a whole and dynamics of individual post. This tool can be used by the discussion facilitator to get an initial idea about the discussion dynamics and give timely feedback. The model is built using Natural Language Processing (NLP) programming packages. The algorithm is done on a sample set of 1000 post from an open discussion post from reddit and 100 discussion post from a student discussion from the Learning Management System (LMS). The model is tested using manual coding of the sample from the LMS. As a future work. The study limitation is that it is not tested with the perspective of the users which will be a future work. As a future work the study will be extended to various factors to see the socially shared regulation of learning (SSRL) and social presence in online collaborative learning activities.

Analytical Methods for LC-MS-MS Characterization of Peptide-RNA Conjugate Structures

Kyle Tyner – Chemistry (CHE)
Faculty Mentor: Shailesh Ambre

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

Therapeutic biomolecules, especially RNA-based technologies, are currently a topic of great interest. The COVID-19 vaccines are one such example of RNA-based therapeutics. The proposed project is a segment of a larger collaboration with the National Cancer Institute (NCI), working to create an improved version of a small interfering RNA (si-RNA) technology. Peptides and RNA are two biomolecules that have important roles in biology but are never found naturally connected to each other. Our role in the collaboration is to synthesize and characterize two such peptide-RNA conjugates. Although the synthesis is not trivial, there are precedents to accomplish it successfully. However, current methods to detect the success of the protocol and to structurally characterize these molecules require access to instrumentation beyond the reach of a typical undergraduate institution. My project involves developing analytical methods using the Chemistry Department's LC-MS-MS instrument at MSU. The LC (liquid chromatography) component of the instrument separates unreacted materials and the mass spectrometer (MS) provides a method to accurately determine molecular changes and characterize biomolecules based on the molecular weight. This introduces two logistical considerations. First, the peptide-RNA conjugates are constructs with large molecular weight (>25000) and any instrument conditions must be optimized to detect the mass to charge ratio of the within the instrument's sensitivity limit. Secondly, a new protocol must be developed for detecting biomolecules with opposite native charges (positively charged peptide and negatively charged RNA) within the same experiment. These preliminary experiments will lay the methodological groundwork for future characterization of similar molecules.

Baby Boomers Motivation to Volunteer: A Study on How to Increase Volunteer Engagement

Eileen Umbaugh – Event and Meeting Management (EVT)
Faculty Mentor: Eric Olson

Poster Presentation, Session I (9:45 – 10:45 am), Poster #12

The role of a volunteer in a company's Corporate Social Responsibility program is vital to a company's positive reputation in today's socially aware, impact-driven, environmentally responsible, politically active generations. Most of today's volunteers come from three of the newest generations; Gen X, Y (millennials), and Gen Z. The largest generation are known as Baby Boomers, and their volunteer rate has been in decline. The newest data was gathered pre-covid in 2017 and showed the decline started in 2011. What is causing the decline in volunteers and maintaining volunteer retention of Boomers? Baby Boomers are known for their strong competitive work ethic; their chosen professions define them.
Further research is required and would be beneficial, from all four generations but, most importantly, from Baby Boomers. The most direct way to find out why they aren't participating as much as they did in the past is to ask them directly through specific surveys created and tailored for Boomers. All four generations should be surveyed to get a complete overview of how all volunteer programs can be improved and increase volunteers. Surveys should be designed with each generation's general characteristics in mind and conducted by the most appropriate method that is most likely to engage that generation in completing it. Program directors should be surveyed to provide the information needed to increase volunteers' volunteer base and retention. They may find they need to overhaul their volunteer guidelines and volunteer activities to attract the Boomer generation. A new study would reveal how to increase Baby Boomer volunteers and be the most productive way to place multiple generations in a volunteer experience.

DNA Extraction of Microbial Communities Within Concrete

Charles Unseld – Biology (BIO)
Co-author: Alena Kelleher
Faculty Mentor: Helene Ver Eecke

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

The purpose of this project is to extract DNA from microbial communities present within samples of concrete. This will be achieved by implementing a DNA extraction procedure designed for this purpose developed by Anders Kiledal and Julia Maresca of the University of Delaware. The extreme chemical properties of concrete as a medium such as alkalinity, salinity, and oligotrophic conditions lead to unique compositions of microbes present. Additionally, the use of local materials to make concrete causes local microbial communities already present in those materials to be reflected in the microbial communities of the resulting concrete. Therefore, analysis of samples from the Denver region will give insights as to what species

survive within concrete as a result of this region's own microbial footprint. The resulting data may also contribute to the Earth Microbiome Project, a project aimed at cataloging microbial communities from a variety of sources across the planet. To acquire the DNA to be analyzed, a concrete sample will be ground to a powder, the sample will be treated to lyse cells, remove excess material, and isolate DNA, and the resulting sample of extracted DNA will be quantified. Implementation of this this procedure will allow for this project to continue across multiple future semesters. To achieve this, materials and equipment will be acquired and fine-tuned to the available facilities at MSU Denver. Once complete, these DNA samples can be used for later analysis of bacterial species present. Understanding of the species present has implications in several applications of microbial life in concrete, such as use in biological indicators of damage, microbial-based self-repairing concrete, bioremediation, alternative energy generation, and conservation of resources.

Perceived discrimination and wellbeing among college students: The role of social support as a moderator

Jenny Valadez Fraire – Psychology (PSY)
Faculty Mentor: Maureen Flynn

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 205

As mental health struggles continue to rise among college students, mental health has increasingly become a concern on college campuses (Castillo & Schwartz, 2013; Gallagher, 2012). College students face increased rates of depression, suicide attempts, alcohol use, and personality disorders (Blanco et al., 2008). One factor that influences mental health is discrimination. Perceived discrimination has been shown to have negative effects on mental health (Pascoe & Richman, 2009). It is important to identify moderators that may help buffer this deleterious relationship. One such moderator may be social support. One study found that social support does not help buffer the relationship between perceived weight-related discrimination and mental health (Hatzenbuehler et al., 2012). The current study is a replication and extension of Hatzenbuehler and colleagues' study (2012). We assessed three different categories of social support rather than overall social support. We also examined perceived discrimination generally rather than focusing specifically on weight-related discrimination. Therefore, the aim of the current study was to examine whether social support (i.e., family, friends and significant other) moderates the relationship between perceived discrimination and wellbeing among college students. A sample of 20 undergraduate students participated in this study by completing a series of questionnaires online. Results showed that social support from family, friends, and significant other did not moderate the relationship between perceived discrimination and wellbeing. The results of the current study are not conclusive due to small sample size. Future studies could replicate the current study with a larger sample size. Additionally, future studies could examine specific types of discrimination (e.g., racial, weight) instead of using a measure of general discrimination.

Modelling water use on the Auraria campus using time series models

Omar Valles – Mathematics (MTH)
Co-author: Joseph Moran
Faculty Mentor: Benjamin Dyhr

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 207

Seasonal Autoregressive Moving Average time series (SARIMA) are statistical models that are used to predict water use in urban areas. Our goal is to use statistical methods like SARIMA to model water use on the Auraria campus. We offer recommendations for data collection and modeling frameworks that could provide useful forecasts of future water use.

Insomnia and depression among college students: The role of social support as a moderator

Lucia Vallez – Psychology (PSY)
Faculty Mentor: Maureen Flynn

Oral Presentation, Session II (10:45 am – 12:00 pm), JSSB Room 205

Insomnia is strongly related with mental health problems, and young adults are at a greater risk of developing early onset psychopathology (Taylor et al., 2011). College students comprise most of the young adult population, and 16% to 23% of young adults report insomnia symptoms (Taylor et al., 2011). Since insomnia is a diagnostic criterion for many psychiatric disorders it is no surprise that insomnia and major depressive disorders often co-concur, and the comorbidity is linked with worse outcomes for both (Taylor et al., 2011; Bei et al., 2018). It is important to identify moderators that may buffer against this deleterious relationship. One such moderator may be social support. In a cross-sectional study, Kim and Suh (2019) found that social support mediated the relationship between insomnia and depression. A more appropriate analysis for such a cross-sectional study is moderation. The aim of the current study was to partially replicate Kim and Suh's (2019) study by examining whether social support moderates the relationship between insomnia and depression. A sample of 20 introductory to psychology undergraduate students completed a series of questionnaires in an online format. Social support from significant other was moderately and negatively associated with depressive symptoms. The three types of social support were not significantly associated with insomnia. Additionally, none of the forms of social support moderated the relationship between insomnia and depression. The current study was underpowered. Future studies could replicate the current study and use a larger, more diverse sample. Identifying protective factors that weaken the relationship between depression and insomnia are needed to help address this important problem.

Keywords: depression, insomnia, moderation analysis, family support, friends support, support from one's significant other

Sex Ratio Effects on Pair Bond Formation in Convict Cichlids (Amatitlania Nigrofasciatus)

Rory Van Lieu – Biology (BIO)
Co-authors: Shaye Page, Leah Vitale, Marki Sivits
Faculty Mentor: Jennifer Gagliardi Seeley

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

Operational sex ratio may affect the formation of pair bonds. We are testing the effects of sex ratio in the socially monogamous, biparental convict cichlid (Amatitlania nigrofasciatus). In convict cichlids, both females and males are choosy during pair bond formation. If sex ratio affects pair bond formation, we predict that the control (1 male: 1 female) would have fewer pair bond formations than the experimental groups. In addition, the duration to form a pair bond would take longer in the control compared to the experimental groups. Furthermore, the group with 2 females and 2 males will have the most and the quickest pair bond formations, because it allows for both male and female mate choice. This experiment has a control (1 male: female), and 3 experimental treatment groups with different sex ratios: 1) 1 male: 2 females; 2) 1 female: 2 males; 3) 2 males: 2 females. Five observations per day are taken using a webcam to determine when a pair has formed. After a pair bond has formed, videotaping of the pair's behaviors are recorded for 15 minutes. The videos will then be analyzed for courtship and aggression behaviors. Although the number of pair bond formations does not differ between the groups, preliminary data suggests the control group had a longer duration to pair bond formation compared to the experimental groups.

Behaviour change

Mishika J Walia – Public Relations
Faculty Mentor: Garvita Thareja

Poster Presentation, Session I (9:45 – 10:45 am), Poster #5

On a psychological, environmental, and intellectual level, behavior changes were examined. Changes in intellectual conduct are one of the five dimensions of health. Since January 1, 2022, I've wanted to modify my ways. This will assist me in achieving my desired objectives if I set my mind to it, and I will also be happy if I am not pointing out my insecurities. I am at the maintenance stage of the Transtheoretical model's "Stages of Change." Changes in psychological behavior were tracked for four weeks. To track my behavior, I was required to fill out a log every day for four weeks. I was able to manage my psychological behavior by going to the gym, seeing a therapist, and thinking about it. After four weeks, these tactics were devised for behavior modification. After four weeks, the behavior shift had occurred. These were the difficulties I faced as a result of my insecurity, impulsive anger, and excessive worry about how others perceived me as a barrier. Sources of motivation are the gym, influencers, and treatment were all essential in accomplishing all or

a large portion of the behavior change. Since I will continue pushing, I believe I'm at the maintenance stage of my behavior change. I intend to continue with my new habit, as well as attempt new tactics and be consistent with my progress, remembering to look back at how far I've come before throwing it all away if a future obstacle arises, and to remind myself that I am happy because I am confident.

Volunteer work for the Sikh Community

Mishika J Walia – Health Care Professional Services
Co-author: Betty Grandaos
Faculty Mentor: Garvita Thareja

Poster Presentation, Session IV (3:30 – 4:30 pm), Poster #16

Denver Sikh Gurudwara is a Sikh house of worship in Indian culture. Every week, specialists sing and explain songs from the Guru Granth Sahib in traditional Sikh melodies, preceded by langar (Indian meal) served by the volunteer families as well as any individual that decides to help. By preparing the food from scratch, men, women, and children all take part in the service, which is thought to be quite valuable and a major strength in where the community comes together to be one. It is important to understand the community cook a complete lunch not because Sikhs are necessarily vegetarians, but because this is the food that is most generally shared, especially across religious boundaries. This is important because community participates in services, with their own will to provide outside their community. When volunteers like as myself donated and participated in the community kitchen, we observed to see how many other volunteers there were. I did a survey to see how often the Sikh community comes together in a year to provide for everyone in the hall. What I saw was that many people from outside the Sikh community, such as Hispanics and Caucasians, were assisting in the Community Kitchen by preparing meals and performing other tasks. The numerous ethnic groups who came out to help the Sikh communities prepare langar was a wonderful curriculum to field experience for me being in public health field. Ideally, as even more individuals become aware of the volunteer options that are available throughout this community, those numbers will go up. This is a part of community engagement and I learned as well as enjoyed the experience.

Motivations and Limitations of Fractal Dimension

Rose Webster – Mathematics (MTH)
Faculty Mentor: Robert Niemeyer

Oral Presentation, Session I (9:00 – 10:30 am), JSSB Room 207

Historically, dimension has been defined inductively, using integer values. In Euclidean geometry, a point has dimension zero. A one-dimensional object has only length, a two-dimensional object has only area, and a three-dimensional object has only volume. Inductive definitions, however, inadequately describe geometrically unusual objects which challenge our conceptions of the relationship

between dimension, length, area, and volume. This paper presents the motivation and reasoning behind increasingly rigorous definitions of fractal dimension—the similarity, the box-counting, and Hausdorff dimensions—and discusses the conditions for equality between these three definitions of dimension. Finally, all three forms of dimension are applied to the set of rational numbers between zero and one to illuminate the limitations and merits of each form of dimension; the Hausdorff dimension returns a meaningful value for a broader range of sets.

Comparative Crime of Burglary Rates during COVID-19

Olivia Weyand – Criminal Justice & Criminology (CJC)
Faculty Mentor: Hyon Namgung

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

The COVID-19 shutdown of 2020 quarantined American people and changed daily behaviors, possibly including criminal activities. In this context, the objective of this study is to observe criminal patterns pertaining to property crimes, specifically analyzing spatial distribution of burglary rates in Denver from 2016 to 2021 utilizing crime data from Denver Open Data Catalog. This research will not only observe spatial distribution throughout the years but also examine how criminal activities have been localized over time and how it has adapted to a vastly changing economy or household dynamic. The spatial and temporal analyses will assist in predictive policing efforts in order to prevent further criminal offenses. Further, allocating resources according to communal need helps address the issues directly whilst preserving unneeded resources for better circumstances.

Affects of violent media on aggressive behavior in children

Penn Younger – Health Care Management (HCM)
Co-author: Devin O'Toole, Melina Berra, Katie McCormick
Faculty Mentor: Garvita Thareja

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

Intro/Purpose: Our research was being done to determine whether there is a correlation between violent media exposure and aggressive behavior in children. In addition, the purpose was to answer the question, are there 'prime' ages to when violent media will impact the development of aggression? Upon review of previously administered studies, we are hoping to find out if there is a connection.

Methods: The systematic review that we have conducted included 12 hand-picked case studies. The inclusion criteria for our search includes ages 4-21, gender male or female, studies conducted in the last 25 years, and any/all race/ethnicities. The exclusion criteria was very limited, meaning studies containing adults ages 21+ and/or studies older than 25 years are not allowed. The data was extracted and summarized for interpretation. We also interpret the population size and geographical location. The database that was used for our search was PubMed and the key words for our search were media, aggression, behavior, and risk.

Results: The results from our analysis of these studies found there to be a positive correlation between violent media and aggressive behavior in children. We had a wide range of studies showing this correlation in different ways. Violent video games as well as television were found in many of the studies to be positively related to aggressive behavior in adolescents. Violent media also had physiological effects in children including increasing cortisol levels and initiating the stress response. We had only one study where the results were not significant but showed both girls and boys who played the violent video games tested with faster reaction times to violent pictures. Further research on this topic is needed to establish valid and reliable associations.

Conclusion: The results from our study indicated that there is a positive correlation between violent media and aggressive behavior in children. The studies provided statistically significant evidence to establish relationships between our variables of interest. In summary, we understand the consequences of exposure to violent media at a young age.

Analyzing the 5′-3′ Kissing-Loop Interaction Sequence for Cap-Independent Translation Initiation of Blackcurrant Reversion Virus

Liheng Zhou – Biology (BIO)
Faculty Mentor: Megan Filbin

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

Translation regulation commonly involves the 5′-m7GpppN cap which binds the initiation factor 4E bound to recruit the other initiation factors and the small ribosomal subunit. Yet some viruses, such as the Blackcurrant Reversion virus (BRV), have no 5′-cap but are still able to translate using alternative mechanisms such as 3′ cap-independent translation enhancers (3′ CITE). The 3′ CITEs in BRV's bipartite genome are predicted to work like 4E by recruiting initiation factors and bringing them to the 5′ end for initiation of translation through a 5′-3′ RNA kissing interaction, called the kissing-loop interaction sequence (KIS). Our goal is to verify whether or not the KIS between the 5′ UTR and 3′ CITE exists to promote translation initiation. Using site-directed mutagenesis and in vitro transcription, we created a series of KIS mutations (including compensatory mutations). Our preliminary in vitro luciferase translation experiments indicate the putative KIS between the 5′ UTR and 3′ CITE may not be important for translation initiation, however, we are currently working to verify these results and identify alternative KISs between the 5′ and 3′ ends. Although many CITEs use 5′-3′ RNA kissing interactions to deliver translation machinery to the 5′ end of the genome, it is not required for CITE function. The BRV CITE may function through a protein bridge or some other unknown mechanism.

Novel SHAPE probe synthetic method used to expand the variety of RNA secondary structure probing reagents

Zach Zimmerman – Chemistry Major for ACS Certified
Faculty Mentor: Megan Filbin and Ambre Shailesh

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

RNA's secondary structure has a large role in dictating its function, and one of the most widely used methods to determine RNA structure is known as Selective 2'-Hydroxyl Acylation analyzed by Primer Extension (SHAPE). This method uses small, electrophilic chemical probes that acylate the ribose backbone of conformationally dynamic - often unpaired - nucleotides, independent of the base identity. The acylated RNA backbone locations can be identified via reverse transcription and aid in mapping the secondary structure of the RNA. There are a variety of SHAPE probes, varying in solubility, half-life, and reactivity, with a recent emphasis on developing acylimidazole probes capable of in-cell RNA structure probing. Yet, to date, there is not a clear synthetic method capable of producing pure, isolatable, and shelf-stable in vivo SHAPE reagents. We used the readily available 2-methylpyridine-3-carboxylic acid, often known as nicotinic acid, as a precursor to the SHAPE probe 2-methylpyridine-3-carboxylic acid imidazolide (NAI), recognized as one of the first viable in vivo SHAPE probes. With the addition of a base to irreversibly deprotonate, we converted 2-methylpyridine-3-carboxylic acid into a potassium salt followed by halogenation with oxalyl chloride. Halogenation provides an isolatable intermediate capable of long-term storage, and when needed, the addition of imidazole converts the acid chloride into NAI. This method can be applied to the synthesis of similar SHAPE probes, such as the recently synthesized 2-aminopyridine-3-carboxylic acid imidazolide (2A3), which excels at in-cell probing due to its increased reactivity and membrane permeability compared to NAI. Additionally, using this synthetic method, commonly available compounds can be converted into electrophilic reagents capable of probing the secondary structure of RNA. The synthesis of such compounds with this method would allow for more diversity in this group of probes, and identification of more effective acylating reagents.